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THE  
**JOURNAL**  
OF  
**GAS LIGHTING,**  
**WATER SUPPLY,**  
ETC.

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m/s

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**VOL. CIX.**

**JANUARY TO MARCH, 1910.**  
~~~~~

LONDON:  
**WALTER KING,**  
11, BOLT COURT, FLEET STREET, E.C.

1910. *g*



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REMOTE STORAGE



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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2434.—TUESDAY, JANUARY 4, 1910.

## EDITORIAL NOTES—GAS, &c.

### Bills under Review—Capital Redemption.

THOUGH Parliament has been prorogued with the view to dissolution in a few days' time, the preparations for Private Bill legislation for the first session of the new Parliament proceed without molestation from the larger political interests now agitating the country. We open to-day our annual review of the Gas Bills as deposited; and though only five of the measures of the new or established limited companies seeking incorporation and parliamentary powers are noticed in the first article, it will be found that they are not without interest. The very first Bill dealt with in virtue of its alphabetical precedence is that of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company—a new concern, promoted under excellent auspices, and proposing, in one form or another, the fusion of no less than seven Companies. No technical man would question, where a cluster of small concerns is in existence as in this Essex instance, the propriety of, and the economy in, amalgamating the interests, and concentrating management and operations generally. The Bishop's Stortford District Council are forward with an opposing scheme of purchase of the local concern. It appears to us that the Council's proposal is not in the public interest, and that, if they succeed, they will spoil a scheme that holds economical service for the people in a large area, of which Bishop's Stortford only forms part. It will—unless some evidence to the contrary (the existence of which we cannot at present trace) is forthcoming—be a pity if this is the result of their intervention. Should the Company's scheme succeed, the new concern will enter upon its career a fairly substantial one, seeing that the expended capital, with premiums and loan capital, of the seven undertakings, aggregates a few thousands over £100,000; and upon this there will be an immediate prosecution of development work, requiring capital outlay.

Of course with a number of comparatively small companies such as these, the capital stands somewhat higher per million cubic feet of output than a Company should have of the magnitude produced by the consolidation; and moreover concentration means the unavoidable production of a certain amount of obsolete capital. The promoters are therefore asking for the power to form a capital redemption fund, by half-yearly appropriations out of revenue not exceeding  $\frac{1}{2}$  per cent. on the capital, including premiums and money borrowed. This is an interesting feature of the Bill; and it reminds of the capital redemption fund of the Gaslight and Coke Company, instituted in their Act of 1903, and continuing operative until a round £1,000,000 of capital has been wiped out by purchase in the open market and cancellation in the stock registers. But in the Bishop's Stortford case now before us, there is provision to the effect that the power is not to operate in respect of any half year immediately succeeding a year "during which the gas sold by the Company has exceeded the rate of 1 million cubic feet for each £400 of the paid-up capital," including premiums and outstanding borrowed money. The construction of this provision is not a model of perspicuity; but it simply means that the dividing-line between the operation and inoperation of the proposed redemption fund is £400 per million cubic feet of gas sold.

Among other noticeable features of the Bills under review this week is that three of the five Companies are asking for authorization to supply electricity. Noticeable among the promotions this session, too, are Companies with names that are reminiscent of adverse criticism. But perhaps there is an intention under the palladium of parliamentary powers to put on good behaviour and cast off old domination. It would perhaps be well if in certain Bills a limitation were placed on the dividends. "Unlimited dividends" may be an attraction for prospectuses, but the provision of such attractions by Parliament is not of its functions.

### Why the Gas Fire is Superior to the Coal Fire.

IT is our pleasure to publish to-day a novel and valuable report just made in Glasgow conjointly by the Corporation Chemist (Mr. F. W. Harris), the Sanitary Inspector (Mr. Peter Fyfe), and the Chief Engineer to the Gas Department (Mr. Alexander Wilson), as to the relative heating efficiency and contaminating influences of gas and coal fires. The report is opportune just when there is a revival of attention to the subject of atmospheric pollution, and when from many quarters reports are coming in regarding the increasing connections of gas-fires. If the popular mind is to be convinced on the points of gas-fire heating efficiency, cost, healthfulness, and contributory advantage to sanitary atmospheric conditions, in comparison with the coal fire, it must be by means that can be grasped by the lay mind; and herein lies the value of the report before us. We would not have a word eliminated from the document as it stands as a record, nor on account of its technical interest; but it may be suggested that, for later popular use, a digest should be made of the results and conclusions, so that each point may have direct appeal without having to pick it out from the surrounding detail—detail, however, that is essential in the present report to certify the care with which the research was conducted. To the lay mind, the very fact that the comparative tests of the gas fires and coal fires were carried out in two ordinary dwelling-houses identical in dimensions and situation will have weight, as no doubt there exists a popular suspicion that the refinements adopted in scientific investigation, by means of which regulation of various kinds can be effected, are out of harmony with, and inapplicable to, ordinary conditions. There is truth in this. But the technical man knows equally well that, without scientific precision, accurate information cannot be attained that is necessary in the cause of improving progress. Between the Glasgow tests and those made under methods giving scientific control, there are distinctive objects; and this should be borne in mind. The Glasgow tests, being conducted under ordinary conditions of use, are distinguished by novelty and commercial and educative usefulness.

In addition to those parts of the report that are confirmatory of the beliefs and experiences of gas technicians, there are substantial sections that are of technical interest. To make experimental and comparative determinations of the relative heating efficiency, heat losses, and so forth of two distinct and differently constituted methods of heating is a complex matter; and so the Glasgow investigators found, just as Mr. J. H. Brearley and the Department of Fuel and Gas Engineering at the Leeds University have found in their prior experiments on gas-fires. The reporters devote some consideration to the use of the thermopile and galvanometer in making heat determinations; and there is a point in this connection upon which other students may turn their wits in the effort to render assistance in future work. It is that the Glasgow investigators spent, without avail, considerable time in the endeavour to find a suitable method whereby the readings of the galvanometer could be translated directly into heat units. If a method of doing this could be devised, it would considerably facilitate, and add largely to the interest of, investigations of the kind. Though, as a result of the limitation, the efficiency tests are only of comparative value, nevertheless we are not prepared on that account to discount their intrinsic worth. For, in every way, though carried out under ordinary conditions of use, the experiments were surrounded by studied care; and they are therefore of reliable value, under the particular circumstances. In the tests, radiant heat—being, hygienically considered, the ideal mode of heat diffusion—was naturally the basis of the comparative tests of heat efficiency; for, as the investigators remark, radiant efficiency of either gas or coal fires must either commend or condemn each as a suitable source of heat for domestic purposes. The heat diffused from the fires by conduction alone was ignored in the report, as being a relatively negligible quantity. In reference to the



convected heat, the report to the layman would probably impress the idea that heating by convection is altogether undesirable. But this notion, as Mr. John Young, in his recent presidential address to the Eastern Counties Association, emphasized, must not be allowed to be taken as a scientifically accepted truth, as, while radiant heat is the supreme factor, a judicious blending of radiant and convected heat produces the most comfortable conditions.

From the report it is easy, and indeed instructive, to extract the findings of the investigators. In the first place, the great advantage of the coal fire is that the heat imparted therefrom to a room is diffused in the form of radiant heat; but there are rapid and wide fluctuations of the quantity of radiant heat. On the other hand, with gas-fires, the intensity of radiation is rapidly developed, and soon becomes constant. This can be readily appreciated. A coal fire is inconstant in its conditions, and chemical change is perpetually going on, from the one extreme to the other, in connection with it; whereas with the gas-fire the chemical procedure is remarkably constant. This is an advantage on the side of the gas fire. Then the percentage of heat given off in the form of convected heat is rather greater with a gas fire than with a coal fire. The investigators had a repetition of the experience of those who have trodden the same paths formerly in encountering difficulty in accurately ascertaining the percentage of the total heat generated that is lost as flue heat. With such ever-changing conditions as are found in chimneys, due to the prevailing atmospherical conditions, the construction of flues, and the many other circumstances, this is not surprising; nor is it strange that the results of different observers vary so considerably. Even in the case of the gas-fires tested by the Glasgow observers, under conditions precisely similar in regard to dimensions and structure of rooms and chimneys, percentage variations of loss range from 26 to 58. The criticism may, of course, be made that these records have no criterion value excepting under the particular conditions there existing, both permanently and temporarily, at the time the tests were being made. But under these same conditions, the reporters confidently assert that at least 75 per cent. of the total heat generated by the combustion of coal in an ordinary domestic coal fire is lost in the form of flue heat. So far the advantages are on the side of the gas-fire; but when we come to the actual fuel cost, taken independently, the coal fire has an advantage. Using gas at 2s. per 1000 cubic feet, and coal at 10½d. per cwt., in a six hours' trial, the money advantage in favour of coal was 1385d. But, on the other hand, a better heat efficiency was maintained with the gas fire than with the coal fire; and taking into consideration the numerous collateral advantages of the former (to which unfortunately the public do not give sufficient heed), such as saving of labour, cleanliness, ease of regulation, &c., the difference in bare fuel cost at the prices named is easily wiped out. This trial was a long-hour one; but for intermittent heating, owing to the facility of lighting and extinguishing in the case of a gas-fire, there is no question as to which would then be the more economical, taking even fuel cost alone.

The question of the relative contamination of the inside and the outside air by gas fires and coal fires forms an excellent section of the report. It is a matter upon which, in regard to inside air, there is extant a considerable amount of absurd opinion—traditional from the days when some of the gas-fires placed upon the market could not claim reliability in the matter of complete combustion, and when the crudest ideas were at times found as to how a gas-fire should be fixed. Given an efficient chimney, draught, and a modern gas-fire properly fitted and adjusted, it is, from the hygienic point of view, superior to the coal fire. In this connection, the findings of the Glasgow experimenters are that, using a gas-fire, the proportion of carbon dioxide in the air of a room is incapable of producing any injurious physiological effect; and that the results of experiments to determine the amount of carbon monoxide in the air of the rooms were in every case (with one single exception) entirely negative. In the case of the coal fire experiments, it was ascertained that, under normal conditions of chimney draught, no waste products, either of complete or incomplete combustion, were by-passed into the room, while the carbon dioxide content of the room was not materially increased. This was due to the rapid change, through the coal fire, of the air of the room, which—to set against the one advantage—produces great loss of heat, and causes draughts. With gas-fires there is not the same rapidity of chimney draught;

the change of air of a room being 10 times an hour in the case of the coal fire, as against an average of 5·2 times in the case of the gas-fire. And the ventilation produced by the gas-fire is quite sufficient. The point has application to the conditions of the atmosphere in the case of electrically heated rooms; but this is a matter that does not fall within the scope of the report. The investigators also treat of the relative pollution of the outer atmosphere by gas-fires and coal fires; and what they have to say forms a strong appeal to those who are—and who are not?—concerned in the question of atmospheric sanitation.

We have here a report fully charged with practical suggestion and usefulness; setting out, as it does clearly, the reasons why gas-fires are superior, from the user's point of view, to the wasteful coal fire. Our friends in Glasgow are heartily thanked for allowing the benefit of the results of their labours to be sent, for the common good, broadcast through the gas industry.

### Calorific Power in America.

AMERICAN gas undertakings have not hitherto given much consideration to the question of the calorific power of the gas they supply, and consequently the practice of calorimetry has not been by any means general. But there are rather material signs now that the question is going to grow rapidly in importance for our friends in America. Caution, however, must be exercised by the Gas Companies that the matter is not advanced by too rapid strides; and that it is viewed not only in relation to its immediate phases, but in full perspective, so that, whatever is done, the future of gas supply will not be trammelled by it. The subject is brought prominently to the front by a highly informative report that has been prepared by Mr. Henry C. Hazzard, the Chief of the Division of Light, Heat, and Power of the State of New York Public Service Commission (Second District), as a preliminary to a conference with the Gas Companies on the subject of the need for a calorific standard and on questions incidental thereto. If there is to be a qualitative standard attached to gas, the need of it being a calorific one is established. But a standard of one nominal degree cannot be of universal application owing to the varied conditions of manufacture; nor must the standards be placed too high so as to prove a disadvantage to technical progress. And above all the report establishes, though the recommendations at the end indicate a view on the part of Mr. Hazzard somewhat contrary, that the illuminating power standard should be entirely superseded, and not have existence alongside a calorific power one. These are points that need to be kept well in mind in the conferences and discussions that are to take place among our American friends, on an early day next month.

The report incorporates the results of a considerable amount of testing work; and these are valuable as an addition to the home published records of calorific power tests on coal gas, carburetted water gas, and mixed gases, and as adding to the knowledge that has already subjugated the belief that had at one time currency here, that there is some definite relationship between the illuminating power and the thermal value of a gas. There is not. We find one omission in the report, and it is that, while mention is made of the fact that the calorific power tests were effected by a Junkers calorimeter, there is no statement as to the burner, standard of light, and photometer used in making the illuminating power tests. The information may be common knowledge in America; but it is not so here. However, assuming that the whole of the candle-power tests were made by like means, and so have a common basis and value, the first thing that strikes one is that, generally speaking, the illuminating power is high, and so is the calorific power. In this fact there lies considerable danger in legislating on the present basis for the future.

Because a gas rich in illuminating constituents has been supplied under old conditions of use, and because this gas represents a high calorific value, there is now no reason why the latter should be maintained at the expense of manufacturing economy. There is no disputing that enrichment up to a higher illuminating power will result in the increase of the calorific value; but if the illuminating power minima and maxima in the tables are studied in conjunction with the corresponding figures for calorific power, it is immediately obvious that there is no *pari passu* advance of the latter with the former. And every candle higher in enrichment that one goes, costs more than the candle preceding. The figures in the report do not in any way offer any sufficient



justification for maintaining a high and unnecessary illuminating power for the purpose to which only 20 per cent. of the gas is applied, in order to obtain a disproportionate advantage in increased calorific power. Other lessons to be drawn from the figures are that it is impossible to calculate the unknown value of the one qualitative property from the known value of the other; and a further point is the demonstration of the constancy of the calorific value of a gas as compared with the inconstancy of the illuminating power. Generally speaking, the variations in the illuminating power of any one gas supply in the tables are wide; while the variations in the calorific value of the same gas are narrow. By this one fact, there is quite sufficient light thrown for anyone to see that the maintenance of a high illuminating power may be a positive technical and economic disadvantage in seeking to distribute the greatest quantity of B.Th.U.'s at the lowest possible cost.

The figures and lessons are so many in the report, that we must leave them with an expression of these few broad conclusions. But Mr. Hazzard's own conclusions are those that immediately concern the supplies of gas in the State of New York; and two of his recommendations in a measure show that Mr. Hazzard rather inclines to the setting up of a dual standard, which we protest would be most unfair, and altogether unnecessary. The estimate in the report, founded on collected data, is that the volume of the distributed gas used for heating, power, and incandescent lighting is quite 80 per cent.; and only the remaining 20 per cent. is of importance for its luminosity direct. Therefore, concludes Mr. Hazzard, "unless and until the amount of gas supplied used in open-flame burners becomes diminished considerably below its present proportion of the total gas consumed, it is desirable that the existing photometrical standards be maintained;" and further down "that by reason of the large class of consumers to whom the value of gas as a generator of heat is a matter of primal importance, it is desirable that the calorific power of gas be standardized by the introduction of appropriate tests." These recommendations, as they stand, are not in any way qualified; but among the questions he submits for consideration is this one: "Shall such [calorific power] standard be enforced supplemental to the illuminating standard now in use?" The answer on the relative volume figures given above is in the negative. Why, we may ask, is 20 per cent. of the gas still used for luminous purposes? The answer is because of the unnecessary maintenance of a high illuminating power for the gas. It is an encouragement to people to neglect the advantage that scientific improvement holds out for their acceptance; and it protracts the diminution of the already comparatively small volume of gas used for its illuminating power. If, when only 20 per cent. of the gas is employed for its luminosity, it is proposed to continue the illuminating power test, how was it that, when only 20 per cent. of the gas was used for its heating value, a calorific test was not then imposed? It has always hitherto been recognized—and it should continue to be—that the standard and test should follow the major use. If protection is needed, it should be accorded to the consumers of the four-fifths of the volume of gas distributed, and not to the laggards who seem to do all they can to avoid the path of illuminating progress.

Regarded technically, towards the end of his report, Mr. Hazzard remarks: "The utmost care must be exercised that the standard adopted shall, on the one hand, ensure excellence of service, and, on the other hand, not impose onerous conditions." The dual test would be, and we say it emphatically, an onerous condition; and unreservedly do we concur in the statement (quoted earlier in the report before us) of the Commission who considered the matter in the interests of Wisconsin, that "to require companies to maintain a double standard which shall ensure both a high heating value and a high candle power, would surround them with such restrictions that economy in manufacture might not be attained." For these reasons, and having regard to the future, and to the weight of the calorific power case in comparison with the illuminating power one, there is in this country going to be strong resistance to any parliamentary infliction of a dual test; and there should be the same in America. It is true that the Public Service Commission of the State of New York have not at the moment the power to set up any other standard than for illuminating power and purity; but no doubt there is a short course to an amendment of powers in this respect. Anyway, the fact gives more time for discussion.

### Newspaper Deception, and a Doctor's Misplaced Confidence.

A perverse fate seems to hang over the daily press in treating of technical matters. In the most simple affairs where it seems impossible for error to happen, stupid blunders are frequently committed; and editorial dignity declines to stoop to admitting the error and rectifying it. This is not just. A case in point occurred last week in the "Daily Telegraph." Prominence was given to a heading "Fatal Gas-Stove Fumes;" and whoever was responsible for this must have been suffering seriously at the time from want of discrimination. The first fatality recorded under the heading was that of a maid at a doctor's house in Cavendish Place; the cause being carbon monoxide poisoning, through the use in a bedroom, without flue or fireplace, of a patent stove in which charcoal was burned. That case, therefore, had nothing whatever to do with "gas-stove" fumes, but with emanations of a so-called "patent fuel" stove. The second case recorded under the heading was that of a man and woman who were suffocated through the misuse of a gas-fire, without vent for the products of combustion. The attention of the Editor of the "Daily Telegraph" was called, by Mr. George Mead-Robins, of Sutton, Surrey, to the injustice to gas heating by the manner in which the occurrences were reported; but the Editor, so far as we have seen, has totally ignored the protest. In the course of his letter, Mr. Mead-Robins wrote:

I desire, in the interests of the gas industry and the gas-consuming public, to point out that both your press notices are open to criticism. The sad occurrence, consequent upon the use of a patent fuel—used in doubtless an excellently designed stove—cannot be identified with a gas-stove. As to the Belfast tragedy, I apprehend that the Corporation Gas Department will agree that, if an ordinary gas-fire were used in the ordinary way, such a catastrophe could not occur, and that there is no more convenient, hygienic, and economic method of heating than by gas. I feel that your notice is calculated to mislead; and, in the interests of a profession with which I have been associated for thirty years, I venture to ask you to be good enough to note these remarks.

It is, to say the least, unfortunate when a paper of the popular standing of the "Daily Telegraph" gives circulation to statements injurious to an industry such as that of gas supply; and then refuses to afford equal publicity to a correction. Apart from this complaint, the first case, in which the maid was suffocated through the fumes from a charcoal stove used in a closed bedroom, attracts particular attention from the fact that this happened in the house of a doctor. We know only too well the old aversion of some medical men to the use of gas-fires, though ventilated, but which aversion is happily being fast dispersed through better acquaintance. Yet here we have a doctor who admits into his house, without question, a "patent fuel" stove, merely verbally commended by a non-technical person "because it gave off no dangerous fumes or obnoxious smell." The result of the doctor's credence is a tragic one.

### The "Safety" of Electric Lighting.

After the opening of the evidence at the inquest on the victims of the fearful fire at Clapham Junction, there appears to be no room for doubt as to the origin of the fire having been due to an electrical cause. The facts are clear; and there is in them the subject-matter for serious technical investigation on the part of the electrical industry. Stripped of all the surrounding evidence not immediately pertinent to the question of the origin of the fire, these facts stand out boldly: In certain of the show windows of Messrs. Arding and Hobbs, there was a special installation of electric lamps for decorative purposes at Christmas time; and the work was carried out by responsible contractors, as near as the conditions would allow, to the rules of the Phoenix Fire Office—the insurance company concerned inspecting and approving of the whole installation. The extra lamps installed were mostly tandalums. All the evidence points to the fire having started in one of the windows, in which there were 70 electric lamps. Two gas-lights had been previously used in this window; but they had been removed, and the gas had been capped off by the firm's own experienced gas-fitter. The window dresser who was in and out of the window every day asserts there had never been the slightest smell of gas there, and that it was intended to restore the gas-lights as soon as the Christmas show had ended. Moreover, during Christmas time, gas was only used in this part of the building on the upper floors. Immediately after the outbreak, all the electric lights went out, and the only light in the lower part was that reflected from above by the still burning gas-lights. There



has been a lot of foolish electrical talk about gas feeding the flames, and so on. It requires a great deal of heat to affect iron gas barrelling; and the gas-lights would simply go on burning until the heat of a fierce fire, or the fall of the structure, caused the gas-pipes to collapse. The assistant who saw the absolute commencement of the conflagration asserts that there was an explosion of one of the electric lamp globes; the explosion being precisely similar to one that occurred in the case of an electric lamp globe at a place at which he formerly worked at Streatham. The window dresser, too, stated that, at a shop at which he had worked at Pimlico, an electric lamp globe exploded in similar manner; and at Streatham he had seen a fur catch fire that was in contact with an electric lamp. In the case of the window in which the fire started at Clapham Junction, there were, it is declared, no inflammable goods within 9 inches of any of the lamps. Another witness asserts that, after the electric lights went out, he saw flashes under one of the reflectors in the costume department. These are the naked facts as to the origin of the fire, as deposed to by those on the spot. Their evidence cannot be shaken by writers who were comfortably seated at the time of the outbreak in the editorial arm-chairs of electrical papers, or by people in some place other than the ill-fated premises.

### The Report of the Canal Commission.

The Royal Commission who were appointed early in 1906 to inquire into the canal and inland navigation systems of the United Kingdom, issued their final report last week; and an important document it is—alike to the railway companies and to the general body of traders of the country. The recommendations are such as, if carried out, cannot fail to have striking effect in various directions. That something might with advantage be done to improve, and even add to, existing facilities for inland water carriage, has frequently been pointed out in the past—as has also the fact that the differences in conditions are so great as to render it difficult to take as an example of what should be done here the extensive canal systems which are to be found, for instance, in both France and Germany. The Commissioners, as is usually the case in such inquiries, were not unanimous in their conclusions; and three of them do not sign the majority report at all. These are Mr. J. F. Remnant, M.P., Mr. R. C. H. Davison, Civil Engineer, and Mr. J. C. Inglis, the General Manager of the Great Western Railway Company, each of whom presents a separate report. Mr. Davison states his reasons for thinking that the difference between Continental and British conditions makes the policy of Germany, Belgium, and France inapplicable here; and Mr. Remnant adopts somewhat the same views. Mr. Inglis takes a different stand, and expresses the opinion that it would be an anomaly that the financial assistance of a Government whose predecessors left private enterprise to develop, at such enormous cost, a railway system which was to compete with the old, inadequate, and most unsatisfactory canal system, should now be invoked to enable the canals to work up an artificial State-aided competition with railways to which no State aid whatever has been vouchsafed.

### The Proposed Scheme.

Having set forth an indication of the views of these gentlemen, a brief sketch may be given of the scheme of the majority of the Commissioners. The chief proposal is the formation of a central Waterway Board for Great Britain, consisting of three or five paid Commissioners, to whom should be transferred the waterways comprised in four main routes, with all their feeders and branches, the acquisition of which by the State they advise. These four main routes connect the Midlands with the estuaries of the Thames, Mersey, Severn, and Humber. The advantages claimed for this scheme are as follows: "These four routes, with the branches which we have specified, should, in our opinion, under any policy of improvement, be treated as great highways traversing Central England. They should be amalgamated under a single control, and should undergo such improvement as will make them efficient means of transporting a volume of long-distance traffic far larger than that which they at present attract. If these steps be taken, and if the amalgamation under the same control, as well as the improvement of certain shorter waterways which would feed the main routes with traffic, be included in the scheme, many of the great manufacturing and consuming centres of England will be linked with each other and with the great seaports

by waterways permitting the cheap transport of minerals and goods not requiring the highest speed. The Midland districts will have cheap access to and from the great estuaries for the import of raw material and the export of certain classes of products; and coal may be brought to London by improved waterways from the coalfields of South Staffordshire, and from those in the counties of Warwick, Nottingham, and Derby. Building materials, also, will be cheaply transported, even from distant points, as well as goods which, for various reasons, are more suitable for transport by water than by rail or by road—such as explosives, acids, and things of great size." No construction of new waterways is recommended. Into the financial side of the question, we have no space to enter; but, of course, this constitutes a serious consideration, inasmuch as the Commissioners estimate the total cost of all the improvements (excluding the cost of acquisition) to amount to £17,500,000, which, however, as the improvements are to be gradual, will be spread over many years. The Commissioners advise that the cost of acquisition, or part of it, shall be borne by the State, and not saddled on the revenue of the waterways. The existing gross income of the canals it is proposed to amalgamate amounts, it may be mentioned, to nearly £570,000. In all there were nineteen Commissioners; and of these sixteen sign the report—twelve without any reservation whatever. Glancing at the names, it seems that the twelve who sign without reservation include gentlemen of practically all shades of political opinion. Proposals are also made in the report to the effect that the administration of the Caledonian and Crinan Canals, now vested in the Caledonian Canal Commissioners, should be transferred to the Waterways Board; and there is, too, discussed the suggestion that a great Ship Canal should be constructed to connect the Forth and the Clyde. It is, of course, not intended that the work of the Waterways Board shall for all time be limited to the particular schemes outlined in the report.

### The Position of Nitrate of Soda.

However much the general body of nitrate producers may be in favour of combination, it seems that so far success has not rewarded the efforts to come to some arrangement which have been put forth by those entrusted with the task of bringing about some such machinery for the restriction of production and shipments as that which, after being in operation for eight years, expired by effluxion of time at March 31 last. Some explanation of the difficulty which stands in the way of a renewal of the combination is to be found in the half-yearly nitrate of soda report of Messrs. W. Montgomery and Co.; and it is worth attention, both from a general business point of view and as regards the particular case to which it refers. It appears that for a long time prior to the dissolution of the last combination, several producers felt that the method of arriving at the quota due to each producer was erroneous and unjust. It was well known that many producers had, for combination purposes, returned their productive power at from anything up to as much as 50 per cent. in excess of what it really was; and the consequence of this was that other producers who could complete their quotas were deprived of that which justly belonged to them—namely, a higher quota. In the most recent effort to find a working basis, 95 millions of quintals per annum were claimed; while under the free-hand *régime* about 53 millions is the average of the past few months. It is urged that, if a combination is considered a necessity by producers, it should be possible, from past experience, for those who may be entrusted with the formation of one to ascertain with some degree of correctness the effective productive capacity of each, and, in order to save time and minimize disappointment to those who are slow to yield their visionary rights, at once reject claims which it must be well known are false. This might be feasible enough; but a far simpler plan would be for those producers who desire a combination to supply accurate figures regarding their output capacity. In any case, however, it may be that when comparing the actual recent production with the total productive power claimed, allowance should be made for the fact that existing low prices have rendered it necessary to close down some of the dearer-producing officinas which would be in operation when more remunerative rates were obtainable. From which remark it will be gathered that what has been the producers' loss is the consumers' opportunity. The course of prices during the major portion of the past six months has been consistently in the downward direction. Early in July, the value of arrived cargoes was about 8s. 6½d. per cwt., cost and



freight; while about the middle of November the lowest figure of 7s. 11d. was touched. Messrs. Montgomery and Co. remark that the world's consumption for the past twelve months, at 1,929,000 tons, against 1,732,000 tons in 1908, is highly satisfactory, showing as it does an increase of  $11\frac{1}{3}$  per cent., or 196,000 tons. Of this quantity, the European Continent accounts for 1,354,000 tons, against 1,275,000 tons, an increase of 6 per cent. An increase of  $7\frac{1}{4}$  per cent. is also shown by the United Kingdom; the figures being 111,000 tons, against 103,000 tons. The United States took 398,000 tons, against 309,000 tons, or an increase of 29 per cent.; and other countries, 66,000 tons, compared with 45,000 tons, or an increase of 47 per cent. The prospects for the coming season are, it is declared, favourable for a large consumption.

### A New Publicity Scheme.

The other week mention was made of the advertising schemes of the London Electric Supply Companies, and how the work had been initiated. The municipal electricity undertakings are now dissatisfied with the limited conditions under which their publicity work is conducted. We have not observed any particular limit to action in this regard—in fact, one thing that has always been striking about municipal electricity supply has been the licence possessed and used by the municipal undertakings. However that may be, the Associated Municipal Electrical Engineers (Greater London) are bringing before the Borough Councils a scheme for the constitution of a Publicity Committee of Municipal Electricity Undertakings and Electric Supply Companies. The idea is to form a Committee consisting of municipal and company officials, whose work will be to prepare, print, and publish (with the aid of competent assistants) productions of common interest, such as leaflets, cards, posters, &c. Some guarantee by the various undertakings—£1000 for the first year—is sought; and a basis of subscription on the amount of the undertakings' revenue is suggested. Effective publication at a relatively small cost to each undertaking is the end aimed at. It is thought that those responsible for the control of electric supply works would do well to learn from their competitors—the gas companies—the advantage of handling their businesses in a more broad-minded and progressive spirit. The last words are suggestive of the conversion of the Associated Municipal Electrical Engineers (Greater London) from the errors of past ways. This was the body who imitated the Chinese slavery cartoons by some vile and highly-coloured pictorial slanders on gas for which they got the applause of certain of our electrical contemporaries. Now that these cartoons have displayed their libellous character at the bill-posting stations of the Metropolis, we may ask whether this sort of thing can be called "effective publicity," or whether it merely excites the derision of the very people whose custom it is desired to capture. Judging from the complaints as to the condition of the domestic electricity business, judging from the hysterical cries for greater business energy in domestic electrification, judging from this new scheme of the Associated Municipals, the slanderous cartoons have not been of any great service to the electrical undertakings of London. If the new publicity scheme goes through, we shall be interested to see how the handling of the electricity business in a "more broad-minded and progressive spirit" will shape. If the organization succeeds in its aim, it is considered that its scope will have to be largely extended; and in all probability, either by expansion or imitation, it will spread its influence throughout the country.

One of those pleasant functions which go to illustrate the cordial feelings of friendship and goodwill existing among the officers of the Gaslight and Coke Company took place last Friday. The occasion was the removal of Mr. P. E. Furniss from the Fulham station, where he has occupied a responsible position in the coke office for several years, to the Company's newly acquired works at West Ham; he having been deputed to assist Mr. W. Stephenson, who is in charge of the clerical staff there. Mr. Edward Mann, the head station clerk, having addressed a few suitable remarks to Mr. Furniss, in the course of which he took the opportunity of expressing his entire satisfaction with the manner in which he had performed his duties while at Fulham, and the general regret felt at the severance of a very pleasant connection, presented him with a handsome case of silver-mounted pipes, which had been subscribed for by the coke office staff and a few others, who, at their urgent request, had been allowed to participate in the movement. Mr. Furniss, in reply, expressed his great gratification at so unexpected and pleasing a token of his colleagues' friendly feeling, which he said he entirely reciprocated, and which he would, in his new sphere of duty, do his utmost to continue to deserve.

## ELECTRICITY SUPPLY MEMORANDA.

### A Review of the Past Year.

ANOTHER year has ended for the electrical industry with the spirit of aggressiveness strong within its administrative and executive workers. Much time and a large amount of attention have been devoted to the commercial situation during the twelve months; and, at the close, the position of affairs is found to be such that it is stimulating schemes of all sorts for giving to the industry's affairs a better aspect. Exhibitions have been frequent; circularizing, advertising, and canvassing have been rampant; misrepresentation—and we use the word deliberately—has been indulged in, if anything, to greater extent than formerly; but with what result? The net profits of many undertakings have been drifting backwards, albeit the output of electricity in some places has been increasing, owing mainly to an enlarged power-load at a lower price per unit than the lighting units. Electricity suppliers are consequently complaining; but, wisely, they recognize that complaint without action will not mend their fortunes. Electrical plant manufacturers, too, are still bemoaning the stagnation that surrounds them; but they are quite helpless. The electrical plant already supplied and fixed has, generally speaking, become too large for the demand made upon it; so that the cloud is likely to be somewhat steadfast for some time to come. And the scapegoat for all this is the metallic filament lamp, which has proved itself to be no respecter of concerns, but has served all undertakings—company and municipal alike—in carving big slices out of the lighting units. Of course, the accounts of the companies for the last six months, and of the municipal undertakings since March, are not before us yet; but there are rumours that the lighting units will show a substantial falling away. The situation is undoubtedly one of concern for the industry; but at times over it there is an attempt to cast a veil of optimism—a very thin and an easily penetrable one. It is hoped that the new lamps will expand the use of electricity for lighting purposes. But the hope does not get much support; for the new lighting business is generally going along much too slowly to have effect in balancing the losses of lighting units by lighting units. To help matters, the "Daily Mail," the "Mirror," and other papers have published some queer articles, purporting to show the public that, using the new lamps, the price of electric lighting is less than that of gas employed in modern ways. The electrical technical papers, too, have given circulation to similar stories; but there is a persistent refusal to meet challenges, and there is nothing but evasion. All that can be shown are a few accounts that possibly do exhibit a saving since electricity was adopted, as compared with gas used wastefully and in an antiquated way. To contrast the ancient and the modern is a favourite pursuit of many an electrician. And sometimes the gas figures include gas used for heating and cooking. In the comparisons of the year, there have been seen such absurdities as giving credit to incandescent gas-lamps for developing an efficiency of only 5 candles per cubic foot of gas consumed per hour. And that was gravely done in a technical electrical paper! The question of dishonesty has not for some time troubled the electrical conscience; and it has troubled less during the past year. But sight is lost of the fact that, where a few accounts exhibiting a saving over gas through easily explained reasons can be produced, there are numerous accounts to be had showing the value of modern gas lighting in yielding economy over electricity. Where these cost methods are not effective, then recourse is had to the poisonous fumes bogey; and attempts are made with the object of securing business to terrorize householders against gas. The London "Electrical Bulletin," the "Electrical Times," and Chairmen of Electricity Companies have played the game very low in this respect, as has been shown in the "Memoranda" during the year.

However, the end of the effect of the metallic filament lamps has not yet been seen. Lower illuminating power units have been developed already for the higher voltages; and the prices of the lamps—high as they still are—have been tending downwards through competition, in which the Welsbach Company have joined. Under these circumstances, the wasteful carbon filament lamp will receive yet greater displacement. The arc lamp branch of lighting has also found the metallic filament lamp, much smaller though it is, a serious obstacle to progress; and already there has been a substitution of arc lamps by groups of metallic filaments in several places both for street and for shop lighting. And the newer type lamps are not the only obstacles with which the electric arc lamps—flame and otherwise—have to contend. The inverted gas-burner is having a bad effect, particularly the high-pressure forms, which, under the modern high efficiencies, put the flame arc out of court in respect of cost and efficient illumination. So much is this so that a deputation of the City of London Corporation has recommended this form of lamp for main street lighting in the City, with ordinary inverted lamps in the side streets, and central suspension wherever possible. The late Chairman of the Corporation Streets Committee bore testimony to the fact that the best example of street lighting in the City was that found in Fleet Street with Keith high-pressure gas-lamps. These points all show that, in the competition, gas is more than holding its own, and would do so better still were it not for the preferential treatment, in street and public building lighting, meted out to electricity where the purveyors are the local authorities. This is one of the means taken



by local authorities, in all too many instances, to provide a questionable form of compensation for lost lighting units for their electricity undertakings.

There has been, in consequence, a great revival of controversy on the street lighting question; and it has been demonstrated again and again that, from the ratepayers' point of view, the action of municipal owners in this respect is not an economic one. The municipalities will not draw a dividing-line between their duty as administrators and as traders. If they would only fairly do this, there would be fewer differences than have been seen during the year with the Local Government Board over the question of street lighting. The Board form the only protection the ratepayer has against prodigal expenditure; but municipal electricity owners deny the right of the Board to stand between them and the spending of large sums of money on the conversion of street-lamps to gain nothing either in actual annual cost or efficiency. Finchley and Yarmouth were last year prominent cases in point; and while the Councils vaguely assert that they are doing the right thing, they absolutely decline to satisfy the Board as to the grounds on which they have arrived at the conclusion that street electric lighting is cheaper and more efficient than gas lighting. There have been attempts to get the better of the Board by empty bluster; but the Board are not so foolish as to allow themselves to be forced into a compliant spirit in that manner. Among other places, the Local Government Board refused a loan for street lighting at Hastings; the London County Council at Marylebone for the same purpose. But this refusal does not stay the hands of the municipal prodigals—they proceed with the work. If the requisite money for initial outlay cannot be got by way of loan, it is taken out of the general rates. In this connection, the Hastings Gas Company gave the Corporation a little lesson as to the legal rights in this matter, by appealing against the general district rate made by the Council on the ground that it was bad in law, as it included retrospective charges incurred and due more than six months before the rate was made, contrary to the Public Health Act, 1875. The Corporation were advised that the Company were right.

But though there is conversion, at heavy cost, of street incandescent gas-lamps to metallic filaments, there is not necessarily satisfaction among the ratepayers. At Hastings, there has not been; and so vigorous was the protest against the Corporation proceeding with the change, that the editor of one of the local papers had, to save his space, to refer his numerous correspondents to the Town Clerk. There was also complaint of the public electric lighting at Chelmsford. On the other hand, public demonstrations with modern incandescent gas-burners, in comparison with electric lamps, both at Beckenham and at Bradford, gained favour for the former in the eyes of the authorities and the public. What, however, is to be thought of the action of the Electricity Committee of the Plymouth Corporation in opposing a public demonstration of street lighting by the Gas Company? Did it show a sign of strength or of weakness? Still in several places, investigation by local authorities of tenders for both gas and electricity—these were mostly where ownership of the electricity undertaking did not affect the question—showed conclusively that economy was on the side of gas lighting. The preferential treatment produced by ownership not only obtains in the streets, but in respect of the lighting of the public buildings. But a Committee appointed by the Local Government Board to inquire into the subject reported, after careful investigation, that "on the whole it does not seem there is adequate evidence to justify the substitution of electricity for gas in institutions where gas is already used." And although there was so much fuss made by the electricians over a statement by a Committee of the Metropolitan Asylums Board, that, in the establishments under the Board, "a financial saving had generally resulted where electricity had been substituted for gas"—this being in comparison with antiquated flat-flame gas-lighting—there has not been much heard of the more recent decision of the Asylums Board to convert the flat-flame lighting at Darent Asylum to incandescent gas lighting. So much for the former report as to a financial saving being created by the use of electricity—the "saving," of course, depending on the remoteness of the gas conditions from present-day efficiency. While on the subject of municipal ownership, it may be mentioned that there have been disclosures during the year at Local Government inquiries and in other ways, as to financial mismanagement of certain municipal electricity concerns.

A great question has been as to how to recoup the lost consumption due to the substitution of carbon filament lamps by metallic filament ones. The height of ingenuity capable of being reached by some of our electrical contemporaries is found in the suggestion that the heating, cooking, and power branches of the business should be developed with all speed. That is to say, consumption lost at 4d., 5d., or 6d. per unit should be replaced by consumption at 1d., or thereabouts, per unit. A poor exchange, truly! But it is the best expedient they can devise for assisting falling fortunes. The expedient has been brandished about under the grandiloquent title of "Domestic Electrification;" and there has been much humorous writing on the subject in the technical press of the industry. One writer, possessing extraordinary perceptive powers, asserted that "the time when gas-cookers will be less numerous, and even near vanishing-point, is not so far off as some people imagine." Others wrote of the mystic powers of electrical cooking and heating appliances for retaining heat to a far greater extent than gas appliances; and by this means the

vast difference in the thermal values of gas and electricity was ironed out, and electricity became the more economical. For water heating, too, there can be no competition (so it is said) of gas with electricity; for, behold! the "Therol" water-heater has come, which after storing electricity for twenty-four hours will give sufficient hot water to rise a few inches in an ordinary domestic bath! But effort finds poor reward in slow connection; and it cannot be expected that, when 6 cubic feet of gas will do as much heating work as a unit of electricity, and without employing complicated and expensive appliances, householders are going to rush for the electrical appliances. And while electricians are talking about these matters, the employees of gas companies and committees are busily connecting up gas fires and cookers. The power business is another source of compensation for lighting units over which advocacy is strong. But the quantity of power required in many towns is of a somewhat infinitesimal character; and where power is required, many manufacturers are finding it cheaper to put in a gas-engine and generating plant of their own. What can be done in this way for lighting is instanced on St. Leonard's Pier. At the meeting of the Incorporated Municipal Electrical Association, more than one speaker asserted that a charge of 1d. per unit was no good for developing the power business; and Alderman Highman, of Accrington, pointed out that, with an isolated plant, he was getting his electricity at 0.34d. per kilowatt hour. Electricity purveyors, it must be confessed, have in the path of their commercial progress a fair amount of very awkward impediment. While speaking of power, the great Power Companies have not shown during the year that they are doing much in the way of extricating themselves from commercial failure, and of demonstrating the correctness of the principle of plant concentration with extraordinarily extensive distribution cables.

Yet other suggested restoratives for the electric lighting business have been found by the officers of undertakings in tariff reform. The "telephone" system of charging for electricity (it is not a new one, though put forward as such) is an example—being a fixed charge for the maximum possible demand, with a small after-charge per unit of current consumed. Another source of possible revenue has been the small householder. But all schemes put forward to secure this class of consumer end in a repetition of the experience that a lean revenue and a fat capital expenditure do not make a profitable consumer. Electricity slot meters have not been heard of much during the year; so that it may be taken that they are not rendering much aid—at any rate that is the experience within the field of our own observation. There are meters that do not go well with the restricted use of current by metallic filaments, as would generally be found in the small household; and, on account of this and expense, the old project of charging so much per point of lighting has been set on foot again—only to be knocked down once more when experiment has confirmed already recorded experience, that such schemes do not pay, even taking the average result. At this particular period, when the electricity industry is looking out for as many strings as possible for its bow, the excision of the wiring and fittings clause from the Electric Lighting Acts (Amendment) Bill in the past session is regarded as a serious loss by those who are favourable to municipal trading, and by them it has been held to be another injustice to the industry. Altogether it will be seen the electricity industry has got its work cut out to make a financial success on the present lines of working, unless local conditions are exceptionally favourable.

Opposed to progress have also been the mishaps of the year. People do not like a light that fails; nor do they appreciate the insidious character of electricity in the matter of fire promotion. With regard to the failures of current, and consequently of light, there have been many during the year, involving inconvenience to householders, loss to both shopkeepers and manufacturers, stoppage of theatre and other performances, and danger to the public. The record by us (which is not by any means complete) shows that there was one in January at Landport (Portsmouth); on Jan. 19 at Ashton-under-Lyne; in February, at Camborne; on March 18 at South Shields; on March 26, at Tulse Hill and West Norwood; on April 13, at Belfast; on the Thursday preceding Good Friday, at Hastings, and again on May 6; one evening in June, in the Seafield district of Broughty Ferry; on July 31, at Southend; on Aug. 21, at King's Lynn; on Aug. 29, at Clapham (Yorks); on Sept. 4, at Llandudno; on Sept. 15, at Stepney and Whitechapel; on Sept. 27, in Berlin; two separate failures were reported from Redditch, and one at Barnsley; on Nov. 5, at Oldham; on Nov. 7, in the western part of Brighton; on Nov. 8, at West Ham; on Nov. 22, at Woolwich; and on Dec. 1, there was a partial failure at Birmingham. Farther afield, Winnipeg suffered a complete collapse; and two failures were reported from Sydney. With regard to failures in public places, the Watch Committee of the Corporation of Portsmouth have been impressed with, in the interests of public safety, the importance, owing to the fusing of electric wires and the collapse of the lighting, of having stand-by gas lights in places of public amusement; and they only granted licences to the theatres and to the South Parade Pier on condition that there should be provision made for gas lighting. At the Worthing Baths, too, through the same cause, it was decided that gas-lights should be fixed. Disaffected workmen have found the electric light quite useful on two occasions during the year in pressing claims for fresh advantage. At the Waldorf Theatre, in London, a strike of workmen led to the collapse of the electric light; and the same thing happened at the Hotel Continental in



Paris, through the electricians on the premises abruptly terminating their service to enforce their demands.

In regard to fires and other casualties, the last annual report of the London Fire Brigade and a report relating to the City of London showed that, in proportion to consumers, electrical fires exceeded those caused by gas. On Aug. 18, there was the terrible disaster in the Italian village of Olginate, near Lake Como, which resulted in several deaths and injury to other persons and property; on April 10, there was a fire at a general dealer's shop at South Shields, owing to a defective main; on April 24, a private house at Colchester suffered seriously from a fire caused electrically; in October, a draper's establishment was burnt out at Battersea through, it is believed, the fusion of an electric wire; there was the ghastly, death-yielding and property-destroying occurrence at Clapham Junction just before Christmas (the details are too fresh in memory to need reiteration); the Kyles of Bute Hydro, near Rothesay, was burnt down owing, it is reported, to the fusion of a wire; first reports attributed the destruction of the pavilion on Yarmouth Pier, also just before Christmas, to a fire caused by electricity. This was subsequently denied as the cause, but suspicion lingers. On Dec. 27, Dixon's Boot Factory at Newcastle (damage estimated at £10,000) was burnt down; the cause assigned being the fusion of an electric wire. The Earl of Longford's residence in Bryanston Square was the scene of a fire about the same time through, according to report, "the overheating of an electric lamp." A portable hand lamp was credited with a fire at the Central Garage at Bradford. A fire occurred during the year at the Dundee electricity station. Going from home, the heavy losses involved by electrical fires were shown by an article from America in our issue for Aug. 17 (p. 441); and one from Germany in the issue for Aug. 24 (p. 512).

The questions of defective wiring and the use of flexible wiring were much debated during the year. It was shown by Mr. W. W. Lackie, the Corporation Engineer of Glasgow, that 61 fires in Glasgow, between 1902 and 1908, were due to defective wiring. Mr. S. G. Castle Russell, the Electrical Engineer of the Phoenix Fire Insurance Company, entered a protest against degenerate wiring; and the other day, following the Clapham disaster, in a letter in "The Times" he referred to the danger of running temporary electric wiring and fixing lamps in show windows without taking simple and necessary precautions. He also said: "It does not at all follow that if an electric lamp bulb is broken, the filament is instantly harmless. Experience has proved otherwise; and it is not sufficiently realized that the bulb, after continuous running, becomes very hot. As the electrical adviser to one of the leading fire offices, I have found that the unreasonable practice of placing electric lamps in contact, or in situations where they may come in contact, with combustible material is a fruitful source of fires." The "Electrical Review" also remarked in connection with the Clapham fire: "Without offering any opinion as to the origin of the fire, we take this occasion to repeat what we have so often said before—viz., that it is high time that the use of flexible cord in shop windows containing inflammable articles such as every draper's shop contains, to say nothing of celluloid goods, should be absolutely prohibited." The year, as usual, gave a crop of explosions in electric lighting boxes—mostly due to gas generated from the insulating material of the cables. Among the incidents was a serious and destructive affair at Manchester. The Home Office regulations applying to the use of electricity in factories were further discussed during the year; and Mr. G. Scott Ram's annual report on electrical accidents in factories supplied abundant proof as to the necessity for the regulations. Among other occurrences that attracted public attention was the death of a man at the Lot's Road generating-station through an electrical shock at 220 volts. It was noticed that a little paper called "Electricity," purchasable at 1d., had, as an attractive temptation to buy it, a "£15 insurance for death by electric shock!" The year has again shown that what with failures, fires, and fatalities, the advertising literature of the electrical industry requires extensive revision. But it may be expected that the old unscrupulous statements will continue to live, and that electricity will still be lauded by electricians as the safest illuminant on earth.

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 59.)

THE feature of the brief and broken week which finished up the year 1909 on the Stock Exchange was its cheerfulness and buoyancy, coupled with a degree of activity much beyond the ordinary. It is perhaps not saying too much to attribute the cheerfulness in considerable measure to the hopeful views regarding the coming elections entertained by the anti-budget majority in the Exchange. The reopening on Tuesday gave good promise, with strong markets pretty well all round; a prominent feature being the improvement in Railways. This continued on Wednesday; and the smoothly concluded settlement of the account was another cheering point. The leading markets were strong and pushful; but in speculative quarters there was some see-sawing. The activity was fairly maintained on Thursday, and the demand for gilt-edged investments was still in full action. Friday was the closing day of the week; and though there was some little realizing, the brightness was maintained till the last. In the Money Market, there was a very large demand for short loans, which put rates up; but discount terms were made easy by quiet business. Business in the

Gas Market was pretty moderate considering the season; and the tone was very firm and steady. Several small advances in quotations were scored, and no issue fell back in the opposite direction. In Gaslight and Coke, the ordinary was fractionally stronger—all transactions being within the limits of 103½ and 103¾. In the secured issues, there was only one deal; the debenture marking 83¼ cum div. South Metropolitan was stronger at from 120 to 121—a rise of 1. In Commercials, the 4 per cent. changed hands at 110 and 110½. Among the Suburban and Provincial group, Alliance old realized 17, British 43, South Suburban rose 1, and Bournemouth ½. In the Continental companies, Imperial was quiet at 175½ and 176½, European fully-paid marked 25, and ditto part-paid 18¾—a rise of ¼. Among the undertakings of the remoter world, Bombay was done at from 5½ to 6, Monte Video at 12½, Primitiva at 7½, ditto preference at 5½ and 5½, ditto debenture at 98, and River Plate at 17½.

According to usual custom, we append a table showing the closing prices at the end of 1908 and the end of 1909, with the respective gains and losses in value. These it is impossible to generalize; for in many instances the movements are attributable to special factors. But it may be noted that, while open stocks have advanced, secured issues are less in favour. The Metropolitan and Suburban Companies stand well; and a conspicuous incident is the higher value of Argentine undertakings, in view of economical amalgamation.

GAS COMPANIES.	Prices on Dec. 31, 1908.	Prices on Dec. 31, 1909.	Gain or Loss.
Alliance and Dublin, 10 per cent.	18½-19	17-17½	-1½
Do. 7 per cent.	12½-13½	11½-12½	-1
Do. 4 per cent. Deb.	90-102	100-102	..
Bombay, Limited	58-64	53-6	+1
Do. New, £4 paid	38-44	48-44	+10
Bournemouth, 10 per cent.	20-30	26½-23	-7
Do. B 7 per cent.	164-17	162-163	-1
Do. Preference 6 per cent.	15½-16½	154-155	-1
Brentford, Consolidated	216-249	253-250	-7
Do. New	87-190	180-191	+13
Do. 5 per cent. Preference.	122-124	120-122	-2
Do. 4 per cent. Debenture Stock	100-112	99-101	-1
Brighton and Hove, Original	213-216	217-220	+4
Do. A Ordinary Stock.	153-156	153-156	..
British	4-4½-4¾	424-434	..
Bromley, A 5 per cent.	114-116	118-120	+4
Do. B 3½ per cent.	84-86	88-90	+4
Do. C 5 per cent.	..	106-108	..
Do. 3½ per cent. Debenture	..	87-89	..
Buenos Ayres (New), Limited	114-11½	14-14½	+2½
Do. 4 per cent. Debenture	92-91	98-100	+6
Cape Town and District, Limited	48-52	3-4	-1½
Do. 4½ per cent. Preference.	48-52	51-51½	+½
Do. 6 per cent. 1st Mort.	47-49	48-49	+1
Do. 4½ per cent. Deb. Stock	76-78	80-82	+4
Chester 5 per cent. Ordinary	109½-111½	108½-110½	-1
Commercial, 4 per cent. Stock	106-108	109-111	+3
Do. 3½ per cent. do.	103-105	101-105	..
Do. 3 per cent. Debenture Stock	81-83	80-82	-1
Continental Union, Limited	93-98	95-97	+2
Do. 7 per cent. Preference.	137-141	137-139	-1
Derby, Consolidated Stock	123-124	121-124	-1½
Do. Debenture Stock	103-105	103-105	..
East Hull, 5 per cent. Ordinary	98-100	97-99	-1
European, Limited	2-2½-2¼	214-25	+2
Do. £7 10s. paid	174-18	184-19	+1
Gaslight and Coke, 4 per cent. Ordinary	99½-100½	103-114	+13½
Do. 3½ per cent. maximum	80-90	87-89	-1½
Do. 4 per cent. Con. Pref.	106-107	103-105	-2½
Do. 3 per cent. Con. Deb.	84½-85½	81-83	-3
Hastings and St. Leonards, 3½ per cent.	95-97	92-94	-3
Do. 5 per cent.	113-115	117-119	+4
Hongkong and China, Limited	18-18½	174-18	-8
Ilford, A and C	131-133	144-146	+13
Do. B	103-105	108-110	+5
Do. 4 per cent. Debenture	102-104	100-102	-2
Imperial Continental	179-181	175-177	-1
Do. 3½ per cent. Deb. Red.	95-97	94-96	-1
Lea Bridge Ordinary, 5 per cent.	120-122	119-121	-1
Liverpool United A	226-228	223-225	-3
Do. B	167-168	166-168	-2
Do. Deb. Stock	105-107	102-104	-2
Malta and Mediterranean	48-44	44-5	+1
Metropolitan of Melbourne, 5 p. c. Deb.	100-102	99-102	-3
Do. 4½ p. c. Deb.	100-102	100-102	..
Monte Video, Limited	114-12	124-13	+1
Newcastle and Gateshead, Consolidated	109-110	136-108	-2½
Do. 3½ p. c. Deb. Stk.	91-92	91-93	+2
North Middlesex, 10 per cent.	20-20½	..	..
Do. 7 per cent.	134-14	13-13½	-1½
Oriental, Limited	140-142	137-139	-3
Ottoman, Limited	68-68	68-68	..
Portsea Island A	138-140	137-139	-1
Do. B	132-134	29-31	-3
Do. C	122-124	122-124	..
Do. D and E	101-106	101-103	-3
Primitiva, Ordinary.	54-6	78-78	+1½
Do. 5 per cent. Preference.	54-54	54-54	..
Do. 4 per cent. Deb. Stock	95-97	97-99	+2
River Plate, Ordinary	13-13½	17-17½	+4
Do. 4 per cent. Deb. Stock	93-95	98-100	+5
San Paulo, Limited	14-14½	144-15	-2
Do. 6 per cent. Preference.	..	112-124	..
Do. 5 per cent. Deb. Stock.	50-51	51-52	+1
Sheffield, A.	240-242	233-235	-7
Do. B.	240-242	233-235	-7
Do. C.	240-242	233-235	-7
South African	134-134	122-122	-1
South Metropolitan, 4 per cent. Ordinary.	120-121	120-122	+1
Do. 3 per cent. Deb. Stk.	85½-86½	82-84	-1
South Shields Consolidated Stock	153-155	160-112	-7
South Suburban, Ordinary 5 per cent. Stk.	118-120	120-122	+2
Do. 5 per cent. Preference Stk.	121-123	120-122	-1
Do. 5 per cent. Debenture Stk.	121-126	122-124	+2
Southampton, Ordinary	107-109	109-111	+2
Tottenham and Edmonton, A 5 per cent.	134-136	133-135	-1
Do. B 3½ per cent.	100-108	111-114	+1
Do. 4 p. c. Deb. Stk.	103-102	98-100	-2
Tuscan, Limited	94-94	9-95	-1
Do. 5 per cent. Deb. Red.	100-101	100-102	..
Tynemouth, 5 per cent. maximum	100-108	110-112	+12
Wandsworth and Putney, B 3½ per cent.	128-130	130-141	+11
Do. 3 p. c. Deb. Stk.	72-74	72-74	..
West Ham, 5 per cent. Ordinary.	112-114	..	..
Do. 5 per cent. Preference	124-126	..	..
Do. 4 per cent. Debenture Stock	105-107	..	..



## PERSONAL.

Mr. A. FRANCIS last Friday retired from his position of Secretary of the Tavistock Lighting, Coal, and Coke Company, Limited.

Lieut.-Col. CHARLES LANYON OWEN, J.P., has been elected by the Directors of the Portsea Island Gas Company to the seat on the Board vacant by the death of Alderman Sir John Baker, J.P., M.P., who held the chairmanship for many years. Colonel Owen had for a long time been one of the shareholders' Auditors.

Mr. JOHN WILLIAMS, who has been Assistant-Treasurer to the Manchester City Council since 1897, is recommended by the Finance Committee for appointment as City Treasurer, in succession to Mr. EDWARD THACKRAY, who has resigned. It is also recommended that Mr. Thackray be appointed Consulting Treasurer.

Alderman F. GEEN, J.P., of Stoke, has received handsome recognition of the services rendered by him in connection with the promotion of the Potteries federation scheme, in the shape of a testimonial valued at 400 guineas, subscribed by residents in the district and others. The gifts consisted of two pairs of handsome vases and a magnificent service of silver plate. The presentation was made by the Mayor of Stoke (Mr. W. B. Hackney), who said the talented services which Alderman Geen so freely gave to the district had culminated in the present fair and equitable measure for the federation of the local towns. Alderman Geen had all the way through been the champion of the principles which had been incorporated in the Act as passed by Parliament—always having at heart the interests, not only of Stoke, but of the district at large. He would be lacking in gratitude if he failed to mention that for the admirable services so rendered by Alderman Geen, involving many months of strenuous labour, both by himself and the members of his staff, he had declined to accept the slightest payment. The saving to the pockets of the ratepayers (of whom the subscribers were nearly wholly composed) by this public-spirited action, amounted to many hundreds of pounds. Alderman Geen, in returning thanks for the gifts, admitted that the work he had done had been very hard, and had extended over a long period. What he had done, he said, had been not only for their own town, but for the general well-being of the whole district. As to the federation scheme, in three months they would be having the elections for the new Council; and they knew perfectly well that there would be a great change, not only in Stoke, but in all the towns, as regarded public life. He was one of those who believed that there must be no injury—not in the slightest degree if it could be avoided—inflicted upon any one of the six towns. On the contrary, it must be their united endeavour to cultivate local spirit, because, say what they would and do what they might, it would be impossible to eradicate the public life which had grown up, and which had developed in every one of the six towns. It would be suicidal, it would be contrary to the best interests of the whole district, if one town were to be advanced at the expense of any of the others. He believed that there would be a proper and fair spirit exhibited in the new Council, which would see to it that every district, whether far away from or near to the centre, had the best attention given it, so that it might advance as it had been advancing in past years.

## OBITUARY.

The death took place last Sunday week, at his residence at Wrexham, of Mr. JOHN BURY, one of the oldest and best-known residents of the town. The deceased, who was in his 92nd year, had been slightly unwell for a few weeks; but the end came somewhat suddenly, and was due to heart failure. Mr. Bury had been connected with public life in Wrexham for a great many years. He was the first Clerk to the old Highway Board, the first Secretary of the Wrexham Gas Company, and Auditor of the Wrexham Water Company since its formation; and he was also connected with numerous other concerns.

Mr. JAMES MANWELL, the Manager of the Dalmarnock Gas-Works of the Glasgow Corporation, died at his Glasgow residence, on the 22nd ult. Mr. Manwell was 78 years of age. He became Manager at Dalmarnock in 1870, when the works were taken over by the Corporation from the City and Suburban Gas Company. He had not been connected with the gas industry before that, but had been engaged in constructional work at Dalmarnock, and was retained as Manager of the works. For long, the Dalmarnock Gas-Works were the most up-to-date works which the Corporation possessed. It was in them that the experiments were made which resulted in the adoption of the Siemens system of regenerative firing. The new works at Provan were opened in 1904; and in the succeeding April the making of gas was stopped at Dalmarnock. But the works have been all along kept in a fit condition for use in case of emergency—Mr. Manwell continuing to have charge of them. When the works were taken over, they were capable of an annual make of 726 million cubic feet of gas; in the last year in which they were going, the output of gas was nearly 1695 millions. Mr. Manwell devoted his best energies to his duties, and was not in evidence on occasions of public ceremony. He was a capable Manager, trusted by his

employers, and looked up to by those who were under him. For some time he had been in indifferent health; but he kept himself in touch with the works down to shortly before his death.

It is with regret that we have to record the death of Mr. ROBERT SHADBOLT, which occurred while he was attending service at the Fleetwood Wesleyan Church on the morning of Sunday, the 19th ult. Mr. Shadbolt, who was for 32 years Engineer and Manager of the Fleetwood Gas-Works, had been in failing health for some time; and it was noticed that when he reached the church he appeared to be in an exhausted condition, having experienced difficulty in making his way against a somewhat heavy snowstorm. The sad event naturally created a painful sensation, not only among the members of the congregation, but among the townspeople, by whom deceased was held in the highest respect and esteem. Mr. Shadbolt was born at Cambridge in 1844, and was thus 65 years of age. He started life at the Cambridge Gas-Works, under his uncle, who was the Manager. Subsequently he had charge of the gas-works at Cambridge, and also undertook similar duties at a gas-works in Shropshire prior to going to Fleetwood. During his sojourn in Fleetwood, Mr. Shadbolt had seen the town develop from its small beginning to its present prosperous state; and with the town's advancement, the gas-works, under his judicious management, made rapid progress also. He was ever ready to assist in any charitable object, and did a considerable amount of good in a quiet, unostentatious manner. Deceased leaves a widow and a grown-up family of three daughters and four sons, with whom the greatest sympathy is felt. Three of the sons are Gas Engineers and Managers. The eldest, Mr. Robert G. Shadbolt, is at Grantham, Mr. Walter Shadbolt at Llandudno, and Mr. Samuel Shadbolt at Kirkby-in-Ashfield. The remains were interred in Fleetwood Cemetery; the coffin being carried by the four oldest workmen in the employ of the Gas Company. One of the Directors of the Company was present, together with a number of the employees; and one of the many floral tributes was from the men at the gas-works.

## THE IRON AND STEEL TRADES IN 1909.

THE passing of the year 1909 is an event which will be regarded without any very keen feeling of regret by those who are engaged in more than one important industry to which it has brought disappointment. Among the branches of trade in which early hopes have not substantially materialized must be included the iron and steel industries, which have generally speaking experienced anything but a satisfactory time, particularly in the first half of the year. Once again, therefore, there is an inclination to look forward, rather than to reflect upon the events of the past. Just at the present moment, much is being said and written on various subjects; and one of these subjects is trade prospects. The Board of Trade returns relating to imports and exports are being freely quoted in proof of assertions that the outlook is rapidly improving; and in other directions also there are to be noted signs that matters are on the mend. Thus the year starts with promise of better things to come in some branches of industry—and of which promise it is to be hoped we shall twelve months hence have seen the ample fulfilment. Under these circumstances, it seems to be only natural to expect that benefit will accrue to the iron and steel trades; and we turned with interest to the annual review of Messrs. Bolling and Lowe, in order to see whether confirmation of this expectation could be found there. There is, however, not much encouragement contained in it. The firm begin with the remark that depression is the keynote that expresses the prevailing condition of trade over the last eighteen months; and they go on to express the opinion that the law of averages alone gives us the right to expect an improvement, though in some quarters there appears to be a more optimistic tone (which they hardly share) as far as the United Kingdom is concerned. While it is admitted that in the year just closed there were not lacking occasional signs of a break in the clouds, the comment is made that the spasmodic strengthening of prices, though no doubt in many cases a wise business move, was, as an indication of better times, "only a fresh instance of the ostrich burying its head in the sand."

Taking first pig iron, the report states that in the spring a considerable decline took place in the price of Cleveland, which went down to about 46s. 3d.; but later on a gradual increase took place, until the quotation towards the end of December stood at 51s. 3d.—higher than had been the case at any other time during the twelve months. For awhile, it seems, "a few shipments to the United States formed a peg on which to hang the hat of looming prosperity;" but, as a matter of fact, the shipments were quite small. At no time do the United States import any really large quantities—but a very small percentage of their requirements in pig iron being obtained in this way, and that only under exceptional circumstances.

No great variation has been witnessed in the price of rails, as fixed by the English Syndicate; the nominal f.o.b. rates for heavy rails having been £5 10s. to £5 12s. 6d. per ton, with £2 extra for fishplates. It must, however, be added that in many cases there has been considerable difference between the nominal Syndicate prices and the actual rates accepted, which, for heavy rails, have varied from £5 5s. to as low as £5 2s. 6d. per ton, according to special circumstances. In fact, the nominal prices named seem,



it is remarked, in the majority of instances only to have been protective ones, and to have been regulated by the decrees of the International Syndicate as to the quarters in which orders were to be placed. As to the outcry against certain orders going abroad when English works were comparatively idle, there is, say Messrs. Bolling and Lowe, no gainsaying the fact that the orders for rails have not been sufficient to go round; and that while the International Syndicate is in existence, orders have to be apportioned equitably among the members, so that slackness at one or other of the works in the various countries is unavoidable. The truth will generally be admitted of the contention that, if there were work enough for all, there would be no necessity to form a Syndicate for the artificial maintenance of prices. It is gratifying to note the firm's view that in this particular branch of the industry the outlook appears to be improving; and we join in the hope that this anticipation may be realized, and that a larger volume of orders may be diverted to this country. As bearing again on the question of Syndicates, attention may be drawn to the remark that wrought-iron pipes and tubes appear to thrive better under a free market than under the Syndicate (when exports materially declined), as shown by the marked increase in the quantity exported in 1909 compared with 1908.

Copper—always a prime favourite as a medium for speculation—has during the past year received much attention at the hands of the "bulls," which fact, Messrs. Bolling and Lowe point out, provides the explanation of the remarkably steady market conditions in face of the constant deterioration apparent in the statistical position. The highest price (£64 3s. 9d. per ton) was reached in January, and the lowest (£54 10s. per ton) in March. A consolidation of the leading interests in North America has long been impending; but the plans have apparently been disturbed by the declaration that the Standard Oil Company is an illegal Corporation. There is, however, the report says, no doubt that in some form or another the consolidation will take effect; and the idea is that it will thereafter be merely a matter of time and diplomacy for a working arrangement to be made including all the more important producers in the world. Through the greater part of 1909, the tin market was comparatively featureless, though there was during the last few weeks of the year a burst of buying on American account in connection with heavy sales of tinplates made by the United States Steel Corporation for January-June delivery. In February the lowest point was reached—£123 15s. per ton for cash; while the highest figure of all (£153 10s.) was witnessed during December.

Referring to trade in other countries during 1909, the review states that Germany has suffered from the universal stagnation; but in the iron and steel trades the tendency is to centralize every branch in Syndicates, all dovetailing and forming a network which becomes increasingly complicated. As to America, in the early months of the year very pessimistic views of the position were taken. Subsequently, however, a fairly substantial increase in the output of pig iron commenced; and month by month this has advanced, until all previous records seem likely to be outstripped. The fact that large sums of money are announced to be spent in new construction for some time to come, is not indicative of a curtailment of demand. Canada seems, however, to be the only instance of continued prosperity and advancement over the last twelve months; and this wave of prosperity, it is pleasing to learn, appears likely to continue. Manufacturers have made great strides, and constructional work is being pushed forward rapidly; while every encouragement possible is given by the Government in the shape of bounties, legislation, &c.

Messrs. Bolling and Lowe as usual give our exports and their value of pig iron and iron and steel for the eleven months ending Nov. 30 of each of the past three years. They are as follows: Pig iron: Year 1907—1,853,635 tons, value £6,881,870; 1908—1,209,452 tons, value £3,809,616; and 1909—1,052,776 tons, value £3,373,402. Iron and steel: Year 1907—3,138,518 tons, value £37,067,362; 1908—2,694,609 tons, value £31,008,812; and 1909—2,943,846 tons, value £31,853,103. The total exports were: Year 1907—4,992,153 tons, value £43,949,232; 1908—3,904,061 tons, value £34,818,428; and 1909—3,996,622 tons, value £35,226,505.

The concluding sentences of the review may be quoted as they appear: "It is, of course, satisfactory that the exports of iron, steel, &c., for 1909 show an improvement. Before, however, we attach importance to it as a measure of prosperity, the figures of other countries must be taken into account. Again we must express the conviction that the outlook is not bright; but no one will welcome more than ourselves a result in the trading of 1910 that will not bear out our expectations."

It is announced that a Commission has been appointed by some German Gas, Water, and Electricity Companies to investigate and report upon the question of earth currents and their effects. Two experts will go fully into the question of the effects of tramways on the gas and water mains at Brunswick, Cassel, Nuremberg, Beuthen, Düsseldorf, and Warsaw.

According to some statistics given in "The Times," the creations of capital in the past half year were on a much smaller scale than they were in the corresponding period of 1908. In commercial undertakings the falling off was from £11,243,790 to £8,058,980; in gas and water undertakings, from £1,043,975 to £130,000; and in electric light and power concerns, from £800,000 to £500,000.

## GAS BILLS FOR 1910.

### [FIRST ARTICLE.]

COMMENCING to-day the review of the Bills treating of gas affairs deposited for the next session of Parliament, there are, in the first place, eleven measures to notice in which incorporation is desired and parliamentary powers are asked for.

The first is a Bill of great bulk. This is the promotion of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company—a concern contemplating the amalgamation of a number of existing interests, and consolidating and extending powers. Briefly the proposal is that the three Companies—Bishop's Stortford, Harlow, and Epping—shall be amalgamated, that in the new Company the undertakings of the Ongar, Newport (Essex), and the Much Hadham Companies shall be vested, and that the undertaking of the Dunmow Company shall be acquired by agreement. Further, that the Company shall be empowered to supply electricity within a certain portion of the limits defined for the supply of gas. It is proposed that the amalgamation shall take place as from on Jan. 1, 1911, and forthwith the Ongar, Newport, and Much Hadham Companies are to be vested in the amalgamated concern. The property and rights that will pass are not to include, in the cases of the Newport and Much Hadham Companies, the cash balances (other than consumers' deposits) and sums standing to the credit of the reserve funds, or coal, coke, and consumable stores, the values of which are to be determined by valuation. The price or consideration for the transfer of the undertaking of the Much Hadham Company is to be £1644. In the case of the other two Companies, the price or consideration is to be the allocation to the present holders of shares or stock in the new Company. The conditions usually applying to such transfers and windings-up are incorporated in the Bill. Provision is made for the taking over and employment of any officers of the three amalgamating Companies or of the Ongar Company as may be required and are willing to enter the service of the new Company. Any officer not taken over, or any officer with a continuous length of service of fourteen years who is not willing to enter into the service of the Company, is to be compensated on agreed terms, or in default of agreement under the decision of an arbitrator. Arrangements are made for the payment of dividends for 1910. Power is next taken for the purchase, on agreed terms, of the Dunmow Company. As to capital, it is proposed that it shall be £240,000, of which £104,568 is the original capital; the remaining £135,432 being additional capital. The division of the original stock into classes, and the allocation of the stock, make a somewhat considerable story. The issue of the additional capital by auction or tender on the conditions that have obtained the last session or two is provided for. On the "A" and "B" stocks the dividend is limited to 5 per cent.; on the "C" stock, and so much of the additional capital as is issued as preference with a dividend of 5 per cent. attaching thereto, also to 5 per cent.; and on the "D" stock, and so much of the additional capital as is issued as preference with a dividend of 4 per cent. attaching, 4 per cent. Reserve, special purposes, and capital redemption funds are provided for. The capital redemption fund may be formed by half-yearly appropriations out of the revenue not exceeding  $\frac{1}{2}$  per cent. on the capital, including premiums and all money borrowed or raised on capital account. The fund is to be applied in the purchase and cancellation of stock:

Provided always that all stock so purchased shall be purchased at a price not exceeding the average price of the last six transactions in such stock, or the price at which the last transaction in such stock has taken place . . . or at the current market price, whichever shall be the lowest.

This section shall not operate in respect of any half year immediately succeeding any period of twelve months ending either on Dec. 31 or June 30 (as the case may be), during which the gas sold by the Company has exceeded the rate of 1 million cubic feet for each £400 of the paid-up capital for the time being of the Company (including premiums thereon), and all moneys borrowed or raised on capital account, and at the time outstanding.

The carry-forward at the end of any half year is not to exceed the amount required to pay a year's dividend at the authorized rates. The Company ask for power to borrow (inclusive of the aggregate sum of £14,825 already borrowed by the Companies) one-third part of the issued capital. The first Directors include the names of Mr. H. E. Jones, Mr. F. H. Jones, and Mr. E. L. Burton, and some half-a-dozen others. The lands to be devoted to manufacturing purposes are scheduled. Protective clauses are given in respect of the use of roads, &c., to various authorities. The standard price of gas within a defined "inner area" is to be 4s. per 1000 cubic feet; and the sliding-scale will apply, on half-yearly penny variations in price, on the lines of changes in the dividend by 1s. 9d. upon every £100 of "A" stock, and 1s. 3d. on every £100 of "B" stock. The price in the outer area is not to exceed the price charged in the inner area by more than 1s. per 1000 cubic feet. But "the Company may at any time charge in any part or parts of the outer area, a price or prices lower than the price or prices charged in any other part or parts of the outer area, but so that such lower price or prices shall not at any time be less than the price charged during the same time within the inner area." But there is a special provision in reference to Ongar. In that area until the price charged by the Company in the inner area is reduced to 3s. 6d. per 1000



cubic feet, the price of gas supplied by the Company within  $1\frac{1}{2}$  miles of the existing gas-works of the Ongar Company is not to exceed 3s. 6d. per 1000 cubic feet; but as from the date upon which the price of gas supplied within the inner area has been first so reduced, the provisions of the section will cease to operate. But if owing to an increase in the cost of coal, or other unavoidable circumstances (which the auditors shall certify to be unavoidable), the price charged in the inner area is increased above the price charged in such area immediately before the passing of the Act, the Company are not to be precluded from increasing the price of gas supplied within the  $1\frac{1}{2}$  miles of the existing gas-works of the Ongar Company by the same amount per 1000 cubic feet as the price for gas supplied in the inner area is increased. The prepayment meter clauses are varied by the charge for the hire of a meter without fittings not exceeding 15 per cent. per annum on the cost of the meter and the fixing. The standard quality of the gas is placed at 14 candles; and the modern testing conditions are to be applied. All the necessary electricity powers are sought; the area of distribution being Bishop's Stortford, Thorley, Birchanger, Great Hallingbury, Stansted-Mountfitchet, and Elsenham. The Company, however, are not to exercise the powers in Bishop's Stortford without the consent of the Council, unless and until any powers for the supply of electrical energy therein which may have been vested in the Council shall have been revoked or ceased to be in force. Separate accounts are to be kept of the gas and electricity undertakings. An open discounts clause is included for both gas and electricity, "provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers." In one of the schedules to the Bill, it is seen that the Bishop's Stortford Company have an issued capital of £35,391 (including premiums), and have raised £11,400 perpetual debenture stock. The Harlow Company have issued £21,000 of capital, and have raised £1925 of perpetual debenture stock. The Epping Company have issued £24,198 capital (including premiums). The Ongar Company have issued £6000 of capital, and £1500 loan; the Newport Company have raised £2400 of capital; and the Much Hadham Company have raised £1420 of capital, and £650 loan. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In the Chipping Norton Gas and Electricity Company's Bill, we have reminder of the proceedings in Parliament on the abortive Mid-Oxfordshire Gas Bill, in a session not very remote from the present. In the preamble of the Bill, it is stated that there is no proper supply of gas or electricity authorized by Parliament in the borough of Chipping Norton and the parishes of Over Norton and Great Rollright. Hence the present proposals. The capital of the old Chipping Norton Company was £7182, divided into 718 shares of £10 each, of which 710 shares were issued—508 being fully paid up, and the remaining 202 shares paid up to the extent of £9 each. Then the preamble informs that the Mid-Oxfordshire Gas Company was incorporated under the Companies Acts with a nominal capital of £50,000, divided into 2500 ordinary shares of £10 each, and 2500 preference shares of £10 each. Out of the £25,000 ordinary capital and £25,000 preference capital, only 182 ordinary shares and 932 preference shares have been subscribed. Notwithstanding the smallness of the subscribed capital, the Company have issued debentures to the total amount of £50,830, the whole of which is charged on the undertaking of the Company, and £4730 is charged specifically on the part of the undertaking which was formerly part of the undertaking of the old Company. It is the Chipping Norton undertaking that the present Company propose to purchase from the Mid-Oxfordshire Company. The Chipping Norton Electric Light and Power Company seem also to have undergone some changes. It was incorporated under the Companies Acts in 1907, with a nominal capital of £2000; and the Company have issued debentures to the amount of £1000. Then the following year the Chipping Norton and District Electric Light Company was incorporated, with a capital of £10,000 in 2000 shares of £5 each. The old Company was wound up, selling their concern to the new Company—the consideration being £500 in cash, and £6500 in either debentures or cash. The new Company issued debentures to the amount of £7000, although the same is not represented by any cash value equalling such amount. It is this undertaking that the Company now seeking parliamentary powers desire to purchase. The limits of supply for gas and electricity are to be Chipping Norton, Over Norton, and Great Rollright. The capital of the Company is to be £12,000, in 2400 shares of £5 each, with one-third borrowing powers. Dividends are not to exceed 10 per cent. on the ordinary capital, and 6 per cent. on the preference capital. Special purposes and reserve funds are provided for. The carry-forward is not to exceed the amount required to pay a year's dividend at the authorized rate. Separate accounts for the two undertakings are to be kept. When the receipts on the revenue account of the electricity undertaking exceed the amount necessary for the ordinary requirements and the payment of 7 per cent. on the aggregate amount of the capital moneys employed in the undertaking, the Company are to make such a rateable reduction in the charge for the supply of electrical energy as in their judgment will reduce the surplus to the maximum rate of profit. The transfers of the undertakings are to take place on the passing of the Act; and the price to be paid for them is to be ascertained by arbitration. The standard price of gas is placed at 4s. per 1000 cubic feet; the sliding-scale applying on the usual terms. The ordinary prepayment clauses are included. The prescribed quality of the gas is to be not less than 14 candles, tested by the "Metropolitan" No. 2 burner. All the

requisite electricity powers are included. Other clauses are on ordinary lines. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Farnham Gas Company, Limited, have a capital of 1920 shares of £10 each, entitled to a maximum dividend of 7 per cent. per annum, and 1000 preference shares of £10 each, entitled to a dividend of 5 per cent. per annum. The Company have borrowed on mortgage sums amounting to £6800. The Company desire to be dissolved and reincorporated. Further they ask for the repeal of the Farnham and District Electric Supply Company's Order, the powers of which have not yet been exercised, and for the necessary powers to enable them to supply electricity for public and private purposes within a certain portion of their own limits of gas supply. The capital of the Company is proposed at £60,000, whereof £19,200 (divided into 1920 shares of £10 each) is to be called the original capital, and the sum of £10,000 (divided into 1000 preference shares of £10 each) the preference capital; the remaining £30,800 being the additional capital. The standard dividend on the original capital is to be at the rate of 7 per cent., and on the existing preference capital at the rate of 5 per cent., and similarly on the additional capital issued. The modern auction clauses apply; and reserve and special purposes funds are provided for. Power to borrow is to be taken on the usual line of one-third, inclusive of £6800 already borrowed by the limited Company. The limits of supply are Farnham, the parish of Farnham Rural, and the Frensham ward of the parish of Frensham. The standard price of gas is contemplated at 3s. 9d. per 1000 cubic feet, with the sliding-scale of dividend operating annually on the basis of 3s. 6d. changes for rd. variations in price. The quality of gas is to be 14 candles, tested in modern manner. The ordinary prepayment meter clauses are inserted. All needful powers are included in respect of electricity; and separate accounts are to be kept. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Garnant Gas Company is a new creation; it being considered that it would be to public and local advantage to have a supply of gas in Garnant, Glanamman, Brynamman, Gwaun-cae-gurwen, and Cwmgor, forming parts of the parishes of Llandilofawr-Rural, Bettws Llangiwig, and Quarter Bach, in the counties of Carmarthen and Glamorgan. The suggested capital of the Company is £18,000, with one-third borrowing powers. Reserve and special purposes funds are proposed; and the revenue carry-forward is not to be more than sufficient to pay the maximum rate of dividend for one year. The maximum price is put at 5s. per 1000 cubic feet for gas of a prescribed illuminating power of 14 candles, tested under the modern conditions. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Gowerton and District Gas Company is forward with a Bill. It was incorporated under the Companies Acts in 1907, with a nominal capital of £15,000. The capital issued is represented by 272 £5 ordinary shares and 809 7 per cent. preference shares. The Limited Company owe upon debentures £2500, carrying interest at the rate of 5 per cent. Further debentures to the amount of £2000 were issued to certain contractors, but have been surrendered to and cancelled by the Limited Company. The Company also possess only a limited interest in the site of the existing works; and they desire to acquire by compulsion or agreement the gas lands as scheduled. For these reasons it is desired that the Company should be dissolved and reincorporated, with further powers. Turning to the clauses of the Bill, the defined limits of supply are Gowerton and Loughor Borough, and so much of Llandeilo Talybont as is not within the area of supply of the Pontardulais Gas Company, Limited; and also as much of the parishes of Penderry and Cockett as is not within the existing area of supply of the Swansea Gas Company. The capital named is £15,000, divided into 3000 shares of £5 each. "Such number of the shares as is equal to the number of preference shares of the Limited Company held by registered shareholders of that Company immediately before the passing of this Act shall be preference shares entitled to a non-cumulative preference dividend at the rate of 7 per cent. per annum out of the profits of the Company in any year, and the remainder shall be ordinary shares." The customary one-third borrowing power is asked for; and authorization for the compulsory purchase of the gas-works lands is requested. The maximum price of gas is suggested at 4s. 6d. per 1000 cubic feet; to be reduced to 4s. 3d. as from Jan. 1, 1912. The old 10 and 15 per cent. discounts clause has been inserted. The ordinary prepayment meter clause appears. The proposals regarding illuminating power and testing of the gas are on the ordinary lines—14 candles, tested by the "Metropolitan" No. 2 burner. There is an elaborate agreement (appearing as the second schedule to the Bill) made between the Rural District Council of Swansea and the Company, referring to the use of the roads by the latter, and also stipulating that the price of gas shall not at any time exceed 4s. 6d., and after the expiration of two years 4s. 3d., and that the price for public lighting in any part of the district shall in no case be higher than 10 per cent. below the minimum charge to private consumers. The Company are not to oppose any application for electric lighting powers. Provision is also made for the transfer of the undertaking, should the Council or the Parish Councils so desire, on agreed or arbitration terms. [*Parliamentary Agents: Messrs. Baker and Co.*]

Mr. Peter Harris, of Brierley Hill, of the firm of Messrs. Harris and Pearson, of Stourbridge, left estate of the gross value of £25,307. He has bequeathed £500 to his Executors for charitable purposes connected with his native town.



## THE HAMBURG GASHOLDER DISASTER.

THE "Journal für Gasbeleuchtung" of the 1st inst. gives some further details, mostly taken from the pages of the "Deutschen Bauzeitung," in regard to the construction of the new gasholder at the Grasbrook works at Hamburg, the tank of which collapsed with such disastrous results on the 7th ult. In so far as these details have not already been given from other sources in the "JOURNAL" of the 14th and 21st ult. (pp. 733 and 805), we reproduce them below.

The restricted ground space available on the works for the erection of a gasholder led to the ordinary form of tank being discarded in favour of a special type. Other considerations which weighed in the same direction were that the site lacked uniformity, and that it was desired to run a railway-line of standard gauge underneath the tank. From the sectional plan of the substructure and the elevation and vertical section of the complete gasholder which are given, it may be seen that the bottom of the annular tank was raised about 6 metres (= 19 ft. 8 in.) above the level of the ground. The ring of masonry forming the outside of the substructure rested on an annular platform, of 63.6 metres (= 208 ft. 8 in.) inner and 77.32 metres (= 253 ft. 8 in.) outer diameter, and having an average thickness of 1 metre (= 39.3 inches). This platform, which was supported by 504 octagonal piles, had thus a width of 6.85 metres (= 22 ft. 6 in.). Special importance was attached to the organic connection of the iron mountings of the piles with the annular platform and with the different pillars or piers, and the arches which joined the latter at the top. There were 32 of these pillars (corresponding with the 32 columns of the guide-framing of the holder) spaced round the annular platform; and they were again connected at the top by an annular platform 4.73 metres (= 15 ft. 6 in.) in width. Below the latter platform arches were built into the openings between the pillars. The openings of the arches were closed by windows and doors, so that the chamber beneath the tank could be used as a store. At the two places where the railway passed through the ring structure, strong platforms reinforced with iron were erected instead of the arches as just described.

The central pillars or stanchions of the floor of the tank were upheld by a hollow circular column, 9 metres (= 29 ft. 6 in.) in height, standing on a base-plate or platform 10 metres (32 ft. 10 in.) in diameter supported on 32 piles. The column tapered upwards to a diameter at the top of 8½ metres (= 27 ft. 11 in.), and the hollow space was 4 metres (= 13 ft. 1½ in.) in diameter. This central pillar was connected by five radial beams or bulks of reinforced concrete with the foundation platform of the outer annular structure. Each of these stiffening beams was 1.2 metres (= 3 ft. 11 in.) wide, and 0.75 metre (= 2 ft. 5½ in.) deep, and was supported on three piles.

The bad character of the site, of which the ground had everywhere been previously broken, from the outset caused the driving of the piles to be attended with quite exceptional difficulties. Water had to be applied at times while driving was in progress; and many broken piles had to be replaced by driving others alongside them. The load on each pile was about 60 tons. The masonry ring supporting the tank contained about 8000 cubic metres (= 10,464 cubic yards) of concrete, exclusive of the volume of the piles, or about 19,200 tonnes (= 18,893 tons). The load of iron-work to be carried in addition was—

1.—In the annular tank	1254 tonnes	= 1234 tons.
2 " " guide-framing	811 "	= 798 "
3 " " stairways	23 "	= 22½ "
4 " " gasholder bell	1194 "	= 1175 "
Total	3282 "	= 3229½ "

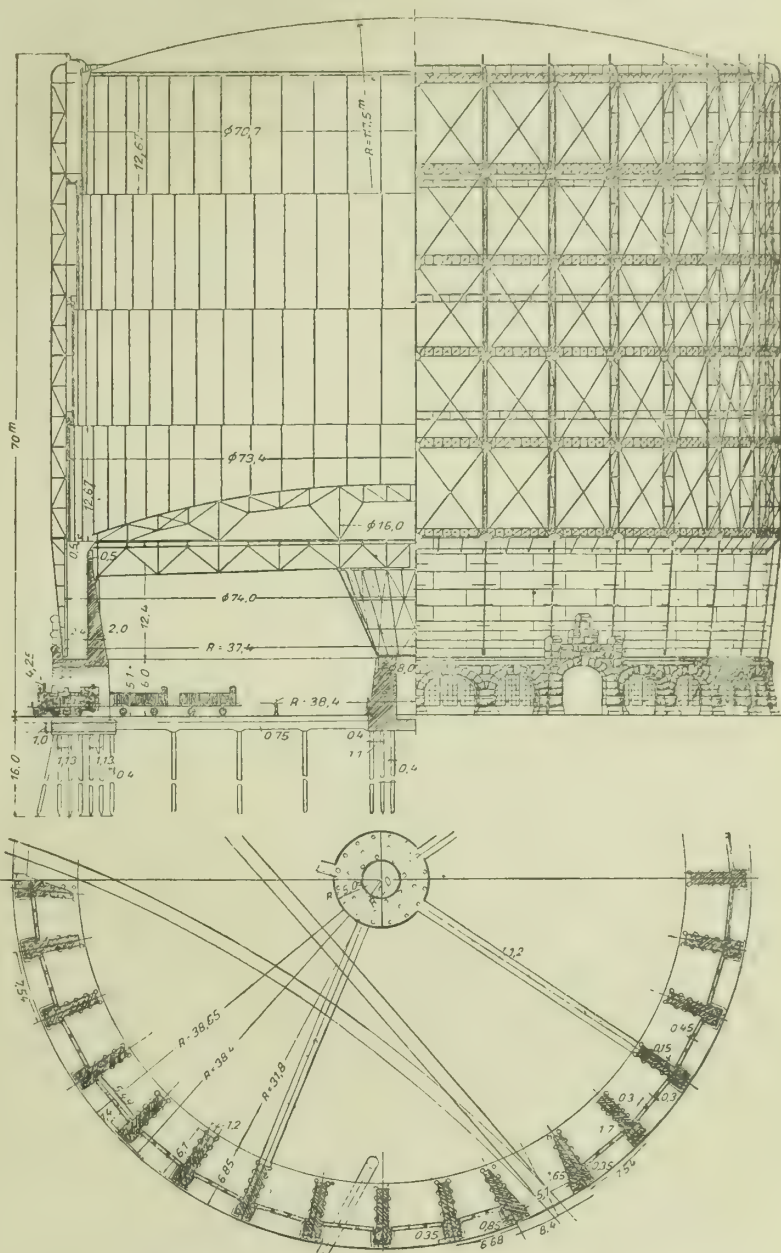
Further the load of water was—

1.—In the annular tank	6359 tonnes	= 6257 tons
2.—On the floor of the tank	1500 "	= 1476 "
3.—In the cups	88 "	= 86½ "
Total	7947 "	= 7819½ "

The total load was therefore 19,200 + 3282 + 7947 = 30,429 tonnes, or about 29,942 tons.

The diameter of the tank was 74 metres (= 242 ft. 9 in.) outside, and 69.2 metres (= 227 feet) inside. Consequently the annular space was 2.4 metres (= 7 ft. 10½ in.) wide. The outer wall was constructed of steel plates, and was 12.9 metres (= 42 ft. 4 in.) high. The inner wall was of cast-iron plates; and the pressure of the water was taken up by a wall of rammed concrete 11.6 metres (= 38 feet) high, and 2 metres (= 6 ft. 6½ in.) wide at the base, and 0.5 metre (1 ft. 7¾ in.) wide at the top. The flat bottom of the water-tank was covered by water to a depth of

about 6 inches. Beneath the tank was a chamber or vault 18 metres (= 59 feet) high, which was roofed by the flat bottom of the tank. It was this part of the structure which gave way from some cause of which the determination is to be the task of a Committee of Inquiry consisting of the most eminent technical men. The water above the bottom ran out so that the gas stored in the holder escaped downwards and ignited. The gas then burnt, as previously described, in enormous tongues of flame issuing from the openings in the annular substructure. It is pointed out, by reference to a reproduction of the photograph given on p. 736 of the "JOURNAL" of the 14th ult. (showing a part of the holder after the fire), that the substructure and annular tank, as well as the guide-framing, remain standing entire; while



Section, Elevation, and Plan of the Grasbrook (Hamburg) Gasholder.

the flat bottom of the middle of the tank and its supporting column are in ruins, and, with the wreck of the roof structure, are piled together chaotically in the vault beneath the holder.

Our German contemporary proceeds to state that conjectures as to the precise cause of the accident at the present time must encroach on the purpose of the Committee of Investigation, and make it more difficult for that Committee to arrive at a proper explanation of the occurrence, while putting very heavy responsibilities on all concerned in the affair. Hence our contemporary intends to reserve its views until the investigation is finished. A full explanation is, it remarks, eminently essential, both to allay the unfounded fears of the public, and to enable technical men to draw a wholesome lesson from the occurrence and to be in a position to avoid the repetition of such a catastrophe.

It is pointed out that, by an unfortunate concatenation of circumstances, the number of victims was far larger than such an accident would ordinarily claim. A great number of men were engaged at the time in painting the holder and in constructional work in its vicinity. The "Journal für Gasbeleuchtung" then proceeds to regret that inquiries made in the proper quarters, immediately the accident became known, for the facts and any explanation met with a rebuff, and that consequently all sorts of conjectures and disquieting rumours were promulgated in the Press. It thinks that the one and best means of preventing



sensational and disturbing reports would have been to have given at once correct information, however brief, as to the occurrence. Gas men would thus at least have had some facts on which to base explanations for which they were called upon everywhere, and would thereby have been able to allay fears. That is the policy pursued in the case of railway accidents. In the interests of the gas industry at large, it wishes to draw the attention of all those in high positions to the desirability, when any accident with gas becomes known to the public, of promptly providing a proper explanation of it so that there shall be no opportunity for others to spread exaggerated and incorrect reports as to the dangers of gas. A hundred years' existence cannot protect the gas industry from such attacks, if proper steps are not taken in the right quarter to at once gain the ear of the public in such a case as that of the Hamburg accident.

## STRASBURG GAS WORKS AND SUPPLY.

### A Record of Fifty Years' Progress.

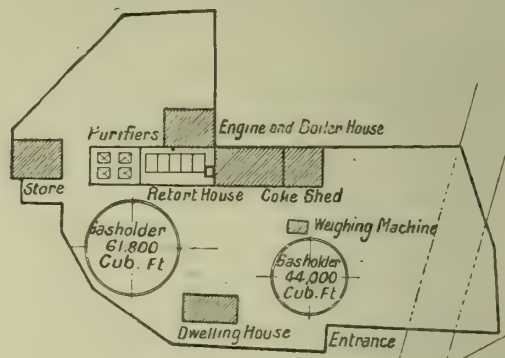
IN the "JOURNAL" for the 23rd of November, we called attention to an interesting *souvenir* of the Jubilee of the Continental Union Gas Company in Strasburg, which had been prepared, with the authority of the Directors, by M. Gaston Kern, the Manager of the works. We are now able to deal at greater length with the contents of the volume, which occupy 300 large quarto pages; but, while recognizing the painstaking research of the author in the compilation of the historical portion of his book, in which he gives an account of the early days of lighting in Strasburg, we must confine ourselves to the record he presents of the progress of the Company and their works during the first fifty years of their operations in the city.

In the twenty years prior to 1858, the gas supply of Strasburg was in the hands of the Union Company of Lyons. When their concession was drawing to a close, steps were taken by the Union des Gaz Company, whose offices were in Paris, to obtain a renewal of it. After considerable negotiation, the Municipal Council ratified, on Oct. 3, 1856, a prolongation of the concession for fifty years from Jan. 1, 1858. The Company were represented by their Managing Directors, Messrs. E. Elsen Goldsmid and W. Brocksopp Gregory, two civil engineers of Paris. At that time, Strasburg had a population of 77,656, inclusive of a garrison of 6000 men. The length of mains was about 13½ miles, and from them were supplied 454 public lamps. In addition, there were 194 oil-lamps used for lighting the portion of the city in which gas-mains had not been laid. The area to be supplied was clearly defined in the new Treaty. With certain specified exceptions, the mains were not to extend beyond the city gates. In the new Treaty, the Company undertook to replace the old lighting plant belonging to the Municipality, and extend the mains by about 7½ miles; also to supply gas for public lighting at 3s. 4½d. and for private lighting at 6s. 9d. per 1000 cubic feet. The value of the undertaking was estimated at 800,000 frs. (£32,000). The works were placed in the charge of M. Michel Weill-Goetz, who took up his duties on Oct. 1, 1857. Under his able management, both technically and financially, the Company made great progress; so great, indeed, that in 1861 it became necessary to undertake the enlargement of the works, which up to then had occupied an area of about 7200 square yards, to twice their size. Accordingly, land to the extent of 8300 square yards was acquired, and upon it was erected a gasholder having a capacity of 176,500 cubic feet. The progress made by the Company up to the period named is shown by the following figures: In 1858, the total consumption of gas was rather more than 25¼ million cubic feet; whereas in 1861 it was just over 35 millions; the number of public lamps having increased from 496 to 709. In the accompanying illustrations are shown the works as they existed from 1858 to 1861 and from the latter year up to 1870. It will be noticed that a considerable portion of the site was available for further extensions.

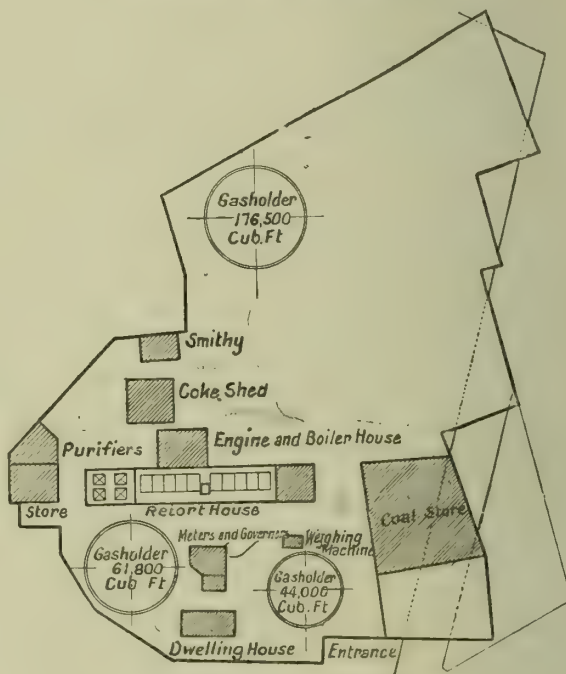
In 1864, various changes were made in the terms of the Company's Treaty, especially in regard to the quality and pressure of gas, the extension of the mains, and the public lighting. In this connection, a Committee was appointed, upon which were the two celebrated chemists MM. Dumas and Regnault. The war which broke out six years later naturally put a sudden stop to the commercial prosperity which had marked so conspicuously the administration of M. Weill-Goetz, who by the year 1869 had brought up the consumption of gas to nearly 64¼ million cubic feet. In the period from 1858 to 1869, oil lighting gradually gave place to gas, as shown by the following figures giving the expenditure on this branch of the service: 1858—Oil, 22,686 frs.; gas, 25,183 frs. 1865—Oil, 13,097 frs.; gas, 46,866 frs. 1869—Oil, 890 frs.; gas, 60,084 frs. On Aug. 6, 1870, Baron Pron, the Prefect of the Lower Rhine, made known to the inhabitants that the city was in a state of siege; and six days later the Mayor (M. Humann) addressed a letter to M. Weill-Goetz, by order of the General in command, requesting him, in the event of the enemy opening fire, to take the necessary steps for liberating all the gas contained in the holders. Next day the cannon roared from the ramparts, within a few yards of the gas-works. The effect has been vividly described by M. Gustave Fischbach in his work entitled "The Siege and Bombardment of Strasburg." He says that the streets

after dark presented a strange appearance. On the night of the 14th of August the order to empty the holders was carried out; and to the *façade* of each house was affixed a lantern. The writer says that though these lamps, which were of all shapes, sizes, and ages, and fixed at various elevations—even as high as the third floor—did little more than make darkness visible, their effect was so novel and *bizarre* that the inhabitants were to a certain extent consoled for the absence of gas. As the attack on the fortress was made on the north side, and the breach by which the enemy purposed making the assault was close to the gas-works, they necessarily suffered severely. Out of the 200,000 projectiles thrown into the city, a considerable number crashed into the works' buildings and the gasholders. In the forty days during which the bombardment lasted, the neighbourhood of the works was destroyed.

Eight days after the capitulation, the ever-memorable Herr Küss, a Professor at the Faculty of Medicine, who, on the 14th of September, succeeded M. Humann as Mayor, addressed a letter, dated Oct. 7, 1870, to the Manager of the gas-works, directing his attention to the importance of restoring, with as little delay as



Strasburg Gas-Works, 1858-1861.



Strasburg Gas-Works, 1861-1870.

possible, the supply of gas to the city, and informing him that he had appointed a Committee to take the necessary steps to this end. He urged the Manager to employ all the means in his power to bring the works again into proper condition for making gas. As it would be some time before a full supply of gas could be assured, the public lighting had the first attention. The city was divided into four districts, and specific directions were given in regard to dealing with them in the order of their importance; and either oil or petroleum could be employed, so that the lighting might be restored. The repair and replacement of the damaged pillars, &c., were paid for by the Municipality.

Surrounded by two nations at war, the greatest difficulty was encountered in carrying out the orders of the Mayor; and it became necessary to turn to England for help, especially for the supply of the gasholder, which was the first thing needed, and to obtain the necessary special safe-conducts for expediting the arrival of the material for the construction of the railway. The work of reconstruction was carried out by M. Louis Weill-Goetz, the son of the Manager, under the direction of the Company's Engineer-in-Chief, Mr. Hodgson Jones. Though the repair of the damaged mains was difficult, on account of the severe weather prevailing, the supply of gas was restored on Dec. 24, 1870.

M. Weill-Goetz, sen., retained the management of the undertaking, which every year increased in prosperity, until July 21, 1875; and he had so trained his son that he might succeed him.



As already mentioned, M. Louis Weill-Goetz had assisted in the reconstruction of the works after the bombardment, and for some time he held the post of Works Manager. He afterwards obtained experience as an Engineer in the Company's works at Nîmes and Genoa, and returned to Strasburg in 1875 to take the place which his father had occupied for seventeen years, and in which he had shown so much zeal and devotion. At that time, Strasburg had 85,500 inhabitants, of which about 9000 were soldiers. One of the early results of the new management was the purchase of the gas-works of M. Müller at Schiltigheim, in order to throw them out of use, and connect this industrious commune with the works at Strasburg. M. Louis Weill-Goetz held his position for twenty years; and thanks to his energy and far-sightedness his management was marked by uninterrupted success. In 1877, the sale of gas reached 106 million cubic feet; and it was increasing rapidly with the general extension of the city. In 1897, when the number of inhabitants was 125,000, the consumption had risen to very nearly 283 millions.

In 1877, the works were laid out for a production of about 882,000 cubic feet of gas per day. All the appliances in use at that date have disappeared, with the exception of the two station meters, each of 425,000 cubic feet capacity, the 210,000 cubic feet holder (subsequently telescoped so as to bring its capacity up to 315,000 cubic feet), and the five station governors. The present vast purifier-house, which is the admiration of all connoisseurs, was erected in 1887, as was also the sulphate of ammonia plant, which is considered to be a model of its kind. In 1889, there was put up a Pelouze and Audouin tar-extractor of about 882,000 cubic feet capacity, and the construction was commenced of the large telescopic holder, which is now capable of containing 847,000 cubic feet of gas. The first settings of retorts on the Klönne recuperative system were put up in 1893. The "Standard" washer-scrubber, having a daily capacity of rather more than 700,000 cubic feet, dates from 1894, as does the third 425,000 cubic feet station meter. In 1896, a new series of the old grate-bar furnaces were replaced by others on the Klönne system, for heating which there was never used more coke than 12½ per cent. by weight of the coal carbonized. The following year, the works were brought up to a maximum production of close upon 2 million cubic feet per day. In order to make this possible, it was proposed to remove a portion of the works to a site outside the city, as they were much cramped by reason of the proximity to them of the railway station and the line, by which they were surrounded. Fortunately, the station was removed in 1884; and M. Louis Weill-Goetz at once profited by the event, and acquired the land necessary to enable him to obtain room for extensions. By this judicious operation, the site was increased from about 3¼ to 8½ acres.

Among other good strokes of business effected by M. Weill-Goetz, was the conclusion, after some very delicate negotiations, of an agreement for the prolongation of the Company's concession, which was originally granted for fifty years, and would have terminated at the end of 1907. In 1885, the period was extended by twenty-five years—viz., to Dec. 31, 1932. Under the new Treaty, the consumers have obtained progressive reductions in price from 5s. 7½d. to 4s. per 1000 cubic feet, and the system of having two meters, one for lighting and the other for heating gas (the latter supplied at a reduced price), was introduced. The effects of this innovation were not appreciable until after M. Weill-Goetz had induced the Company to open, on April 1, 1892, large show and sale rooms in the Old Wine Market, one of the principal business thoroughfares in Strasburg. A thoroughly qualified demonstrator in cooking was engaged to give practical lessons, with the result that the use of gas for culinary purposes increased considerably; and in 1897 the promoter of this increase was able to register the first million cubic metres (35·3 million cubic feet) as the annual consumption of gas in this way. At the time no one thought that the quantity of gas used for cooking and heating would exceed that employed for lighting; yet in 1901 the two applications of gas had each reached about 176½ million cubic feet. But at the time the book now under review was passing through the press, the quantity of heating gas consumed was nearly 318 millions a year; whereas that used for lighting was only 212 millions.

In 1897, the Directors of the Company, being desirous of securing the services of their very able Manager at Strasburg, invited him to take a seat at the Board. M. Weill-Goetz indicated his successor; and before leaving the city he gave a farewell dinner to his co-workers and subordinates. In 1903, he was nominated a Chevalier of the Legion of Honour; and he is now the President of the Union des Gaz. In this position he has had only three predecessors in the fifty years' existence of the Company—viz., MM. F. Toché (1862 to 1889), E. Breitmayer (1889 to 1899), and A. Salanson (1899 to 1908).

So much for the general progress of gas supply in Strasburg. In a subsequent issue, some particulars will be given of the works as they now stand.

In the second part of the report of the Local Government Board for 1908-9 (issued last week), the usual comparison is made between national and local indebtedness. Thirty years ago, the local debt of England and Wales amounted to £136,934,070; while the National Debt of the United Kingdom was £770,604,774. At the end of 1906-7, the local debt had increased to £494,487,512, and the National Debt to £779,164,704. In the 27 years under comparison, the National Debt had increased by £8,559,930, and the local debt by £357,553,442.

## EFFICIENCY TRIAL OF A SETTING OF EIGHTEEN VERTICAL RETORTS AT MARIENDORF.

A COMMUNICATION by Mr. E. Körting, the General Manager of the works of the Imperial Continental Gas Association in Berlin, to the "Journal für Gasbeleuchtung" of the 1st inst., contains his observations on different modern methods of carbonization, including the Woodall-Duckham and Dessau vertical retort-settings, the Glover horizontal retorts, and large carbonizing chambers. The paper concludes with the reproduction of a report by the German Association's Instructional and Experimental Gas-Works at Karlsruhe, on an efficiency trial conducted by that institution at the Mariendorf works at Berlin, on a setting of the Dessau type, containing eighteen instead of the customary twelve retorts. We give a summary of the contents of this report, deferring further notice of the remainder of Mr. Körting's communication.

The Instructional and Experimental Gas-Works undertook the efficiency trial at the request of the Imperial Continental Gas Association, and carried it out from the 31st of October to the 5th of November. The setting differed from the ordinary Dessau type in that it contained eighteen instead of twelve retorts; but it occupied only the same ground area. Instead of two rows (placed one behind the other) each containing six retorts, there were in this setting three rows of six retorts of smaller cross section. In elevation and in dimensions the new setting so closely resembled the previous beds of twelve retorts, that it was installed in a bench between two of the latter, and was only noticeably different through the alteration of the mechanical discharging equipment. For making the trials, this setting was connected with the apparatus of the experimental plant at the Mariendorf works; so that the gas which was produced in the setting was condensed, purified, and measured apart from the gas coming from the other settings. All the precautions taken in the previous efficiency trials on a bench of settings of twelve vertical retorts, which were made in May, 1908, were observed in the present set of observations. [See "JOURNAL," Vol. CIV., p. 256.]

The bed of eighteen retorts had been at work in normal conditions for a considerable time before the experimental run, and had been heated by the use of coke produced as to two-thirds from English (Boldon) coal, and as to one-third from Silesian coal. During the trials, the same coke was used for heating the setting. It contained on an average 12·4 per cent. of ash, and had a calorific power of 12,564 B.Th.U. per pound. The retorts were charged with large coal from the Concordia Mine in Silesia. They had been scurfed eight days before the trials were started. The coke produced in the trials was, by desire of the management of the works, not used for firing the setting (as already mentioned), in order that the regular working of the producer should not be disturbed for the experiment. The Concordia coal used contained 2·91 per cent. of water (on drying at 110° C.); 4·28 per cent. of ash; and 92·81 per cent. of combustible substance or coal proper. The ultimate analysis of the coal showed that its percentage composition was as follows, the figures in brackets being the percentages on the combustible substance or ash-free and dry coal: Carbon, 78·14 (84·19); hydrogen, 4·79 (5·16); oxygen and nitrogen, 9 (9·70); sulphur, 0·88 (0·95). The coking test showed a yield of 65·10 per cent. of coke; the flame being luminous and only slightly smoky. The coke was well caked, and of a shining grey character. The proximate analysis showed a yield of 60·82 per cent. of coke free from ash and moisture, and 31·99 per cent. of volatile matter; or, if reckoned on the ash-free and dry coal, 65·50 per cent. of dry and ash-free coke, and 34·50 per cent. of volatile matter. The coke contained 6·59 per cent. of ash. The net calorific value of the coal was 13,315 B.Th.U. per pound, or, on the combustible coal substance, 14,346 B.Th.U. per pound.

The most suitable time for working off the charge had been ascertained by previous trials to be 10½ hours, with admission of steam during the last two hours. The trials were begun on Oct. 31, at 5.30 p.m., and continued until 2 a.m. on Nov. 5. They thus comprised five periods of 21 hours each. A summary of the results obtained is given in the appended table:—

TABLE I.—Results Obtained with the Setting of Eighteen Vertical Retorts, Oct. 31 to Nov. 5, 1909.

[Charges worked off in 10½ hours, with steaming for the last two hours.]

	Total for 10½ Hours.	Average for 24 Hours.
Weight of coal (air-dried) charged into the setting.	85·575 tons	391 cwt.
Average charge of coal (air-dried) per retort = 1065 lbs.	—	2434 lbs.
Make of gas (at 60° Fahr., 30 in. bar., and saturated)	1,150,180 c.ft.	262,898 c.ft.
Do., do. per ton of coal	—	13,430 c.ft.
Coke used as producer fuel—		
Per cent. by weight of coal carbonized	—	11·8
Per 1000 cubic feet of gas	—	20·02 lbs.
Quality of gas—		
Gross calorific power per cubic foot	—	542·6 B.Th.U.
Illuminating power in Carpenter burner, at 5 cubic feet per hour	—	10·0 candles
Specific gravity	—	·445
Nitrogen in gas	—	1·2 per ct.

In regard to the figures recorded in this table, it may be observed







## CONTROLLING THE LEVEL OF LIQUID IN THE HYDRAULIC MAIN.

### Meunier's Patent Arrangement.

ONE of the patent specifications issued on the 23rd ult. was that of an invention for "Improvements Relating to Gas Manufacture," for which application was made as long since as Oct. 31, 1908, by Mr. S. Meunier, the Engineer and Manager of the Stockport Corporation Gas-Works; and it is described as relating to "the production of gas by the distillation of coal in gas-retorts, and the collection of the gas by means of a hydraulic main, and the usual scrubbers for delivery into a gasholder."

The patentee points out that "it has been found, in practice that the gas on distribution frequently deposits naphthalene, and this introduces considerable difficulties in the distribution system in town supplies—rendering it necessary to have the various distributing pipes cleaned out at more or less frequent intervals, and is liable to give more trouble at one time of the year than at another."

Many proposals have, he says, been made to get over this difficulty by treating the gas after manufacture with various hydrocarbon liquids; but he has found that, by very simple means applied in the hydraulic main, he is able to obtain and use, owing to the relative absence of fluctuation, a gas pressure very closely approximating to atmospheric, and to obtain an increase in the quantity of gas as contrasted with that obtained in other systems using ordinary hydraulic mains, while in most cases a gas of such quality is obtained that naphthalene practically does not deposit in the mains and an increase in both its illuminating and heating value results—the particular coal gasified to a certain extent determining the precise improvement obtainable. Further, he finds that the liquid in the hydraulic main becomes much richer in ammonia; and this enables the scrubbing plant for a given quantity of coal gasified to be reduced.

The specification continues: It has been proposed heretofore to employ means, in gas-washing apparatus and in hydraulic mains, having for their object the spreading and dissemination of the gas in contact with the main liquor or the lightening of the seal. In all these devices, however, the gas bubbled through the main liquor and escaped from a free surface of the same; and as these devices were in no way adapted to steady the consequent disturbances of the liquid surface, pulsations of pressure in the retort, as well as in most cases excessive back-pressure, resulted—conditions which prevent the obtaining of the maximum yield of gas. It has also been proposed to split up any sudden rush of gas from the dip-pipe into small bubbles without causing any material disturbance of the liquid surface by serrating the lower edge of the dip-pipe and employing a pressure regulator or governor between the retorts and the exhauster.

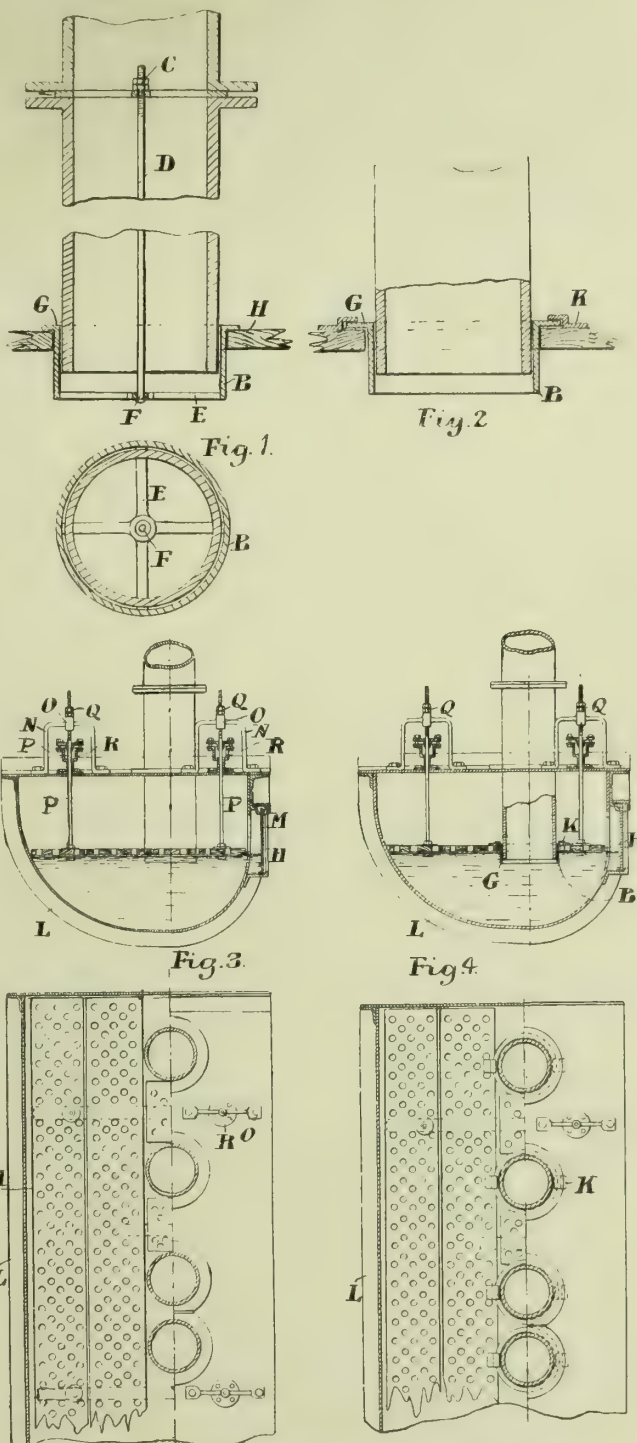
The present invention consists in providing means—such as floats or baffle-plates—in the hydraulic main, at, or partially below, the liquid level which are adapted to give free egress of the gas, while maintaining a much more uniform liquid-level in the main than exists at present, and ensuring the maintenance of a more even pressure of gas in the retort and a much more thorough contact of the gas with the liquids in the hydraulic main, whereby a more effective removal of impurities from the crude gas is carried out while it is still hot. The invention further consists in providing suitable floats or baffle-plates in the hydraulic main, carrying dip-pipe sleeves in such a way that the dip-pipe seal can be either mechanically or automatically controlled. Where adjustable floats or baffles are used, they are preferably adapted for adjustment in sections.

In carrying the invention into effect, in one form, floats are provided in the hydraulic main—boards which will float in the hydraulic main liquor. The boards substantially cover the liquid surface in the hydraulic main, except for the required spaces through which the gases find exit after coming in contact with the hydraulic main liquor. Instead of employing floats (which, in the case of wooden or like absorbent floats, if allowed to remain unchanged for a lengthy period become saturated with main liquor and sink), baffle-plates may be used, which may or may not be capable of floating, but are fixed—preferably at an adjustable level—by bolts or screws. The adjusting devices should be so constructed that they can be operated from outside the hydraulic main during distillation, whether floats or baffle-plates be used. The adjustments may be either as regards the depth of seal or as regards the extent to which the floats or baffle-plates are immersed in the liquid, and, consequently, as regards the height of the liquid column in the gas-exit spaces of the baffle-plates or floats, or as regards both. The upper surface of the baffle-plate or float is, therefore, never appreciably immersed in the liquid.

The adjustment in the case of floats may be by means of rods or the like passing through stuffing-boxes upon the upper cover of the main bearing upon the upper surface of the float and capable of adjustment, or by any suitable means which "limit the upward movement of the float." In some cases, sleeve pieces, preferably supported from the baffle-plates or floats, may be applied, which slide on the dip-pipes, and enable the dip-seal to be adjusted either automatically or by hand. The former method is, however, preferable. One set of baffles or floats is employed for each bed of the retorts; so that close adjustment may be maintained,

notwithstanding differences in the rate of distillation from different sets of retorts.

Fig. 1 represents a sectional elevation and sectional plan of a form of the apparatus in which floats and mechanically adjustable dip-pipe sleeves are employed. Fig. 2 is a sectional elevation of a form employing floats and automatically adjustable dip-pipe sleeves. Fig. 3 is a sectional elevation of a hydraulic main provided with mechanically adjustable baffles, with a sectional plan. Fig. 4 represents, in sectional elevation and plan, a hydraulic main provided with mechanically adjustable baffles and dip-pipe sleeves.



Meunier's Patent Hydraulic Main Floats.

In fig. 1, the dip-pipe is shown provided with a sleeve-pipe B adjustable with respect to the dip-pipe by means of a nut C co-acting with a projection within the dip-pipe and a further nut (not shown) upon the opposite side of the projection, and with a rod D connected to the sleeve pipes by the four radial arms E and boss F. The sleeve-pipe has a flange G on its upper edge, limiting the upward movement of the float. This apparatus provides means whereby the seal in the hydraulic main may be adjusted by hand as desired; the float H being free to move, except as checked by G, with such variation of water-level as may occur.

In fig. 2 is shown a modification whereby a constant depth of seal is automatically ensured. It consists in providing a float H with a sleeve B having a flange G on its upper edge clamped



between the float and the clamping flange K, and sliding over the dip-pipe; its position automatically adjusting itself to the variations in the liquid level in the main. In fig. 3, L represents the hydraulic main provided with a gauge M to show the level or fluctuation of the liquor in the hydraulic main and dip-pipe, and having upon its upper cover supports N through the bosses O of which pass rods P having their upper ends screw-threaded and provided with adjusting nuts Q. These rods pass also through stuffing-boxes R and support on their lower end the baffle-plates H provided with suitable perforations. This device allows of adjustment of the baffle-plates within the hydraulic main during distillation from the outside.

Fig. 4 shows a similar device; but means are here provided for the alteration of the seal coincidentally with the alteration of the position of the baffles. These means consist in a sleeve B clamped to the baffle H by a clamping flange K fixed to the baffle and co-acting with a flange G on the upper end of the sleeve B, which latter slides freely upon the lower end of the dip-pipe. By this means, any alteration of the position of the baffle H by the nuts Q results in a corresponding movement of the lower end of the sleeve.

A suitable thickness for the floats is said to be about 1 inch, and the holes provided may also be made of about 1 inch in diameter; while the baffles are preferably adjusted so that the lower surface is at the liquid level.

With the application of this invention to a retort-bench in a gas manufacturing system using a hydraulic main, the patentee says that he has found (for example) an increase in the make per ton by from 10 to 12 per cent.; while the gases produced did not deposit naphthalene in the distributing system.

THE NEED FOR A CALORIFIC STANDARD.

A Report from the State of New York.

THE State of New York Public Service Commission (Second District) have made arrangements to hold, on the 1st prox., a conference with representatives of gas companies on the subject of standards for the measurement of the value of gas—the special aim being to obtain an interchange of opinion on the need for a calorific standard, and on all questions necessarily incidental thereto. A preliminary inquiry into the subject on behalf of the Commission has already been completed, and the results are embodied in a report (of which the main portions are here reproduced) by Mr. Henry C. Hazzard, the Chief of Division of Light, Heat, and Power. Before proceeding, it may be mentioned that, in the report, all calorific values are stated as gross.

The Division of Light, Heat, and Power began, in August, 1908, an investigation into the subject of the calorific power and illuminating power of the coal gas, carburetted water gas, and mixed coal and carburetted water gas supply. The particular object of the investigation was to ascertain the relative importance of heating power and illuminating power as a standard for the measurement of the real value of gas. Its general scope included: (1) The making of a series of tests to determine the calorific values of the coal gas, carburetted water gas, and mixed coal and carburetted water gas supplied by the several gas corporations operating within the jurisdiction of the Commission; (2) the making, contemporaneously with each of the calorific tests, a test to determine the illuminating power of the gas; (3) a study of the relation, if such exist, between the calorific value and the illuminating value of the gas; (4) an inquiry into the approximate proportion of the total gas supply that is used for such purposes and in such manner as to make its heating power a factor of prime importance; (5) an examination into the merits of different types of calorimeters; and (6) the ascertaining of the gas heating-power requirements in force in other governmental jurisdictions. The report summarizes the results of the study, which may be regarded as work of a preliminary nature in a broad field of inquiry.

After setting forth what has been done in this country and in Germany in the direction of recognizing the importance of a calorific standard, the report goes on to remark that in the United States the practice of calorimetry is by no means so marked. Several municipalities in different States have prescribed calorific standards with which in the respective communities the gas supplied must comply. Dallas (Texas) and Omaha (Neb.) have respectively fixed standards of 650 and 600 B.Th.U. gross; but the only State which has acted in the matter is Wisconsin, where, until 1908, no statutory requirements whatever as to the quality of gas existed.

In that year, following tests made at various plants in the State, and a most careful examination into the subject generally, the Railroad Commission of Wisconsin adopted a regulation that—"The company furnishing gas which, within a 1 mile radius from the distribution centre, gives a monthly average total heating value of not less than 600 B.Th.U., with a minimum which shall never fall below 550 B.Th.U., may be considered as giving adequate service as far as the heating value of the gas is concerned." As far as the illuminating value of the gas is concerned, the Commission reached the conclusion that "the candle power standard which has been almost universally used in the past for gas

measurements is of minor importance in this State," and commented further upon the subject, as follows: "It is possible to secure a high candle-power gas which has but a moderate heating value; and to require companies to maintain a double standard which shall insure both the high heating value and a high candle power, would surround them with such restrictions that economy in manufacture might not be attained. And since but few gas consumers would be benefited by a candle-power restriction, and this number is continually decreasing, no regulations as to candle power are prescribed at this time. It should be added, however, that with a 600 B.Th.U. heating standard, and in view of the conditions under which gas is being manufactured in this State, a fairly satisfactory illuminating value is insured. It is hardly possible to manufacture a coal gas of 600 B.Th.U. which shall not have a candle power of from 12 to 16, or even more. The enrichment of a water gas up to 600 B.Th.U. will insure an even higher candle power."

In New York State, uniformity in the quality of gas has for some years been sought to be secured through general and special laws establishing illuminating power and purity requirements. The subject of gas calorimetry has so far not received Governmental recognition, State or Municipal, except in the city of Auburn, where, by agreement entered into in 1906 between the Municipality and the Auburn Gas Company, it is provided that the mixed gas supplied by the Company in that city shall have an illuminating power of not less than 18 candles and a heating power of not less than 600 B.Th.U. gross. Neither is the practice of gas calorimetry voluntarily followed in this State except by a few of the larger companies. Investigation into the subject was begun, therefore, with practically no information at hand of the heating value of the gas furnished in this State.

CHARACTERISTIC FEATURES OF THE INVESTIGATION.

Coal gas is supplied in the Second Public Service District by 43 companies, carburetted water gas by 44 companies, and mixed gas by 6 companies. Several of these companies at times vary the kind of gas produced.

The alternative was presented of making a few tests of the gas of each of this large number of companies or a large number of tests of the gas of a few companies. The difficulty of the latter method lay in the selection of the plants; and the former plan was adopted, in the belief that the averages of chance in meeting with exceptional conditions of gas manufacture were approximately equal either way, and that the results obtained under the former plan would fairly represent the mean of all the gas supplied. It was deemed impracticable, in connection with the regular gas inspection work, to make more than one calorific test of the gas of each plant in each of the four seasons of the year, more so by reason of the special candle-power tests planned to be made in each instance for comparative purposes. A Jünkers calorimeter was selected; and the thermometers of the instrument purchased were carefully checked for accuracy. The original results of each inspection, both calorific and candle power, were checked with supplemental tests, and rejected unless falling within the narrow limits of prescribed accuracy. In fact, all reasonable precautions were taken to ensure the collection of data which would put the Commission in possession of accurate and reliable information on the subject.

Upwards of 700 original tests were made and recorded—divided equally between calorific tests and candle-power tests, the results of which are summarized and commented upon.

CALORIFIC POWERS OF THE GAS SUPPLY.

TABLE I.—Number of Plants supplying Coal Gas, Carburetted Water Gas, and Coal Gas with an Admixture of Carburetted Water Gas, Number of Calorific Tests made of each Kind of Gas, and Lowest, Highest, and Average B.Th.U.

	Kind of Gas.		
	Coal.	Water.	Mixed.
Number of plants . . . . .	43	44	6
Number of tests . . . . .	165	173	14
Lowest B.Th.U. . . . .	544	501	559·5
Highest B.Th.U. . . . .	737	802·6	689
Average B.Th.U. . . . .	637·8	626·3	622·3

The mean calorific value of the gas supplied within this jurisdiction, determined from all the tests, is 631 B.Th.U. The average B.Th.U. of coal gas exceeds this general average 1 per cent. That of water gas falls below it by 0·7 per cent.; and of mixed gas, by 1·3 per cent. The wide gamut run between the minimum and maximum of B.Th.U. of each kind of gas is illustrated in comparison with the averages in the following table:

TABLE II.—Comparison of B.Th.U. Averages.

Gas.	Average.	Lowest.	Variation from Average.	Per Cent Variation.	Highest.	Variation from Average	Per Cent. Variation.
Coal . . . . .	637·8	544	93·8	14·8	737	99·2	15·6
Water . . . . .	626·3	501	125·3	20·0	802·6	176·3	28·1
Mixed . . . . .	622·3	559·5	62·8	10·1	689	66·7	10·7

The explanation of these figures naturally lies in the fact that



gas calorimetry is practised by only a few of the gas corporations, and these the larger ones, for their own information; and that there exist no legal requirements for the maintenance of a uniform heating power. A further explanation may be found in the table which follows:

TABLE III.—Number of Tests of each Kind of Gas, showing B.Th.U. of Given Values; the Calorific Values being Arranged Serially in Groups of 25 B.Th.U. each.

Number of Tests of			Showing calorific values of
Coal Gas.	Water Gas.	Mixed Gas.	
—	5	—	B.Th.U.
1	4	—	500 to 524
12	20	3	525 to 549
21	27	1	550 to 574
30	41	3	575 to 599
41	24	4	600 to 624
30	19	2	625 to 649
13	17	1	650 to 674
8	7	—	675 to 699
6	3	—	700 to 724
2	3	—	725 to 749
1	2	—	750 to 774
—	1	—	775 to 799
—	—	—	800 to 824
165	173	14	

Analysis of the figures appearing in this table shows that the average range of existing calorific values is between 550 and 700 B.Th.U. The values outside this minimum and maximum, while interesting and important as illustrating the limits of heating power actually being reached, may generally be attributed to exceptional conditions of gas manufacture at particular plants. Several instances may be cited.

The gas of one company supplying carburetted water gas was found upon one test to have a heating power of 802.6 B.Th.U. This company supply a very superior quality of gas the year through, in the endeavour to satisfy the special lighting requirements of large textile factories in the territory of operation. The average calorific value of the gas was found to be 756.2 B.Th.U., and the average illuminating power 28.8 candles. One of the two water-gas companies whose gas upon one test showed a heating power of between 775 and 779 B.Th.U. was found to be making gas of an average calorific value of 701.6 B.Th.U. The average candle power was 23.9. This company, operating in a small community, without special need, distributes gas considerably above the statutory requirements. The other water-gas plant, having upon one test a gas of 775 B.Th.U., upon another test was found to have a gas of only 506 B.Th.U. Upon the former test, the illuminating power was found to be 22 candles; and upon the latter test, 14.9 candles. These instances suffice to show that the exceptional conditions of manufacture heretofore mentioned may be due either to special exigencies, disregard of economies, or laxness in methods.

Referring now to the ten companies whose gas showed heating power of less than 550 B.Th.U., the works and methods employed by all of these companies except one, by reason of the inferior quality of gas supplied, have heretofore been examined by the Commission, resulting in recommendations that specific improvements be made. These instances, therefore, of extreme calorific values in gas may be explained as due to poor management, inadequate plants, or both. Eliminating upon these grounds all those tests showing in the above table calorific values in excess of 700 B.Th.U. and less than 550 B.Th.U., the following table, giving the remaining tests, fairly indicates the results to be obtained under present average conditions of gas manufacture in this jurisdiction.

TABLE IV.—Number of Tests of each Kind of Gas and Percentage of Total Tests, showing B.Th.U. of Given Values under Present Average Conditions of Gas Manufacture; the Calorific Values being Arranged Serially in Groups of 25 B.Th.U. each.

Number and Per Cent. of Tests of						Showing Calorific Values of
Coal Gas.		Water Gas.		Mixed Gas.		
Number of Tests.	Per Cent. of Total.	Number of Tests.	Per Cent. of Total.	Number of Tests.	Per Cent. of Total.	
2	8.2	20	13.5	3	21.4	B.Th.U.
1	14.3	27	18.3	1	7.1	550 to 574
0	20.4	41	27.7	3	21.4	575 to 599
1	27.9	24	16.2	4	28.6	600 to 624
0	20.4	19	12.8	2	14.3	625 to 649
3	8.8	17	11.5	1	7.2	650 to 674
						675 to 699

From these figures, it may be seen that, without the endeavour of the gas producers in this State being directed by any statutory or local requirements to the maintenance of a reasonable heating power in gas, all of the above tests, made presumably under normal conditions of manufacture, show calorific values in excess of 550 B.Th.U.; and 77.5 per cent. of the tests of coal gas, 68.2 per cent. of the tests of water gas, and 71.5 per cent. of the tests of mixed gas disclosed heating values of over 600 B.Th.U.

Based upon all the tests made, and not upon the above selected number, we find, reverting to the figures given in Table II., the heating power of the gas supply to be in excess of 600 B.Th.U.—(1) Of coal gas, 79.4 per cent. of all tests; (2) of water gas, 63.6 per cent. of all tests; and (3) of mixed gas, 78.6 per cent. of all tests. We further find that, inclusive of all tests made, the gas supply fell below 550 B.Th.U. in 0.6 per cent. of the tests of coal gas, 5.2 per cent. of the tests of water gas, and not at all in the tests of mixed gas.

COMPARATIVE FIGURES OF HEATING AND ILLUMINATING POWER.

The results of the candle-power tests are summarized in Tables V., VI., and VII., in which are shown, respectively for coal gas, water gas, and mixed gas, the minimum, maximum, and average of the candle powers existing at the time the B.Th.U. values given opposite each candle-power figure were determined. The figures in each table under the column entitled "Number of Tests" represent alike the number of candle-power tests and the number of heat-unit tests.

TABLE V.—Comparative Results of Contemporaneous Tests of Heating Power and Candle Power of Coal Gas.

Heating Power.	Number of Tests.	Candle Power.		
		Minimum.	Maximum.	Average.
B.Th.U.				
500 to 524 . . . . .	0	..	..	..
525 to 549 . . . . .	1	11'0	11'0	11'0
550 to 574 . . . . .	12	11'7	19'8	14'5
575 to 599 . . . . .	21	12'4	16'7	15'1
600 to 624 . . . . .	30	12'7	20'4	15'7
625 to 649 . . . . .	40	13'0	17'9	16'2
650 to 674 . . . . .	30	14'3	18'9	16'7
675 to 699 . . . . .	13	16'3	19'2	17'6
700 to 724 . . . . .	8	15'6	19'4	17'1
725 to 749 . . . . .	6	16'7	18'9	17'6
750 to 774 . . . . .	2	17'6	17'7	17'7
775 to 799 . . . . .	1	18'9	18'9	18'9
800 to 824 . . . . .	0	..	..	..

TABLE VI.—Showing Comparative Results of Contemporaneous Tests of Heating Power and Candle Power of Water Gas.

Heating Power.	Number of Tests.	Candle Power.		
		Minimum.	Maximum.	Average.
B.Th.U.				
500 to 524 . . . . .	5	14.1	20.8	16.7
525 to 549 . . . . .	4	12.1	16.6	15.0
550 to 574 . . . . .	20	14.4	21.6	19.0
575 to 599 . . . . .	27	15.5	24.0	20.2
600 to 624 . . . . .	41	11.1	23.6	20.4
625 to 649 . . . . .	22	17.6	31.5	21.5
650 to 674 . . . . .	19	19.1	25.5	21.5
675 to 699 . . . . .	17	20.2	26.9	22.4
700 to 724 . . . . .	7	19.5	25.8	22.9
725 to 749 . . . . .	3	22.3	29.6	26.7
750 to 774 . . . . .	3	25.1	30.5	27.1
775 to 799 . . . . .	2	22.0	27.0	24.5
800 to 824 . . . . .	1	27.1	27.1	27.1

TABLE VII.—Showing Comparative Results of Contemporaneous Tests of Heating Power and Candle Power of Mixed Gas.

Heating Power.	Number of Tests.	Candle Power.		
		Minimum.	Maximum.	Average.
B.Th.U.				
550 to 574 . . . . .	3	13.7	19.2	16.6
575 to 599 . . . . .	1	16.7	16.7	16.7
600 to 624 . . . . .	3	15.2	20.6	17.4
625 to 649 . . . . .	4	18.7	21.3	20.5
650 to 674 . . . . .	2	18.8	21.6	20.2
675 to 699 . . . . .	1	19.8	19.8	19.8

Referring to Table V., the statutory illuminating power required in coal gas is 16 candles. The average candle power findings show that this standard is not reached except where the coal gas has a calorific value of 625 B.Th.U. or over. The averages of the candle-power readings also show a remarkably uniform increase in candle-power value in keeping with the increase in calorific values. The importance of the apparent relation between the two values becomes less pronounced, however, upon attention being given to the maximum and minimum candle-power figures where the variations are wide.

The same conclusions are arrived at on a study of Table VI.—the water-gas results. An apparent relation is here also discernible between the candle power of water gas as given in the column of averages and the heating value of the gas. With the exception of the lowest and one of the highest groups of values, there is shown a gradual and regular increase in candle power relative to the increase in calorific values; and this evidence of relationship also is considerably shaken in contemplation of the wide variation between the minimum and the maximum candle-power determinations, particularly in connection with the lower



calorific values. The legal illuminating power for water gas is 20 candles; and from the average candle-power results, it appears this illuminating power is not found in gas of a lower calorific value than 575 B.Th.U.

The legal illuminating standard for mixed gas is 18-candle power. The tests made show that this standard was reached in gas having a calorific value a little in excess of 600 B.Th.U.

To further show the connection, if any exists, between the heating power and the illuminating power of gas, averages and group values are departed from in the table following, and individual determinations given for coal gas and water gas. The highest and lowest calorific values of the gas of each company are arranged in order of their value; and opposite each is shown the candle power of the gas existing at the time.

TABLE VIII.—In Further Illustration of the Relation (if any) of the Illuminating Power and the Heating Power of Gas.

Coal Gas.				Water Gas.			
Highest B.Th.U.	Candle Power.	Lowest B.Th.U.	Candle Power.	Highest B.Th.U.	Candle Power.	Lowest B.Th.U.	Candle Power.
585.0	16.2	544.0	11.0	592.0	20.3	501.0	14.1
597.0	13.9	550.7	12.3	595.5	20.4	506.0	14.9
616.0	15.6	552.0	12.0	597.0	17.6	516.0	17.4
627.0	14.1	559.0	13.6	601.5	20.4	518.5	16.2
630.0	14.4	561.0	16.4	606.5	15.5	519.5	20.8
630.0	16.9	561.5	15.4	613.5	22.3	526.5	16.2
632.0	13.0	562.0	17.0	615.5	20.3	533.5	16.6
635.0	15.2	563.5	14.7	617.5	20.3	544.4	12.1
636.5	16.2	569.0	14.3	621.5	17.3	552.0	20.5
639.5	16.8	572.0	19.8	623.5	23.6	554.0	20.9
641.0	16.0	574.5	16.3	624.0	20.9	559.0	21.3
646.0	13.9	574.5	16.3	627.0	19.4	563.0	19.7
647.0	14.4	577.0	16.1	630.0	19.8	564.0	20.6
651.0	15.4	582.0	12.4	633.0	31.5	566.0	19.4
653.5	16.5	583.5	16.2	633.5	22.0	568.5	18.4
654.0	16.4	584.0	14.7	636.5	..	569.5	21.0
655.0	17.1	588.0	16.1	637.1	21.3	571.0	21.6
656.0	14.4	588.0	16.2	639.5	21.7	572.0	17.5
658.0	15.9	589.0	12.4	639.5	23.3	574.0	20.6
659.0	16.0	591.0	14.3	642.0	20.9	578.0	21.7
662.5	16.7	592.0	13.0	645.0	20.3	579.0	19.0
663.3	17.8	592.0	16.3	645.5	20.2	581.5	20.5
667.0	17.3	594.0	14.4	649.0	20.8	587.0	20.6
670.5	18.3	597.5	16.4	651.0	19.1	587.5	19.3
671.0	16.5	601.5	13.3	662.0	20.0	588.0	20.8
675.0	16.9	604.0	16.2	666.0	21.6	588.5	18.9
688.0	16.8	608.0	13.2	667.5	22.9	589.0	20.8
690.5	17.9	608.5	16.7	675.0	20.2	589.6	20.8
691.0	19.2	611.5	16.2	676.5	23.0	590.0	20.9
695.5	17.0	614.0	17.3	678.5	22.3	592.0	23.5
698.0	18.0	621.5	16.9	681.0	22.8	593.5	18.9
713.5	16.4	625.0	16.4	692.0	22.2	604.0	20.7
715.5	16.5	625.0	17.2	693.0	21.5	604.5	20.4
717.5	16.8	630.5	17.1	707.0	21.8	620.9	20.2
717.0	15.6	631.0	17.3	709.0	24.3	622.3	21.6
719.5	16.9	633.0	..	710.5	21.6	627.0	20.7
727.5	17.4	635.0	17.2	712.0	19.5	635.0	21.8
727.5	16.7	642.5	16.0	713.0	22.2	636.5	20.4
727.5	17.1	644.0	17.2	714.0	25.8	637.0	21.9
729.0	17.8	651.5	17.0	734.0	22.3	637.5	21.0
737.0	18.9	665.0	16.2	761.0	25.8	649.0	26.5
758.0	17.7	690.5	17.9	775.0	22.0	667.5	22.9
794.0	18.9	717.0	18.4	786.5	27.0	676.0	26.0
..	..	..	..	802.6	27.1	729.5	29.6

If any conclusion is to be drawn from these tables of comparative values, it is that the heating power of gas naturally follows, and therefore has some connection with, the illuminating power. That there is no definite relation between them, is the concurrence of engineering opinion. The unknown value of one cannot be calculated from the known value of the other. The temperature of the air, the quality of the coal used, and the general character and methods of manufacture, all enter as conditions to disturb and render uncertain, with varying effect in the different kinds of gas, any fixed relation.

USE OF GAS FOR FUEL AND HEATING.

The relative importance of heating power standards and illuminating power standards depends naturally upon the proportion of the gas supply for which each standard is the proper measure.

In the early days of the gas industry, when gas was used solely for lighting, and only in open-flame burners, its value lay entirely in its illuminating power. As modern inventions made gas available as a fuel, its heating value became of significance. To-day it is by no means exceptional to find the greater portion of the output of a company used for heating and fuel purposes. The success of the incandescent method of lighting is dependent largely upon the heating power of the gas; and in the extensive use of mantles, the illuminating power of gas has finally become in not a few communities a factor of minor importance. This is particularly true abroad, where, especially in Germany, gas consumers, encouraged by the distributing companies, are nearly all using burners on the incandescent system. In Germany, by reason of this situation, most of the gas is supplied according to its heating value; and, as has been pointed out, the tendency is very marked toward the general adoption of this standard in England.

Is the situation the same in the United States? We have noted the action of the State of Wisconsin in recognizing the necessity

of a calorific standard. Of other precedents there are none of significance. To obtain information on this point, a request was made to each gas corporation under the supervision of this Commission to report upon blank forms provided for the purpose the proportion of its gas used—(1) for fuel and heating purposes, and (2) for lighting. Of the gas used for lighting, the report required to be shown, if possible of determination, the proportion consumed in—(1) mantles, and (2) open-flame burners. While at best the reports would consist of close estimates, especially as to the percentage of gas used in mantles and in open-flame burners, the reports were not all satisfactory. Several of the companies failed to respond at all; and a number gave returns which upon the face of them were unreliable. From the remainder, there have been selected those estimates which may be fairly regarded as having been carefully made, and as best representing the opinions of practical gas men in this district.

TABLE IX.—Showing in Percentages the Proportionate Amounts of Gas Used for Heat and Fuel in Mantles and Open-Flame Burners, as Estimated by the Several Companies Named; the Arrangement being in the Order of the Amount of Gas Output Expressed in 1000 Cubic Feet.

Company.	Annual Gas Output (1000 Cubic Feet).	Per Cent. of Total Used for		
		Heat and Fuel.	Lighting.	
			In Mantles.	In Open-Flame.
Rochester . . . .	984,307	50	10	40
Syracuse . . . .	508,735	60	20	20
Troy . . . .	291,711	32.4	40	27.6
Binghamton . . . .	160,411	40	50	10
Poughkeepsie . . . .	99,305	50	25	25
Fulton County . . . .	89,891	60	20	20
Watertown . . . .	80,801	60	36	4
Chuctanunda . . . .	70,949	45	34	21
Newburgh . . . .	67,015	50	40	10
Kingston . . . .	58,937	45	45	15
Lockport . . . .	51,691	55	18	27
Ithaca . . . .	49,975	25.5	68.1	6.4
Saratoga . . . .	40,925	62	22.7	15.3
Peekskill . . . .	35,733	33.7	36.4	29.9
Orange County . . . .	30,489	55	20	25
People's (Oswego) . . . .	30,031	50	25	25
Northern Westchester . . . .	25,033	35.9	27.9	36.2
Homer and Cortland . . . .	24,473	19	73	8
Plattsburgh . . . .	22,714	57.2	15.6	27.2
Oneonta . . . .	13,062	33.3	61.7	5
Canandaigua . . . .	9,145	59	15	26
Corning . . . .	8,472	0.1	90	9.9
West Shore . . . .	6,824	30	50	20
Huntington . . . .	6,588	44.5	34.7	20.8
Brockport . . . .	6,000	30	40	30
Saugerties . . . .	5,613	41	50	9
Geneseo . . . .	3,801	26.9	68	5.1
Warsaw . . . .	1,452	25	72	3

CONCLUSIONS AND RECOMMENDATIONS.

A general survey of the entire study leads to the following conclusions:—

- 1.—That, of the coal gas, carburetted water gas, and mixed gas furnished within the territorial jurisdiction of this Commission, the proportion used in open-flame burners probably does not exceed 20 per cent. of the total supply.
- 2.—That the existing photometric standards by which is judged the illuminating power of the gas afford the proper basis of measuring the real value of this proportion of the supply.
- 3.—That unless, and until, the amount of the gas supply used in open-flame burners becomes diminished considerably below its present proportion of the total gas consumed, it is desirable the existing photometric standards be maintained.
- 4.—That the present test for illuminating power is not suited to a determination of the real value of gas used in the various methods now employed in incandescent lighting, nor does it afford a proper standard of measure for gas used for heat and power.
- 5.—That the amount of gas used in these methods, and for these purposes, constitutes fully 80 per cent. of the total supply.
- 6.—That the real value of this portion of the gas supply lies in the heating properties of the gas, for which no standard of measurement exists in this State.
- 7.—That by reason of the large class of consumers to whom the value of gas as a generator of heat is a matter of primal importance, it is desirable that the calorific power of gas be standardized by the introduction of appropriate tests.

These conclusions directly confront us with the questions:—

- 1.—What authority has the Commission to prescribe a calorific standard for the gas supplied under its supervision and within its jurisdiction?
- 2.—If the authority exists, shall a calorific standard be prescribed by the Commission?
- 3.—What is the proper calorific standard?
- 4.—Shall such standard be enforced supplemental to the illuminating standard now in use?

The powers of the Commission relating to gas standards are



defined in subdivision 3, section 66, article 4, of the Public Service Commissions Law, as follows —

Sec. 66, *General Powers of Commissions in Respect to Gas and Electricity*.—Each commission shall within its jurisdiction . . . . . (3) Have power to fix the standard of illuminating power and purity of gas, not less than that prescribed by law, to be manufactured or sold by persons, corporations, or municipalities for lighting, heating, or power purposes . . . . . and by order to require the gas so manufactured or sold to equal the standard so fixed by it, and to establish the regulations as to pressure at which gas shall be delivered.

From this it appears that the Commission at present is without authority to fix any standard for gas other than “the standard of illuminating power and purity.”

In view of the conclusions above expressed, Mr. Hazzard recommends, and urges the importance of securing, such amendments to those provisions of the law as will vest the Commission with the broad authority to ascertain and fix adequate and serviceable standards for the measurement of gas, pursuant to which such action may be taken, in the discretion of the Commission, as will serve to carry out the evident intent of the law as it now reads—that a standard shall be established for gas sold “for lighting, heating, and power purposes.”

Until such time as the Legislature may act in this matter, it will not be necessary to decide as to the calorific standard proper to be prescribed for the gas supply of this district. This and other considerations may, meantime, be matters of further study and investigation. There is no generally accepted standard of calorific value for gas; and the precedents established by other Governmental bodies do not of necessity afford a criterion as to what the action of this Commission should be. A determination of this question must be based solely upon the conditions of gas manufacture and distribution of this State; and the utmost care must be exercised that the standard adopted shall, on the one hand, insure excellence of service, and, on the other hand, not impose onerous conditions.

The probable effect of the enforcement of a calorific standard upon the costs of plant operation; the advantages (if any) of reasonable and uniform thermal units as against high candle-power units; the objections (if any) to the enforcement of a double standard; the experiences of the local gas manufacturers in determining and regulating calorific values; the present plant equipment and facilities for making heat-unit tests; and the time necessary to adapt gas-works conditions to calorific conditions—are, among others, subjects to which the attention of the Commission should further be addressed prior to any final action. Upon all these matters, the distributing companies whose interests would be affected should be given the opportunity to be heard.

STREET LIGHTING.

An American Paper.

At the Fifth Annual Meeting of the National Commercial Gas Association, of New York City, the following paper on “Street Lighting” was submitted by Mr. E. N. WRIGHTINGTON.

A history of a recent street lighting campaign in Boston may be instructive. The campaign began by an investigation on the part of representatives of both the electric interests and the Gas Company of the street lighting conditions in Europe. As far as gas is concerned, it was found that the present tendency in Europe is towards the inverted lamp, both with high pressure and with low pressure. The simpler application is, of course, with the low pressure; and it was therefore determined to make a trial installation of low-pressure inverted lamps.

The weakest point for attack in electric street-lighting systems seemed to be the enclosed carbon arc. This light, with its sharp shadows, constant flickering, and uneven distribution, offered a particularly good opportunity to make a satisfactory comparison with gas. It was evident that a large number of small gas units distributed at more frequent intervals would give a very much better lighting effect than the arcs.

Tabulations proved that a two-mantle light, while not operating to as great advantage in the way of even distribution, would cost considerably less to instal and maintain than two units with single mantles each, and would be the best all-round competitor of the electric arc. It was calculated that under the conditions in Boston, with gas at 80 cents and labour at the high price of \$2 a day, the two-mantle inverted lamps could be operated at about \$35 per year, including fixed charges, gas, labour, and all other expenses. The price for enclosed electric arc lights was about \$118. It was anticipated that this price would be considerably reduced on a new contract; and the two-burner gas-lamps were accordingly installed at about the ratio of three lamps to displace one electric arc.

An installation made on this basis and compared with the enclosed electric arc was very satisfactory from the gas point of view. It was admitted on all sides, and, as later developments showed, even by the electric people themselves, that the gas-lamps were superior to enclosed arc lamps. The light was softer, steadier, more evenly distributed, and of better colour.

Meanwhile, the electric interests had not been idle; and finding themselves at a disadvantage, they brought into the field a new type of 6/10 ampere magnetite arc, with opalescent globe, and replaced the old enclosed carbon arcs with the new magnetite

arc in a section where our installation had been made. This light has still the great disadvantage of all large-unit light sources at considerable distances apart; but as the total volume of light given was much more than that of the old arc, the effect was to increase the illumination.

We contended that the small units at more frequent intervals, whether with gas or electricity, would give the best results; but the city authorities, with whom the tests rested, preferred the larger units. We therefore suggested the use of high-pressure gas. We admitted, however, that high-pressure gas for street lighting in America was not in a sufficiently advanced stage for us to be able to make any price covering the whole city. We offered to light the Boston Common with an experimental installation, provided the city would sign a short-time contract with the Electric Company which would allow us to put in a price for high-pressure lighting after the experience of the trial installation had determined a fair price under American conditions.

The city was unwilling to wait, however; and an electric contract was signed for the same number of lamps as before—about 3000 in all, and displacing most of the old enclosed carbon arcs with the magnetite arcs. The flame arc lamp was brought into the competition; but only a few of them were contracted for. It should therefore be remembered, in any comments made on the street lighting situation in Boston, that the experimental gas installation was on low-pressure gas and was never intended to compete with magnetite or flaming arc lamps, but only with the enclosed carbon arcs, which it did very satisfactorily. It is manifestly unfair to compare the latest electric appliances, only patented in February, 1909, with anything but the latest gas lighting appliances—high-pressure gas.

Shortly after the electric contract was signed, the gas contract for about 12,000 lamps expired. In connection with the renewal of this contract, the competition with gas and electricity was renewed as between the smaller lamps—the tungsten and the single mantle. Here the gas interests were at a disadvantage from the fact that, under the terms of a new city Charter, which had been passed by the State Legislature, no municipal contract could be made for a longer term than to Feb. 1, 1910. By a clause in the electric contract previously signed, the city could increase the number of tungsten lamps so as to displace the gas-lamps. This contract, being on a five-year basis, gave the Electric Company a decided advantage. It was finally arranged, however, to extend the present gas contracts to Feb. 1, 1910, and at that time to ask for bids for a long-time contract.

During the campaign, so many statements were made regarding the relative efficiency of the respective lamps, which did not seem to agree, that we employed a firm of engineers, whose authority could not be questioned, to make tests of both gas and electric street-lamps. A large number of tests were made, both on the street and in the photometer-rooms; and the results will no doubt prove of value.

The following tables are extracted from these tests, with the exception of the indoor test on the upright single-mantle lamp, which we tested ourselves.

Table of Tests—Small Units.

TABLE I.			
SINGLE-BURNER UPRIGHT GAS-LAMP.			
Candle power at 20° below the horizontal.			
Average of all results . . . . .			Outdoor Tests. 74 c.p.
DISTRIBUTION OF LIGHT IN VERTICAL PLANE.			
Angle Below Horizontal.	Outdoor. C.P.	Indoor. (Our own test.) C.P.	
10° . . . . .	82	..	—
15° . . . . .	76	..	—
20° . . . . .	74	..	74
30° . . . . .	75	..	—
45° . . . . .	81	..	—
60° . . . . .	56	..	—
Approximate M.L.H.S.C.P. . . . .			70·7
Consumption . . . . .			3·3 ft.
Candle power per foot 20° angle . . . . .			22·4 c.p.

TABLE II.			
SINGLE-BURNER INVERTED GAS-LAMPS.			
Candle power at 20° below horizontal.			
Average of all results . . . . .			Outdoor Tests. 94·5 c.p.
DISTRIBUTION OF LIGHT IN VERTICAL PLANE.			
Angle Below Horizontal.	Outdoor. C.P.	Indoor. C.P.	
0° . . . . .	—	..	73
10° . . . . .	98	..	86
15° . . . . .	96	..	90
20° . . . . .	99	..	95
30° . . . . .	117	..	102
40° . . . . .	—	..	121
45° . . . . .	135	..	—
50° . . . . .	—	..	127
60° . . . . .	137	..	126
70° . . . . .	—	..	124
75° . . . . .	161	..	125
90° . . . . .	165	..	127
Candle power M.L.H.S.C.P. . . . .			118
Gas consumption per hour . . . . .			105
Candle power per foot M.L.H.S.C.P. . . . .			3·66 ft.
At 20° angle . . . . .			28·7 c.p.
Maximum . . . . .			26·0 c.p.
			34·7 c.p.



TABLE III.  
TWO-BURNER INVERTED GAS-LAMP.  
Candle power at 20° below horizontal.  
Average of all results :

	Outdoor Tests.
In plane of mantles . . . . .	153 c.p.
In plane perpendicular to plane of mantles . . . . .	175 c.p.

These lamps were not adjusted at this time to American conditions, but were tested just as they came from the Custom House.

DISTRIBUTION OF LIGHT IN VERTICAL PLANE.

Angle Below Horizontal.	Outdoor. C.P.	Indoor. C.P.
0° . . . . .	—	176
10° . . . . .	—	195
15° . . . . .	—	203
20° . . . . .	186	220
30° . . . . .	205	242
40° . . . . .	—	252
45° . . . . .	213	—
50° . . . . .	—	253
60° . . . . .	230	255
70° . . . . .	232	253
80° . . . . .	—	251
90° . . . . .	216	257
Candle power M.L.H.S.C.P. . . . .	193	226
Gas consumption per hour . . . . .		6·6 ft.
Candle power per foot M.L.H.S.C.P. . . . .		24·3 c.p.
At 20° angle . . . . .		33·3 c.p.
Maximum . . . . .		40·2 c.p.

Large Units (High-Pressure Gas).

TABLE IV.

THREE-BURNER PRESS GAS-LAMP.

Angle Below Horizontal.	Indoor Test. C.P.	
0° . . . . .	3520	
10° . . . . .	3780	
15° . . . . .	3930	
20° . . . . .	3880	4300
30° . . . . .	4070	
40° . . . . .	4050	
50° . . . . .	3740	
60° . . . . .	3800	
70° . . . . .	2870	
80° . . . . .	2240	
90° . . . . .	2320	
Candle power M.L.H.S.C.P. . . . .	3520	
Gas consumption per hour . . . . .	70·3 ft.	
Candle power per foot M.L.H.S.C.P. . . . .	50·1 c.p.	
At 20° angle . . . . .	52·2 c.p.	61·2

Pressure, 72·1 inches of water.

TABLE V.

ONE-BURNER PRESS GAS-LAMP.

Candle Power at 20° Below Horizontal.	Outdoor Test.
Average of all results . . . . .	1521 c.p.
Gas consumption per hour (estimated) . . . . .	25 ft.
Candle power per foot at 20° angle . . . . .	60·8 c.p.

TABLE VI.

MAGNETITE ELECTRIC ARC, WITH OPALESCENT GLOBES.

Candle power at 20° below the horizontal.	Outdoor Test.
Average of all results (except fluctuations) . . . . .	1059 c.p.

DISTRIBUTION OF LIGHT IN A VERTICAL PLANE.

Angle Below Horizontal.	Outdoor Test.		Worst Lamp.	
	Normal. C.P.	Best Lamp. Fluctuation. C.P.	Normal. C.P.	Fluctuation. C.P.
10°	1,036		781	
15°	1,020		765	
20°	1,161	{ 432 294	838	{ 392 372
30°	1,250	793	875	
45°	1,200		923	
60°	1,130		798	
75°	1,130		738	{ 273 221
90°	975		786	
Approximate M.L.H.S.C.P.	1,150		835	

It will be noted from the above tests that the efficiency of the upright gas-lamp at the useful angle for street lighting of 20° below the horizontal, is 22·4-candle power per foot; that of the single inverted gas-burner at the same angle is 26-candle power per foot; and that of the two-mantle lamp, is 33·3-candle power per foot. While conditions of the tests in the photometer-room were more favourable than in the case of lamps burning out of doors, it will be noticed that in some cases the outdoor tests gave higher candle power results than the indoor tests. Comparison has sometimes been made by the electric interests to the disadvantage of gas lighting by measurements taken of gas-lamps in poor condition or in old-style burners. While the outdoor tests mentioned in the paper were made under good conditions, we would not expect any great depreciation in candle power for the lamps if given satisfactory care during their operation.

From what the electric people say, one would imagine that the electric lamps, and especially the tungsten lamps, were subject to no depreciation whatever. As a matter of fact, tests which were made of tungsten lamps show a depreciation in some cases as high as 30 and 40 per cent. It will be noticed from the above figures that either of the single-burner gas-lamps, upright or inverted,

will give more light than the 60-candle power tungsten lamp. In dealing with the question of candle power, a very important point, however, should be considered in comparing the two sources of light—that is, the quality. It has been shown by actual demonstration, and we believe to the satisfaction of impartial observers, that a gas-mantle lamp, even where the candle power is the same, gives a great deal better light than the tungsten lamp.

A number of gas-mantle lamps were installed in Boston, and next to them in the same street a number of tungsten electric lamps. Both these sets of lamps gave practically the same candle power; but the gas-lamps were markedly superior to the electric lamps, not only in freedom from the glare which is prevalent with the tungsten street-lamps, in which the light source is not shaded from the eye, but also in the distribution of the light. This is a case where the most accurate photometric measurements do not show the real effect in the comparison of the two light sources.

When we come to the larger units, and consider the use of gas under pressure, we reach practically untried conditions so far as this country is concerned. In Europe, competition between high-pressure gas and flame arc lighting is very keen; extremely large units being used in both cases. So far, gas has a decided lead. In Berlin, they have just appropriated \$250,000 a year for four years to instal gas exclusively; and in London a Committee appointed to consider the comparative merits of gas and electricity have decided in favour of gas. In this country I do not believe that we shall ever have the need for the very large amount of light which is used in European cities. Consequently, the flame arc lamp and the largest high-pressure gas-lamps with three burners will probably not come into very general use for street illumination. I believe, however, that a one-burner high-pressure gas-lamp will prove a valuable competitor with electric arc lighting, both of the carbon and the magnetite types.

Here we have a lamp, as shown by the tests, of some 1500-candle power, which can be produced with 25 cubic feet of gas per hour. What exact difficulties of operation we shall encounter in the use of a separate high-pressure street lighting system remains to be seen; but in Berlin, at any rate, they seem to have solved the working problems. It may be that American conditions will increase these difficulties, or the contrary may be true. Neither do we know what the expense for the maintenance of these lamps will prove to be on this side of the water. Of course, we must consider the extra investment necessary to supply the separate system; but this is not different from the case of the electric company where the street-lamps are operated from series circuits. Some of the manufacturers in Europe are working on a system by which air may be supplied under pressure in pipes and introduced at the burner—thus accomplishing the same purpose as with gas under pressure, but with less probable difficulties and expense. The whole question is admittedly in an experimental stage; and the next few years, no doubt, will see considerable work done along this line.

The practical difficulty in undertaking these experiments is to secure a long contract for a sufficiently large number of lamps to make the experiment worth while from a commercial point of view. We have taken the first step in an installation of five one-burner lamps in the town of Brookline, just outside Boston.

Another feature in connection with street lighting—especially regarding the future—is the use of automatic devices for lighting and extinguishing lamps. Under conditions in America, the cost of labour is high, amounting in some cases almost to as much as the cost of gas in the smaller units. A number of systems are in use in various parts of Europe, and also in some parts of this country, by which the hand labour is largely dispensed with, and the lamps automatically lighted and extinguished. These devices are of two kinds—the clockwork system and the pressure impulse system. In the former, a clock mounted on the lamp actuates mechanism in such a manner as to turn on the supply at the proper hour, which is then ignited by a pilot-flame. In the other system, the impulse of pressure is sent along the main from the works, and this actuates a valve by means of which the supply is turned on and lighted in a similar manner. The lamps, of course, cannot be left entirely without care; but this consists only in the cleaning and adjusting and renewing of mantles, and does not necessitate a daily visit to the lamp. These systems where installed abroad have been investigated; and the reports are satisfactory. Some installations have been made in this country with apparent success. There seems to be considerable hope for some assistance in this direction.

Conditions vary in each city; but at the usual rates for gas and electricity, there is no reason why gas should not continue to furnish the best and cheapest light for illumination of the streets.

**Scottish Junior Gas Association (Western District).**—A meeting of this Association will be held in the Technical College, Glasgow, next Saturday evening, at which Mr. V. M. Evans, of Glasgow, will read a paper on "High-Pressure Gas Distribution."

**The Gas-Engine Industry in the Past Year.**—According to an article in the Engineering Supplement to "The Times," the year 1909 will take its place in the annals of the gas-engine industry as one of steady development and of improving trade, rather than as one of exceptional activity. The volume of work had been falling since 1906; but, judging from the reports received, the corner has now been turned, and many works found the past year an increasingly busy one—some shops having even been fully employed.



## EVAPORATION FROM WATER SURFACES.

By SIDNEY R. LOWCOCK, M.Inst.C.E., of Westminster.

[Abstract of a Paper read before the Association of Water-Works Engineers.]

In introducing his subject, the author said he had recently had occasion to go somewhat closely into the question of the amount of evaporation from the surface of an impounding reservoir; and he found that the investigation entailed an immense expenditure of time and labour, as results of experiments and information on the subject were scattered through a great number of papers and articles. The late Mr. G. J. Symons, in "British Rainfall" 1889, stated that there were some 225 books and articles on the subject; and since that date there had been many others. The author had not been able to obtain access to the whole of them; but he had been through a very large number—something like 150 in all—and it had occurred to him that the collection of the more important data and the results in the form of a paper might be useful to the members of the Association, and possibly save some of them a good deal of labour.

Up to about 1885, when a standard iron tank 6 ft. by 6 ft. by 2 ft. deep, sunk in the ground, was installed by the late Mr. Symons at Camden Square, there were very few reliable records, either in this country or abroad; the chief exceptions being the following: Luke Howard's observations at Plaistow (1812 to 1815); Daniel's experiments near London; M. Vallé's experiments at Dijon (1846 to 1852); the long series commenced by the late Mr. James Leslie in 1853 at Glencorse, Peebles, and continued by Mr. Tait; the experiments of the late Mr. Greaves at Old Ford (1860 to 1873); Golding's records at Copenhagen; the Rev. Mr. Griffith's records at Strathfield Turgiss (1870 to 1883); Mr. Miller's record at Lowestoft (1878 to 1897); and Mr. Baldwin Latham's records at Croydon with a floating evaporator, which were begun in 1879 and have been continued up to the present time. The results obtained by various observers are so incongruous, and the opinions expressed so divergent, that it was impossible to summarize them; and the author felt that the only plan was to give the principal results and opinions as briefly as possible, and then endeavour to form some conclusions on the subject. Taking the data available as far as possible in their chronological order, the results of experiments and the expressions of opinion by authorities of which the author has found records are as follows.

In October, 1801, Dr. Dalton contributed a paper to the Literary and Philosophical Society at Manchester, in which he gives the results of a long series of experiments on the evaporation of water at various temperatures in dry air. He came to the conclusion that evaporation depends upon the difference of the force of vapour at the temperature of the surface of the water and the force of vapour in the air—the latter being determined from an observation of the dew-point; and that the same quantity is evaporated with the same evaporating force whatever be the temperature of the air. He also considered that with the same evaporative force a strong wind would double the effect produced in a still atmosphere, and that generally when the air is in motion the rate of evaporation increases with the velocity of the wind. Mr. Luke Howard's observations at Plaistow (Beardmore's "Manual of Hydrology," 1862, p. 296) gave the average evaporation for the three years as 21.13 inches; while Mr. Daniel's experiments showed that, taking the whole year as unity, the evaporation during the four winter months was 0.104; during the four months March to June, 0.434; and from June to October, 0.462. From 1839 to 1845, very careful experiments were made on the Burgundy Canal by M. Vallé. They were made at four places with large tanks, 8 ft. 2½ in. square by 16 inches deep, sunk in the ground; the observations being taken monthly, and the water in the tanks filled up to a depth of 10 inches on the first of each month. His experiments at Dijon were continued for a further seven years; and at La Roche for a further five years.

The results showed that the actual evaporation was less than one-half of what had been previously assumed in this district. At Copenhagen during eleven years (1849 to 1859), Mr. Golding found the mean evaporation to be 27.9 inches. In 1860 the late Mr. Thomas Hawksley said that near London evaporation from water was nearly 36 inches per annum; Mr. Bailey Denton found it to be 33 inches; and Mr. Braithwaite considered it was greatly influenced by the velocity of

the wind. In 1861, Mr. Bailey Denton quoted Dr. Dalton's experiments as showing that the average evaporation from water surfaces in England was 44.43 inches; and Mr. Charnock found it to be 35 inches.

In 1869 the late Mr. Rogers Field and the late Mr. G. J. Symons read a paper at the British Association meeting, in which they referred to Professor Daniel's proposal of two methods of calculating evaporation from observations of the dew-point thermometer, but admitted that the error by this method might amount to 25 per cent. either in excess of or below the true evaporation. They also referred to Major Phillips and Lieutenant Haughton's experiments at St. Helena (and illustrated the apparatus used), and showed that the evaporation during 22 days in July and August, 1869, at Camden Square, as computed from the hydrometer, was 38 per cent. in excess of the true evaporation, as measured by Phillips pattern evaporator—*i.e.*, a small vessel immersed in water contained in a larger one—the computed evaporation being sometimes greater and sometimes less than the actual evaporation. Mr. Beverley found that the level of the water in the evaporator had an effect on the evaporation, and that this varied with the rapidity of the movement caused by the wind. Mr. G. Dynes expressed the opinion that the only true way to measure evaporation is by means of an evaporator fixed in the midst of a large piece of water. In "British Rainfall" for the same year, Mr. Symons pointed out the inconsistency of almost all the then published records; and the following year he again discussed the question and described a large number of evaporators, most of which were worthless. He also made the important statement: "The key to the whole question will be found in one item—the temperature of the water."

Up to this time all the observers had endeavoured to trace some relation between evaporation and rainfall, and this fallacy is still persisted in to some extent; many subsequent records (including those of Mr. Fitzgerald in 1887) giving the evaporation as a percentage of the rainfall. Though the total evaporation and precipitation over the whole globe must be equal, it is perfectly certain that in any one particular place they bear no relation whatever to one another.

In 1876, the late Mr. Charles Greaves, in a paper on "Evaporation and Percolation" read before the Institution of Civil Engineers, gave results of his observations at the East London Water-Works, Lea Bridge, from 1860 to 1873, with a gauge, 3 feet square and 12 inches deep, floating in a flowing stream and read every day. The records show that the maximum monthly evaporation was 4.854 in July, 1868. In 1877, Mr. Harlow, in a paper submitted to the American Society of Civil Engineers, gave the annual evaporation at Ogdensburg (N.Y.) as 49.4 inches; at Syracuse, 50.2 inches; at Salem, 56 inches; and at Cambridge, 56 inches. These figures, the author believed, were only the records for a single year. In 1878, Mr. J. Brady, in a paper on the "Sandhurst Water Supply, Geelong, Australia," read before the Institution of Civil Engineers, gave the mean evaporation for the years 1848 to 1877 as 50 inches per annum. Mr. H. C. Russell (Government Astronomer for New South Wales) gave the mean evaporation at Sydney for nine years, 1871 to 1879, as 32.45 inches.

Early in 1885 the standard tank, the observations on which had been recorded by the Rev. C. H. Griffith, was removed from Strathfield Turgiss, near Basingstoke, to Camden Square; the observations at the former place having been made continuously for fourteen years (1870 to 1883). From 1885 to the present time, daily measurements from the tank have been made (by means of a hook gauge in a small compartment on the side of the tank) under the direction of the late Mr. G. J. Symons, and since his death under that of Dr. H. R. Mill. In 1886, Mr. Desmond Fitzgerald read a most important paper giving the results of very careful experiments, and also of observations on the evaporation from floating tanks in the middle of the Chestnut Hill reservoir of the Boston (U.S.A.) Water-Works, where the water was 20 feet deep; the area of the reservoir being 85 acres. Mr. Fitzgerald agrees with Dalton's original statement that "evaporation depends on the difference between the force of vapour at the water surface and that existing in the air;" but he does not consider that it bears any direct relation to the relative humidity of the air—the force of vapour depending entirely upon the temperature. He considers the dew-point a most important factor. As it varies the force of vapour varies; and, other things being equal, it is the difference between the temperature of the water and the



dew-point that determines evaporation. If the water be cooler than the dew-point, condensation will take place; if the dew-point is lower than that of the temperature of the surface of the water, evaporation takes place.

In "British Rainfall" for 1886 a comparison was made as to the results at Dijon (already referred to) which give the mean of 22.4 inches per annum, and those obtained in London; Mr. Greaves' experiments gave an average of 20.9 inches per annum. Mr. Symons expressed the opinion that, looking at the relative temperature and humidity of London and Burgundy, it seemed very reasonable that the evaporation in the latter should be about 10 per cent. more than in the former; but he thought at that time that the evaporation from a large water surface in this country would not exceed, if it reached, an average of 20 inches per annum. It was still considered, however, that evaporation depended largely on the wind. In 1889, however, Mr. Symons had changed his mind as to the effect of the wind. He concluded that the surface temperature of the water was the one important factor, and that the Strathfield Turgiss results represented what occurred in a lake or reservoir, and showed that practically all the other evaporators were unreliable. In 1890 he stated that for England the average of 18 inches shown by the standard tank was, in his opinion, a value to be adopted in preference to any other.

Mr. C. E. Peek, at Rousdon, Lyme Regis (Devon), found the evaporation in 1888 to be 16.82 inches, and the next year 17.25 inches. In 1890 the average evaporation at Lawrence, U.S.A., for three years, 1888 to 1890, is given as 29.16 inches in the report of the State Board of Health for Massachusetts. The notable point about these records is, that although the air temperature in the winter is very low, the evaporation is very considerable.

In 1892, Mr. William Matthews started a standard tank (similar to that at Camden Square) at Otterbourne, near Winchester; and other tanks have since been installed at Kennick, Devon, by Mr. W. Ingham; Downholland, Lancashire, by Mr. J. Baxendell; at the Ardsley reservoir, Wakefield, by Mr. Clemesha Smith; at Heaton, Bolton, by the late Mr. R. H. Swindlehurst; at Stanley Grange, Wakefield, by Mr. H. Stanley Haworth; at Revesby, near Lincoln, by Mr. J. Shaw; at the Talla Water-Works, Peebles, by Mr. W. A. Tait; and at Isfield, Sussex, by Major H. King.

In "British Rainfall" for 1903, Dr. Mill pointed out that the individual observations vary so much that he was unable to draw any definite conclusions as to the distribution of the amount or the rate of evaporation; and he expressed the desire to see experiments carried out on the effect of different exposures to the sun and wind on evaporation from two precisely similar tanks at the same place. In the following year, which completed the twenty years' record at Camden Square, Dr. Mill made the very significant statement that, generally speaking, the monthly results for the whole period appeared to show some relation to the amount of sunshine; and, further, that the excess of rain relatively to the average in 1903 accompanied evaporation similar to that in 1904, when the rain was generally below the average. This would appear to dispose of the inverse relationship sometimes supposed to exist between the amount of rainfall and evaporation.

In 1905, Mr. Rafter (*vide* Bulletin, No. 85, 1905, p. 134) referred to Professor Cleveland Abbé's statement of relations of evaporation as established by Professor Thos. Tate. These conclusions are that, other things being the same—

- (a) The rate of evaporation is nearly proportional to the difference of the temperatures indicated by the wet and dry bulb thermometers.
- (b) The increase of evaporation due to air in motion is nearly proportional to the increased velocity of the wind.
- (c) The evaporation is nearly inversely proportional to the pressure of the atmosphere.
- (g) The rate of evaporation from a horizontal surface facing upwards is very much affected by its elevation above the ground.
- (h) The rate of evaporation is affected by the radiation of surrounding bodies.

Mr. Rafter considered that the velocity of the wind must have a very material effect.

In the same year, Dr. Mill, in "British Rainfall," has an

interesting note on the relation of evaporation from a water surface to other meteorological phenomena which gives a comparison of the evaporation with the temperature in air and soil, duration of sunshine and rainfall, relative humidity, and amount of rain. The curve of evaporation closely followed those of the soil and air temperatures during winter, early spring, and late autumn. During summer, including the late spring and early autumn, the evaporation ceased to follow the mean temperature curve, and during these periods the black bulb thermometer and still more the duration of sunshine and rainfall seem to have had the greatest effect on evaporation. On one occasion only the influence of wind seems to have accelerated evaporation. He then discusses an instructive diagram given, and concludes: "Too much stress must not be laid upon the conditions for one year, but, as far as it goes, this year shows that when evaporation was below the average it followed the mean temperature; when it was above, it followed the sunshine and black bulb temperature, and the wind appeared to have but little effect upon it."

In 1906, Dr. Mill published in "British Rainfall" another diagram of the observations at Camden Square, and pointed out in his notes on evaporation that, as in the previous year, the main factors appear to be the mean temperature of the air in the winter and the duration of sunshine in summer. In 1907 a new form of evaporimeter—the Wilson "Radio-Integrator," was described and illustrated in "British Rainfall." This instrument appears to the author to be based on the right principles; but it does not seem to be sufficiently sensitive to the reduced evaporating power of the sun during the winter months. In 1908 from the diagram of results at Camden Square, Dr. Mill considered that the radio-integrator curve showed an unmistakable relationship to the evaporation curve during the summer; and he thought the instrument offered the best means of estimating evaporation in the absence of a tank. In referring to the wind, he stated that the effect was far less pronounced than that of sunshine and temperature.

In a large table the author gives the mean monthly and yearly evaporation in inches for all the places where standard tanks have been established, and for some others where the records have been carefully kept with smaller tanks, and can probably be relied upon. The records for Port Elizabeth, Lawrence (Mass.), and Boston (U.S.A.), and some Australian stations, are inserted for comparison. He concludes his paper with the following observations.

In the whole of the records which the author has been through, he has not observed a single instance of the maximum annual evaporation occurring in the same year in which the minimum rainfall occurred, which is a fortunate thing for water-works engineers; but, of course, it does not follow that because such a coincidence never has occurred, that it never will occur. What water-works engineers want is to be able to estimate with some degree of accuracy what evaporation is likely to occur, in the absence of reliable records of actual evaporation for a long period such as we now have for several places. But it is not easy to see how this is to be done. As already stated, the radio-integrator seems a step in the right direction. From a careful consideration of the existing data, it appears to the author that the intensity and duration of the solar radiation are the determining factors. It also appears to be established that the barometric pressure has so small an effect as to be negligible, and that although the wind has some small effect, it is so small as to be practically inappreciable in comparison with the effects of temperature.

Proceeding on this basis, the author has endeavoured to find some method by which the evaporation can be calculated from the records of intensity and duration of sunshine. He has obtained such records for various places, but, unfortunately the records of both sets of observations are not available at the same place (and are therefore useless for this purpose), except at Camden Square. He has been able to obtain records for the last four years through the kindness of Dr. Mill. This is, of course, only a short period; but, bearing this in mind, the results of the calculations from these data are, he ventures to think, extremely satisfactory.

Taking the average maximum sun temperature, and multiplying it by the duration of sunshine and by a factor, the figures agree very nearly with the evaporation observed in the standard tank. The factor based on the records for these four years is 0.0001254. Using the same formula for each of the four years, the results are true within a very small percentage. Thus for 1905 the difference between the calculated and observed evaporation is only — 0.7 per cent.;



for 1906 it is only — 0·8 per cent.; for 1907 it is — 3·9 per cent.; and for 1908 it is + 6·8 per cent.

The formula is—

E = M × D × 0·0001254.

E being the evaporation in inches.

M „ „ mean maximum sun temperature in degrees Fahr.

D „ „ duration of sunshine in hours.

Although this formula gives the above results for the whole year, if it is applied to the individual months, it gives a result rather too high for the winter months, and rather too low for the summer months. Taking the summer re-

cords for the four years at Camden Square to calculate the evaporation during the six summer months, April to September inclusive, the equation becomes—

E M × D - 3500.  
6000

The constant 3500 and the divisor 6000 are empirical figures, and may possibly require some alteration when the observations for a long series of years are available.

The following table shows the summary of the records for each year and for the average of the four years, and also the evaporation calculated from this equation. It will be seen that the calculated evaporation agrees very nearly with that observed.

—	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Duration of sunshine . . . . 1905	38·7	68·1	86·0	91·3	222·2	157·6	214·8	148·4	104·1	93·9	33·5	12·4	—
Mean maximum sun temperature „	53·1	68·4	83·4	89·3	112·0	109·6	121·7	114·5	100·1	79·6	59·6	49·8	—
D × M . . . . .	2,065	4,660	7,160	8,140	24,900	17,280	26,000	16,990	10,420	7,470	1,997	618	—
Evaporation in inches (actual) . „	·17	·35	·65	1·14	3·19	2·49	3·65	2·23	1·24	·78	·09	·16	16·14
Evaporation in inches (calculated) „	—	—	·61	77	3·56	2·30	3·75	2·25	1·15	·66	—	—	—

—	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Duration of sunshine . . . . 1906	43·3	67·9	99·4	192·9	124·7	216·1	235·9	196·9	154·1	79·8	29·9	37·2	—
Mean maximum sun temperature „	60·3	64·6	79·6	99·4	102·2	114·4	120·6	118·5	106·9	86·0	61·6	51·2	—
D × M . . . . .	2,610	4,380	7,910	19,160	12,760	24,750	28,410	23,300	16,480	6,860	1,841	1,904	—
Evaporation in inches (actual) . „	·06	·21	·73	1·90	1·9	3·53	3·65	3·46	2·38	·78	·27	·16	19·03
Evaporation in inches (calculated) „	—	—	·73	2·61	1·54	3·54	4·15	3·30	2·16	·56	—	—	—

—	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Duration of sunshine . . . . 1907	40·1	53·7	151·4	104·2	137·0	146·5	162·6	149·7	143·9	73·9	30·6	23·4	—
Mean maximum sun temperature „	53·0	60·5	78·4	91·1	102·5	109·9	109·5	108·8	101·5	67·4	60·5	51·9	—
D × M . . . . .	2,122	3,250	11,880	9,490	14,050	16,100	17,800	16,280	14,600	4,975	1,850	1,215	—
Evaporation in inches (actual) . „	·21	·38	1·02	1·27	1·93	2·47	2·65	2·24	1·72	·49	·27	·19	14·84
Evaporation in inches (calculated) „	—	—	1·39	·60	1·76	2·10	2·38	2·13	1·85	·25	—	—	—

—	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Duration of sunshine . . . . 1908	32·5	53·1	97·7	141·8	173·7	240·0	161·5	179·3	129·3	84·8	48·2	14·0	—
Mean maximum sun temperature „	50·1	66·8	76·0	85·8	108·7	115·6	111·1	109·5	99·6	83·7	65·9	47·2	—
D × M . . . . .	1,629	3,550	7,420	12,160	18,870	27,740	17,960	19,640	12,890	7,100	3,177	660	—
Evaporation in inches (actual) . „	·05	·27	·56	1·32	2·23	3·77	2·75	2·47	1·25	·48	·29	·14	15·58
Evaporation in inches (calculated) „	—	—	·65	1·44	2·56	4·04	2·41	2·69	1·56	·60	—	—	—

Mean.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Duration of sunshine . . . . .	38·6	60·7	108·6	132·6	164·4	190·1	193·7	169·3	132·8	83·1	35·6	21·7	—
Mean maximum sun temperature .	54·1	65·1	79·3	91·4	106·3	112·4	115·7	113·0	102·1	79·1	61·9	49·8	—
D × M . . . . .	2,088	3,952	8,612	12,110	17,480	21,380	22,400	19,131	13,560	6,573	2,203	1,080	—
Evaporation in inches (actual) . .	·12	·30	·74	1·41	2·31	3·07	3·17	2·60	1·65	·63	·23	·16	16·39
Evaporation in inches (calculated) .	—	—	·85	1·43	2·33	2·98	3·15	2·60	1·67	·51	—	—	—

The factors in either of the equations will probably only be true for England and places having the same latitude and variations of climate, and it will be extremely interesting if any members of the Association have access to records at other places, to see what alterations in the factors are necessary for different latitudes. Calculations based on the results from tanks will be on the safe side, as although it is not very definitely supported by figures, the impression left on the author's mind by a study of the subject is that the tank records give a result in excess of the actual evaporation from reservoirs, provided the latter are kept reasonably full. The only definite figure supporting this impression is that given by Mr. Desmond Fitzgerald, where in the large tank, 10 feet diameter by 10 feet deep, floated in the middle of a large body of water (in the Chestnut reservoir at Boston, U.S.A.), it was found that the temperature of the water in the tank did not agree with that of the water of the reservoir; the difference on one occasion being as much as 10° Fahr. This supports the author's conclusion that the radiant heat has a far greater effect upon evaporation than heat transmitted by contact.

Discussion.

Mr. WILLIAM WATTS (a Past-President) wrote: The loss by evaporation from the surface of a large reservoir is slightly greater than that from the experimental tanks referred to by the author, in consequence of the crest of the waves breaking up and toppling over into the trough of each wavelet. Although dew cannot be measured in rain-gauges, it has a potential value in its effect on the amount of evaporation from the surface of still water. Atmospheric vapour in supplying dew provides some water not accounted

for in the rain-gauges and not revealed by the phenomena of evaporation. Although it may not be recoverable in a measurable quantity, its effects must be felt on large water-sheds, such as those in the Pennine valleys. No attempts have, however, been made by water-works engineers to scientifically measure it. All available drainage areas in the country should be measured; and their rates of rainfall known, not only for the information of the county councils, but for the benefit of corporations requiring water.

Mr. C. CLEMESHA SMITH (Wakefield) said the whole point of the paper rested in the discovery of some means of ascertaining the evaporation from the solar radiation and the duration of the sunshine. Dr. Mill, in his "British Rain-fall, 1907-8," referred to the Wilson radio-integrator. This instrument utilized the same two factors that Mr. Lowcock had embodied in his formula. It utilized solar radiation and the duration of sunshine. Dr. Mill stated that the curve of wind velocity appeared to have very little relation to that of evaporation; but he pointed out in one case, where he had a difference between the results from the Wilson radio-integrator and the results from the tanks, that the radio-integrator was screened from the wind, whereas the tank was not, which did not square with his remark that the wind had little relation to evaporation. Was it not possible that, if the two had been equally exposed to air movement the results might have been more accordant?

The PRESIDENT said it would be interesting if Mr. Smith or Mr. Lowcock would explain how these tanks were fixed in the water; and how the wind affected them with the water on the outside. Did the wind blow water into them or out of them in exposed places? Wind would blow up waves on large sheets of water.



Mr. SMITH said in his case the tanks were 6 feet square and 2 feet deep; and they were made of galvanized iron, and were sunk into the ground. All the standard tanks were in the ground some distance from the water. If they were put into water, there was the difficulty of waves breaking over the side, and a large amount of water getting into them, and so vitiating the value of the observations. The top of the tank was some 2 to 3 inches above the surface of the ground; and they kept the level of the water as near as possible to the level of the ground. If, owing to excess of rainfall over evaporation, the level of the water rose, they took a measured 1 inch or 2 inches out of the tank; and if evaporation took it away more rapidly than the rainfall was replacing it, they put a measured inch into the tank.

Mr. EDWARD SANDEMAN (Derwent Valley Water Board) said a few years ago he had an evaporation tank on Dartmoor of which he kept a record, and recently he had had one in Derbyshire. The results on Dartmoor, at an elevation of 700 feet, showed under 20 inches of evaporation; and those in North Derbyshire, at an elevation of 750 feet, about 11 inches. The point he should like to put to the author was in what way he proposed to use the figures. He did not himself see there was much scope for their use by water-works engineers. If they were to be used to ascertain the loss from reservoir surfaces, it did not appear that the loss was likely to be more than 1 or 2 per cent. of the quantity of water supplied per annum, which was so small an amount as to be practically negligible in formulating a scheme of water supply.

Dr. HERBERT LAPWORTH (Derwent Valley Water-Works) said the first thing that struck one on looking at the formula the author employed for the annual evaporation was the use of the term  $M$ —that was, the mean maximum sun temperature in degrees Fahrenheit. As the formula stood, it would mean that, so long as there was sunshine of any duration with a maximum temperature well below freezing-point, there would be some evaporation. This did not seem quite natural. It would look, therefore, as if the basis of his formula was not quite correct; and in dealing with mathematical points of this sort, unless one got the basis correct, one landed oneself into all sorts of errors by trying to harmonize the different factors and the experimental results. The author apparently had felt a difficulty because when he tried to apply the first formula month by month, he found, as he said, the results were too high in the winter and too low in the summer. As a rough check, he (Dr. Lapworth) had worked out the first year on the sheet—that was 1905—and the results seemed to be quite satisfactory. In spite of all this, however, it appeared to him that in certain other places—for instance, in exposed situations—a formula of this kind, while it might be a rough guide, should not be depended upon, for the simple reason that, he believed, the wind, particularly in exposed situations, must have an effect on the evaporation. Why he said this was for the same reason that Mr. Sandeman had mentioned. He had been testing some filter-beds, having to take into account the evaporation. The only particulars he could get were from an experimental evaporation tank 5 miles away. The results seemed to show the evaporation at the two places to be far from identical. So that it appeared to him that evaporation might vary enormously within quite a few miles. To verify this, he looked into some of the American journals; and he found that there were many cases where they had monthly evaporation three and even four times, and annual evaporation over twice, as much in one place as in another, in the same State, and fairly close together. Therefore, he thought it exceedingly unlikely that a formula for the Camden Square tank could be applied to other places, unless one took into account several other factors—such as the velocity of the wind and the moisture of the air. He should like the author to describe the Camden Square tank, and let them know to what extent it was exposed—whether the wind could reach the water surface, and whether the tank was sheltered by houses or other screens.

Mr. S. C. CHAPMAN (Torquay) said there were one or two points in connection with the question of evaporation that were sometimes lost sight of. In the first place, there was the direct influence not only on reservoirs, but on streams as well. The flow of streams varied between day and night to a considerable extent—to an extent that he did not think was appreciated by the majority of engineers. He had been watching some stream-gauges for a long time; and he observed that, in the summer months, there was a distinct difference between the flow in the day and night.

There was just another point. He likewise noticed that evaporation followed almost uniformly with the numbers of hours of sunshine. By way of curiosity, he had worked out the amount of evaporation per hour of sunshine throughout three years. He took a wet year, a medium year, and then a dry year. The wet year was 1903 (when they had 52 inches of rain, which was practically the maximum), and 1906 and 1908; and he found the mean of the three years was 0.01103 inch of evaporation per hour of sunshine taken throughout the year. The years were as follows: 1903, 0.011 inch; 1906, 0.0118 inch; 1908, 0.013 inch—making the mean, as he said, 0.01103 inch per hour of sunshine.

Mr. H. E. STILGOE (City Engineer, Birmingham) said to his mind, the great object of this paper, or perhaps the great use of it, had been to draw the members' attention to the large divergence of opinion and of obtained results. Dr. Lapworth said the formula was only a rough guide. This might be so; the author acknowledged it. So were all the results that had been obtained merely rough guides, because they varied so much. If they took Mr. Baldwin Latham's figures of his gaugings—the gauge in which he had a copper vessel of 1 foot diameter floating in a vessel 4 feet diameter, with 3 feet of water—his yearly average for a period of 30 years was 18.137 inches; whereas in another form of gauge—4 feet square, and standing entirely in the open on an iron pedestal, completely exposed to the air—he got 33.85 inches. Of course, it was obvious the latter form of gauge would probably not give such accurate results as a tank 6 feet square and about 2 feet deep, buried and the top level with the surface of the ground, the water in which was filled up as it evaporated and the gaugings were taken. Now whether the amount of evaporation was much or little, whether it mattered was quite another thing. He said that the use of these observations and these gaugings, and so forth, was that they turned the mind in a particular line, and that they taught them to observe things and to record them, and to get a knowledge of meteorological conditions which might otherwise be passed over as useless.

Mr. F. W. HODSON (Loughborough) said the figures in the paper only applied to water surfaces; and he, like some of the other members, looked first to see what was their actual effect, because, as they all knew, evaporation was the greatest factor which an engineer of overground or underground water-works had to take into account. He valued all these figures, because they were a distinct advance, and would no doubt ultimately assist in the solution of a greater problem; but he did not think the figures as they stood relating to water surfaces only were of such importance as those which referred to watershed areas. Applying the average figure of the tables—namely, about 18 inches—to two reservoirs almost similar in watershed area, rainfall, total capacity, and total daily supply (which amounted to 2 million gallons), he found a result in one case of 4.6 per cent. of loss throughout the year, provided the reservoir was kept quite full. Of course, a reservoir in normal operation would sink in level during the summer time when evaporation was at its highest, and evaporation would only act on the smaller surface area. Therefore the figure became reduced to probably something like 3 per cent. In the second reservoir—a shallow reservoir in proportion to its area—if kept full throughout the year, the loss amounted to rather over 10 per cent., subject also to some reduction in working. This was a serious amount, though it did not compare with the loss they got throughout the whole watershed area, which amounted to considerably over 60 per cent. in both cases.

THE PRESIDENT: Are you giving the percentage on the total capacity of the reservoir, or the water got out of the reservoir?

Mr. HODSON replied on the percentage of the daily supply available out of the reservoir. He should also like to confirm the observations Mr. Chapman had made, as to the variation found in recording the flow of streams between day and night, which he had observed for many years. He should like to give the figures from a stream which was measured regularly for ten years. He found that, during the three months, December, January, and February, the rainfall was about 25½ per cent. of the mean rainfall during the same period of ten years. The quantity which ran off during those months was 51½ per cent. of the total annual mean flow. During the three other winter months—October, November, and March—with a rainfall of 24 per cent. of the whole year, the flow-off was 24½ per cent. of the mean, which left them with the six summer months, in which they



had  $51\frac{1}{2}$  per cent. of the rainfall, yielding only 24 per cent. of the gross supply over the whole ten years. These figures showed the importance of the effect of evaporation; and it was the relationship between them and the evaporation from a water surface which was capable of definite measurement which required elucidation.

Mr. WILLIAM MATTHEWS (Westminster) said perhaps he might say a word or two, as he was responsible for one of the observations that went on for sixteen years—the one at Otterbourne, which was started at the special request of the late Mr. Symons, and for a particular reason. The conclusion he (Mr. Matthews) came to long before was that evaporation depended upon the component of the temperature and the prevalent wind. The temperature alone was not sufficient to account for the variations; but the wind had a great deal to do with it. The subject wanted a good deal more study; and he did not think anything could be settled until they had had much larger experiments than they had at present. One thing the author had omitted. They might hope he would put it into his paper—that was, the height of the gauges above sea-level. Mr. Symons considered this was an important point; and he (Mr. Matthews) believed that, in the Rainfall Organization books, Mr. Lowcock would find the elevations of most of the gauges referred to in his paper.

Mr. Lowcock, in reply, said he was very gratified that the paper had produced such a good discussion; and that it had brought out, exactly as he hoped it would do, the results of observations that other members had been able to make, and which he had not been able to carry out himself. Mr. Smith and other members referred to the wind. He could not in the paper give the whole history of what had been done in connection with wind experiments. But this question of the wind had cropped up from time to time, and had been a great subject of discussion. At Camden Square, in

order to test the matter, Dr. Mill had a wind-recording apparatus fixed by the side of the tank, and the results of the experiments he (Mr. Lowcock) had thus referred to in the paper: "The curve of wind velocity appears to have very little relation to that of evaporation; contrary to the hypothesis we set out to test." If members would look up the references to the matter, they would find that a good many experiments were made on wind. Mr. Sandeman had asked what was an extremely pertinent question: "After all, what was the good of it all?" He (Mr. Lowcock) thought this had been partly answered by Mr. Hodson in the figures he had given. The evaporation from water surfaces had been of great importance both to him (Mr. Lowcock) and his clients. That was why he started on the investigation. As he mentioned at the beginning of the paper, there was no doubt, in his mind at any rate, that evaporation from water surfaces must bear a relation to that from the area of the gathering-ground. If it did, then this sort of investigation was one step in the chain which would eventually, he hoped, enable them and their successors to do something even better than they did at present, in a sort of haphazard way, in arriving at the available quantity of water gathering-grounds could be relied upon to yield. There was another direction in which records of the kind would be extremely useful. The tendency at the present time was to put up big reservoirs, as for London, in which to store the raw river water for at least thirty days. The loss from these shallow reservoirs through evaporation was something considerable. All the water had to be pumped, and it was also a matter of considerable importance to know what the evaporation was, in deciding what the capacity of the reservoirs should be, as they would have to store a large proportion of a supply amounting to something like 200 million gallons per day. In this case, therefore, it became a matter of double importance.

## GAS-STOVES AND AIR PURIFICATION.

### Important Experiments in Glasgow.

The following report by the Corporation Chemist (Mr. F. W. Harris), the Sanitary Inspector (Mr. Peter Fyfe), and the Engineer of the Gas Department (Mr. Alex. Wilson), on the effect on the atmosphere of a more general use of gas-stoves in dwelling-houses has been submitted to the Corporation of Glasgow.

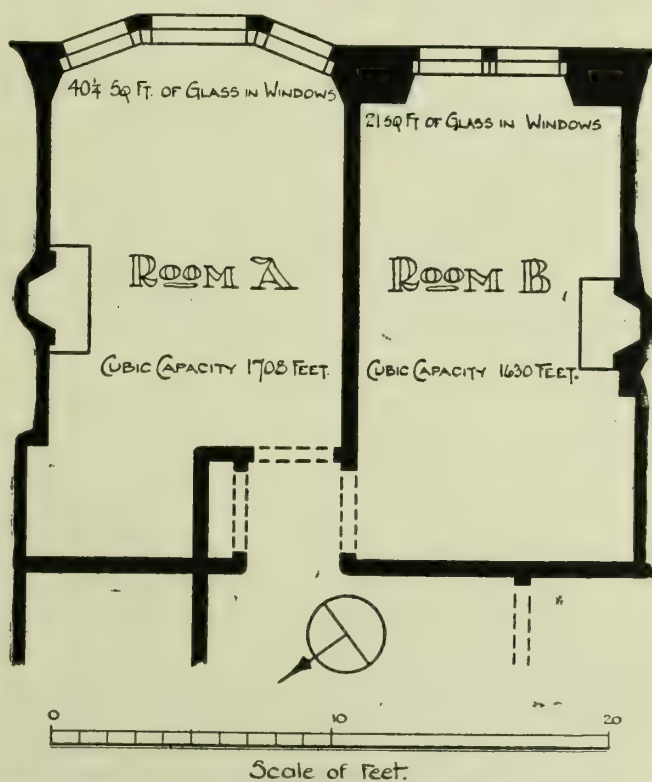
In obedience to the remit to us to report upon the effect which a more general adoption of gas-firing in dwellings and occupied premises in the city would have on the city's atmosphere, we have the honour to lay before you the following facts and considerations as the result of experiments we have made in firing with gas and coal in dwelling-houses. We were quite aware that experimental evidence was unnecessary to enable the educated to realize the great hygienic advantages to our atmosphere of burning gaseous fuel instead of coal; but we feel that, before the citizens generally will voluntarily adopt gas as a domestic fuel, they must be convinced of three things—(1) that the heating efficiency of a gas-fire is equal to, if not better than, that of a coal-fire; (2) that hygienically a gas-fire compares favourably with a coal-fire; and (3) that the relative costs of gas and coal for heating and cooking purposes are not such as to make the former uneconomical by comparison.

Our experiments were therefore directed with these considerations in view; and we determined to make them under conditions which would appeal to the general community, by securing the undisturbed tenancy, during six months, of two dwelling houses of equal dimensions in all respects, and identical as to situation. A plan of each house is shown, except the kitchen, which in each case lies behind. Both of them were therefore ordinary houses of two rooms and a kitchen, on the same flat, and, with the exception that they were unfurnished, similar in size to the great mass of such dwellings in the city. The four rooms in the two houses were labelled A, B, C, and D; A and B in the one house being in all respects the same as C and D in the other. In A and B the gas-fire experiments were carried on simultaneously with the coal-fire experiments in C and D. In each case the kitchens of the respective houses were utilized as temporary laboratories.

Firstly, we give a record of our experiments and their results as to the comparative heating efficiency of gas and coal fires. The experimental determination of the comparative heating efficiency of gas and coal fires is a complex problem. It is not solely a question of how many degrees the atmosphere of a room has been raised by the consumption of a definite quantity of gas or coal; the mode by which the heat transference has taken place is equally important, if not more so. Heat is diffused by three different processes—by conduction, convection, and radiation. For the purposes of this report, the proportion of heat diffused from a fire into a room by conduction alone can be ignored, as it is

relatively a negligible quantity. This leaves for our consideration convection and radiant heat.

It is common knowledge that, when air is heated, it becomes lighter through volume expansion, and consequently rises; its place being taken by air of a lower temperature and of greater density. This process is a continuous one so long as the source



Plan of Rooms in which the Tests of Gas and Coal Fires were carried out.

of heat endures. Currents of air are in this way set in motion; the heated moving air eventually parting with its heat to the ceiling and walls of the room. This mode of heat diffusion is termed "convection."

In a room heated entirely by convected heat, the temperature



of the air must necessarily be higher than that of the walls or floor—a condition which is undesirable, as, apart altogether from the personal discomfort experienced in breathing warm air, there are other weighty objections. Radiant heat, on the other hand, is diffused with entirely opposite effects. It passes or radiates through air without warming it, and is absorbed by the walls and floor of the room, which again slowly part with their heat to the air in contact with them, so that the walls and other solid bodies in the room are at a higher temperature than the air. Under such conditions, one experiences a sense of warmth without breathing unduly heated or dried air. Hygienically considered, radiant heat is the ideal mode of heat diffusion. Consequently, the radiation efficiency of a gas or coal fire must either commend or condemn it as a suitable source of heat for domestic purposes. We therefore devoted very particular attention to this part of the subject.

TESTING RADIATION EFFICIENCY.

Radiant heat, like light, is diffused from all bodies in straight lines and in all directions; the intensity of the radiation emitted from any given point being the same at equal distances from that point, and at unequal distances inversely as the square of the distance.

Different methods have from time to time been proposed for determining radiant heat. In 1907, a paper was read before the Institution of Gas Engineers by Mr. J. H. Brearley, of Longwood, in which he described a method for testing radiation efficiency, which method is not only far more sensitive, but yields more accurate comparative results than the older ones. The apparatus we employed was a thermopile, consisting of fine iron and constantin wires; the instrument being connected with a single-pivot moving coil galvanometer. The rays of the radiant heat striking on the thermopile set up an electric current, which passes through the connecting wires to the galvanometer, causing the needle to be deflected in proportion to the intensity of the rays. A weak point of this method, as with all other suggested methods, is that it is only comparative; the reading of the deflection of the galvanometer needle conveying no idea as to the intensity of the radiant rays expressed in any form of heat units. It only serves to indicate the radiation efficiency of one fire as compared with another.

Considerable time was spent by us in an endeavour to find a suitable method by which the readings could be calculated into heat units given off, but without success. Naturally, the test being only a comparative one, a definite system was necessary in working with the thermopile and galvanometer, in order that the readings should be made under exactly similar conditions. We made a semicircle, 3 feet in diameter, on the floor, with the middle fret of the fire as centre. Galvanometer readings were taken with the thermopile on this semicircle, at a height of 1 foot, and at a distance of 1 foot apart, beginning from the left. In this way, seven readings were taken at this height; and these readings were repeated at heights of 2, 3, and 4 feet. It must be understood that in each case, before the galvanometer readings in the different positions of the half circle were recorded, it was determined that the intensity of the radiation emitted by the different gas-fires was practically constant.

In experimenting with different gas-fires over a lengthy period of time, the calorific value of the gas varied slightly, as also did the pressure and the consumption. Hence it became necessary, in order to make the figures expressing the radiation efficiency strictly comparable, to calculate the same to a common standard. The standard adopted, and the method of calculating the same, are fully explained in Appendix I.

The radiation efficiency of the gas-fires tested, as indicated by the galvanometer readings taken at a height of 1 foot (the position of maximum intensity), and calculated to a standard of 100 cubic feet consumption of gas of a calorific power of 600 B.Th.U., is expressed as follows.

Comparative Radiation Efficiency.

No. 1 Gas-fire . . . . .	86	No. 6a Gas-fire . . . . .	135
" 2 " . . . . .	81	" 6b " . . . . .	82
" 3 " . . . . .	70	" 7a " . . . . .	120
" 4 " . . . . .	91	" 7b " . . . . .	91
" 5 " . . . . .	90		

NOTE.—Nos. 6a and 6b represent the results of observations of the same fire burning different consumptions of gas. In the case of 7b, four of the centre burners were turned off.

The great advantage of a coal-fire, from the point of view of comfort, is that the heat therefrom imparted to a room is diffused in the form of radiant heat. The question naturally follows—How do the above figures, expressing the comparative radiation efficiency of various gas-fires, compare with the figures obtained under similar conditions for coal-fires? As previously stated, a reliable comparison of the radiation efficiency of gas-fires was only rendered possible from the fact that the intensity of radiation became practically constant after a certain time. Experiments on similar lines to ascertain the radiation efficiency of coal-fires speedily demonstrated that with coal-fires the case was quite the reverse. We found the galvanometer readings to fluctuate so rapidly and so widely that any attempt to record a series of readings with the object of calculating them to a standard of definite coal consumption and calorific value was rendered futile. In fact, such a record would, in our opinion, be not only worthless, but actually misleading. A decision on the comparative heating efficiency of gas and coal depends, as we have explained, so much on the comparative radiation efficiency of these fuels, when burned

under ordinary conditions, that for the purpose of this report such a comparison becomes essential.

After careful consideration, we decided to experiment on the following lines: A gas-fire was ignited and a coal-fire was kindled simultaneously in two different rooms, both identical in regard to situation and structural details. Galvanometer readings were taken every ten minutes throughout a period of six hours, from 10 a.m. to 4 p.m. The thermopile was placed at the point of maximum intensity on the semicircle mentioned, which point we found to be the centre, at a height of 1 foot, both for gas and coal fires. The coal combustion was regulated according to the usual domestic practice—the fire gradually developing into a bright, clear combustion, then allowed to burn itself somewhat low before replenishing with a fresh supply of coal.

Experiments were made on two days with different gas-fires. Gas-fire No. 4 consumed 29·7 cubic feet per hour at a pressure of 16·10ths; while the consumption of gas-fire No. 6 was higher—namely, 33 cubic feet per hour at a pressure of 16·10ths. The results are graphically illustrated by curves in Appendix II. These curves bring out very clearly that the radiant efficiency of the two gas-fires, after a relatively short interval of time, becomes remarkably constant. On the other hand, the radiant efficiency of a coal-fire is very irregular, rising rapidly to the point of brightest combustion, and then falling equally as rapidly until the fire is replenished with a further supply of coal and the effective combustion renewed. Another point, and a very important one from a practical point of view, is shown by these curves—namely, the rapidity with which gas-fires in contrast with coal-fires develop their radiation efficiency.

In the case of the first experiment with gas-fire No. 4, the galvanometer indicated at the first observation taken (ten minutes after igniting the fire) a reading of 22; a similar reading for No. 6 gas-fire being 33. The development of the radiation efficiency of the coal-fire was much lower in the first experiment. A galvanometer reading of 22 was not obtained until after one hour's combustion, although from gas-fire No. 4 this reading was obtained in ten minutes. Similarly, to equal the first ten minutes' galvanometer reading obtained from gas-fire No. 6, the coal-fire required 44 to 45 minutes.

If we debar from the comparison gas-fire No. 6, on account of its comparatively high radiation efficiency and gas consumption, and limit our consideration to the results obtained with gas-fire No. 4, whose comparative radiation efficiency was 91, we notice, firstly, that the intensity of radiant heat emitted from a gas-fire is very regular, while that from a coal-fire is subject to extreme and rapid fluctuations; secondly, that the radiating powers of a gas-fire are much more speedily developed than of a coal-fire.

It is obvious that, given a modern, well-constructed gas-fire, fitted with gas and air regulators, intelligently fixed and used, the radiation efficiency becomes a definite asset; whereas the corresponding efficiency of a coal-fire, being dependent upon innumerable conditions, cannot be designated otherwise than as an indefinite quantity. Another advantage that a gas-fire possesses over a coal-fire is that its radiation efficiency is, to a certain extent, under control, which is certainly not the case with a coal-fire.

HEAT DIFFUSED BY CONVECTION.

Convection has been defined as the motion of a hot body, itself carrying its heat with it; the hot body, as already explained, being in this case the air which receives a portion of the heat generated by the combustion of coal or gas. It is obvious that the air in the near vicinity of the fireplace must necessarily receive the greatest stimulus; hence the upward current of air is in this position the most pronounced. In order to render this current of air amenable to measurement, we had a hood constructed, similar to that devised by Mr. J. H. Brearley in his experiments on convected heat. A sketch of the hood, as fixed in position for testing purposes, is given in Appendix III.

Careful experiments were made in order to ascertain whether the opening in front permitted an uninterrupted passage for the radiant heat. This was found to be the case. The practice was followed as in testing for radiated heat—no observations being recorded until each gas-fire had reached its normal heating point. In Appendix IV. are tabulated the observations made, and the result deduced therefrom. In the notes accompanying the table, the method of calculation is also given. The main point for consideration here is the percentage of total heat generated by the combustion of gas in the different gas-fires, which was transmitted to the room in the form of convected heat (see Columns 11 and 12). The following percentages were obtained:—

		Percentage of Total Heat Given Off as Convected Heat.
Fire No. 1 . . . . .		7
" " 2 . . . . .		19
" " 3 . . . . .		13
" " 4 . . . . .		23
" " 5 . . . . .		10
" " 6 . . . . .		16
" " 7 . . . . .		29

In addition, an experiment was made with a ball-fuel fire—the ball fuel fitted into an ordinary fire-grate furnished with bunsen burners. The result obtained for this fire was 6 per cent. Similar experiments were made with a coal-fire under identical conditions (see Appendix V.). However, owing to considerable fluctuations in the anemometer readings taken at the top of the hood, we thought it was expedient to take frequent observations



throughout the day from 10 a.m. to 4.30 p.m., and average the results. The tabulated results for the convected heat from a coal-fire show that 2.3 per cent. of the total heat generated from the combustion of coal in an ordinary domestic fire is imparted to the room in the form of convected heat. The percentage of total heat generated and given off in the form of convected heat is therefore greater for gas-fires than for coal-fires.

The fact that in our experiments the chimney draught was very efficient, might explain why the percentages of convected heat are on an average much lower than those recorded by Mr. Brearley. However, we must not lose sight of the fact that the difference in the figures might result from improvements in gas-fire construction. This will be substantiated in the second part of this report.

#### FLUE HEAT OR WASTE HEAT.

We have now considered the comparative heating efficiency of gas and coal fires in so far as their heat is available for warming our rooms. There is another aspect of this question to be considered—namely, the proportion of heat generated which is rendered valueless for warming purposes by ascending the chimney in the form of flue heat. Unfortunately, for the determination of this flue or waste heat, we were forced to make our experiments fit the prevailing circumstances, instead of having the circumstances to fit the experiments. It was our original intention to measure the waste heat by a calorific method. We found that to give effect to our intentions would necessitate greater structural alterations to the flue than we could reasonably request permission to make. After due consideration, we decided to determine the flue heat from the difference between the temperature of the air of the room and the flue gases; the volume of the latter being ascertained by the anemometer.

An opening in the flue was made, 6 feet from the floor; and a glass door was fitted so that the opening could be securely closed while the temperature and velocity of the gases were determined. An iron band and hook were fixed in the centre of the chimney to hold the thermometer and anemometer in position. The temperature registered by the thermometer was under close observation; and, when it was practically constant, a series of anemometer readings were taken and averaged. In this way, we obtained very concordant results. The tables for the flue heats in Appendices VI. and VII. give the observations made as well as the method of calculation.

The percentage of total heat generated in the gas-fires (Appendix VI.) which was lost as flue heat varied from 26 to 58. These results are considerably higher than those recorded by other experimenters; but, obviously, so much depends upon the effectiveness of the draught of the flue that it is no wonder that, under varying conditions, different results are obtainable.

A series of experiments was instituted to determine the flue heat from a coal-fire (see Appendix VII.). Here, again, we were confronted with the same difficulty that we experienced throughout with our coal-fire experiments—namely, the extreme fluctuations in the intensity of the heat developed by the combustion of coal in a domestic fire. Consequently, both the temperature and volume of the waste gases fluctuated greatly; and, although our observations were extended over a whole day and were made at frequent intervals, in order to minimize the effect of these rapid and excessive variations, the final result obtained was not satisfactory. However, we obtained sufficient evidence to confidently make the assertion that at least 75 per cent. of the total heat generated by the combustion of coal in an ordinary domestic fire is lost in the form of flue heat.

#### HYGIENIC EFFICIENCY OF GAS-FIRES COMPARED WITH COAL-FIRES.

We now come to our second consideration—namely, the hygienic efficiency of gas-fires compared with coal-fires. When considered from a purely scientific standpoint, a comparison of the hygienic efficiency of gas and coal fires entails not only consideration of the probable effects of the combustion of these fuels on the internal air of dwelling-houses, but also on the external atmosphere. The perfect combustion of either coal or gas yields products chemically identical, though the proportion in which they are formed varies. Under ideal conditions, the chimney draught should be so efficient as to draw these products entirely away from the air of a room. Therefore, the two main principles on which the hygienic efficiency of gas and coal fires depends are—First, perfect combustion of the fuel, whether gaseous or solid; and, secondly, effective ventilation by the chimney. Leaving the question of the emission of the products of complete or incomplete combustion into the outer air for consideration later, we will confine attention at present to the comparative effect produced by gas and coal fires on the internal air of dwelling-houses.

The contamination of the air of a room heated by gas or coal under every-day conditions is possible only by a proportion of the waste products of combustion finding their way into the room. Naturally, the degree of contamination is more pronounced if the combustion of the fuel is not perfect. The emission into a room of the waste products of combustion results not only in the pollution of the air, but also in over-drying it, because the discharge of gases of relatively high temperature, possessing great avidity for moisture, renders the air unduly dry. This induces a feeling of discomfort in the inmates. These two undesirable effects—namely, contamination and excessive dryness of the air—constitute the main objections commonly urged against the adoption of gas as a domestic fuel.

The scope of our experimental inquiry was framed so as to prove the accuracy or fallacy of these objections. To determine the percentage of waste products of combustion which are discharged from gas-fires into a room, we experimented on the following lines: The hood already described in our experiments on convected heat was used for this purpose (see Appendix III.). All waste products bye-passed into the room necessarily ascended into the hood, and were discharged into the air of the room from the top of it. We determined the carbon dioxide contents of the air first at the inlet to the hood, and, secondly, at the outlet, and likewise made tests for carbon monoxide by the sensitive method of Nicloux and Gautier, as modified by Kinnicut and Sanford.\* We found from experiments that passing the air through concentrated sulphuric acid and soda lime tubes was sufficient to remove formaldehyde and other products of incomplete combustion likely to affect the accuracy of these results.

As in all our experiments, the gas-fires were allowed to develop their full efficiency before observations were made. In fact, the estimation of the percentage of waste products bye-passed into the room was made in conjunction with our determinations of the convected heat. The results obtained are tabulated in Appendix IV., which likewise explains the method of calculation followed. From the table, it will be observed that the percentage of waste gases diffused into the air of the room varied from 0.8 to 5 per cent. in the case of five fires; while the two remaining fires—Nos. 6 and 7—allowed 20 and 19 per cent. respectively of the waste gases to bye-pass.

Obviously the proportion of waste gases diffused into the room from gas-fires must depend upon the efficiency of the chimney draught, the construction of the canopy, and the dimensions of the outlet. It may be assumed, taking into consideration the gas consumed and the total heat developed, that the variation in the efficiency of the flue draught would not be excessive. This was experimentally proved by frequent observations made with the anemometer; and if we consider that in the case of Nos. 6 and 7 fires 7050 and 8913 cubic feet respectively of waste gases admixed with air were passing every hour up the flue, it is obvious that the relatively high percentage of waste gases bye-passed from these fires was due to faulty construction. In new fires which have been put on the market since the tests were made, the construction in this respect has been much improved.

When we examine the tabulated results in detail, we find that the carbon dioxide contents of the air of the room varied from 0.066 to 0.098 per cent. with fires Nos. 1 to 5; the corresponding figures for fires Nos. 6 and 7 being 0.156 and 0.164 respectively. Now, what is the true significance of these figures? Considerable importance is attached to the proportion of carbon dioxide in the air of rooms, as being indicative of the degree of contamination. This is undoubtedly correct, with the reservation that not only the proportion, but also the source, of the carbon dioxide must be taken into consideration. It is an accepted fact that if the carbon dioxide results entirely from respiration, then the proportion of this gas becomes a direct index of the polluted condition of the air, solely because the quantity of it found is in such cases in direct proportion to other products of respiration organic in nature and toxic in properties. The perfect combustion of coal gas yields no toxic compounds; and therefore considerably more latitude is permissible in regard to the proportion of carbon dioxide when a portion of that gas has been derived from combustion. This principle has been adopted by the Departmental Committee on the Ventilation of Factories and Workshops in deciding upon a legal limit for carbon dioxide. Another point of considerable importance is that the tests for carbon dioxide were made after the fires had been burning six hours, so that we cannot be accused of putting forward results too favourable to gas-fires. On the contrary, the reverse is the case. There can, however, be no doubt that this proportion of carbon-dioxide, due to gas combustion found in the air of a room, is incapable of producing any injurious physiological effect.

We have already stated that, if the products of incomplete combustion of either coal or gas were discharged into the room, the contamination of the air thereof would be greatly aggravated. Careful experiments were made to determine the presence and estimate the amount of carbon monoxide in the air of the rooms; and in every case, with the exception of one, the results were entirely negative. Coal-fire experiments on similar lines were made; and the results are shortly summarized in the statement that, under normal conditions of chimney draught, we found that no waste products, either of complete or incomplete combustion, were bye-passed into the room, while the carbon dioxide content of the air in the room was not materially increased.

These results will occasion no surprise when we state that the average flow of chimney gases was, in the case of coal-fires, not less than 17,500 cubic feet per hour, which is equivalent to changing the air of the room ten times every hour. Gas-fires are equally efficient as ventilating mediums as coal-fires; for though only in one case was the volume of waste gases passing up the flue per hour found to approach that of coal-fires, yet such an outgoing volume as 17,500 cubic feet is altogether unnecessary. It tends to cause draughts, and results in great loss of heat; while it is doubtful whether a corresponding increase in ventilating efficiency is thereby to be obtained, as such an excessive pull must increase the short-circuiting between the door, the windows, and the chimney.

\* *Journal of the American Chemical Society*, 1900, Vol. XXII., p. 14.



The ventilating efficiency of gas-fires may be shown by the volume of waste gases passing up the flue per hour—

No. of Gas-Fire.	Waste Gases Passing per Hour in Cubic Feet.
1	6,440
2	7,993
3	14,181
4	9,810
5	7,884
6	7,050
7	8,913

From this it will be observed that the minimum volume is equivalent to a change in the air 3·7 times per hour, while the average equals 5·2 times—figures that are quite satisfactory from a hygienic point of view.

Having demonstrated that the ventilation efficiency of gas-fires compared favourably with that of coal-fires, and that no vitiation of the air of rooms is occasioned by gas-fires, we direct attention to the results of a series of experiments made to determine the comparative effect of gas and coal fires on the humidity of the air. Two rooms exactly similar in regard to dimensions and situation were set apart for the tests; one being heated by gas and the other by coal. Both rooms were aired during the night, and the temperature was recorded each day fifteen minutes after closing the windows. The temperature was taken by wet and dry bulb thermometers—one set placed 5 feet from the floor and the other at the ceiling; half-hourly readings being taken throughout each experiment. It is, perhaps, unnecessary to state that the thermometers were so placed that they were not affected either by the radiant heat from the fires or by convected heat from the walls. In the tables in Appendix VIII., the humidity is expressed as the ratio of the amount of moisture actually in the air to that necessary to saturate it at the observed temperature; the saturation quantity being taken at 100.

In this way, we experimented with gas-fires consuming varying quantities of gas; the consumption of coal being regulated accordingly so as to maintain the temperature of both rooms as nearly as possible at the same level. In each experiment, the coal-fire was replenished under similar conditions to those prevailing in an ordinary household. The tables given in Appendix VIII. prove that the common objection to gas-fires—namely, that they cause undue dryness of the air—is not based upon fact. On the contrary, our experiments unmistakably demonstrate that gas-fires exert no more drying effect on the air of rooms than ordinary coal-fires.

In any attempt to compare the economical aspects of gas-fires for dwelling-houses as against those of coal-fires, we are at once faced by considerations favourably affecting the former which do not attach to the latter. We will consider these after an attempt has been made to select from the nine tables constituting Appendix II. one which seems to offer, from the results obtained, a fair basis of comparison.

Meanwhile, leaving convenience, ease of regulation, rapidity of effect, cleanliness, and non-production of solid waste products on one side, let us look at one of the tables which appears to show the results from both gas and coal firing to be pretty equal—namely, No. 4—and see what the exact difference is in money value, burning from 10 a.m. until 4 p.m. This experiment was made on Jan. 28, 1908; and in both rooms the temperature 5 feet from the floor was found to be 43° Fahr., and the humidity to be 84 per cent. The gas-fire and the coal-fire were lighted together at 10 a.m.; the former consuming gas at the rate of 29·8 cubic feet per hour, and the latter started with 1 lb. of dry sticks and 7 lbs. of coal.

At the end of the first hour, we had spent 0·7150d. for gas (at 2s. per 1000 cubic feet), and 0·6562d. for coals, at 10½d. per cwt., exclusive of the sticks. At 11 a.m., the air in the gas-fired room had risen from 43° to 51° Fahr., with 74 per cent. of humidity; while the air of the coal-fired room had only risen from 43° to 47°, with 86 per cent. of humidity. In another hour, with the same relative expenditures, we had 54° of heat and 69 per cent. of humidity for the gas-fire, and 52° of heat and 74 per cent. of humidity for the coal-fire.

It will be observed from the table that at 1 p.m. (three hours after starting) the air of both rooms, 5 feet from the floor, had attained the same temperature and the same humidity—viz., 56° and 65 per cent.—but that the coal-fire had reached this point by much lower gradations than the gas-fire. At 1 o'clock, 2·1456d. worth of gas had burned, compared with 1·9687d. worth of coal, or only 0·1769d. in favour of the coal-fire. Two hours after, or at 3 p.m., the air of the gas-fired room had reached the comfortable temperature of 61° Fahr.; while, notwithstanding that 7 lbs. of fresh coal had been added at 2 p.m., the temperature of the other room still remained at 56° Fahr. At 4 p.m.—the closing hour—the air of the gas-fired room had risen 1° to 62°, with 62 per cent. of humidity; while the air of the coal-fired room had suddenly jumped from 56° to 61°, with the same humidity—viz., 62 per cent.

The total expenditures for the six hours' trial were: For gas, 4·2912d.; for coal, 2·9062d.—1·385d. in favour of coal. If the price of gas were 16d. per 1000 cubic feet, instead of 24d., the cost of the two fires would have been identical, with a manifest advantage from the gas-fire in rapid, even, and progressive heating power to the maximum, and an instantaneous extinction when no longer required. But even with the extra 1½d., gas can claim, as we have already indicated, a convenience and simplicity of

regulation impossible with coal; a rapidity of effect, as shown in this and other tables, which coal-fires cannot attain to; and an absence of dirt and dust and ashes which we think may easily compensate every cleanly housewife for the fractional saving she can make in money by burning coal.

We are therefore of opinion that, even when fires are required for continuous daily use, if gas is burned in properly constructed grates or stoves, and the cost of service for attending coal-fires, and the extra work entailed in dusting, sweeping, and washing because of them, are added to the price of the fuel, the cost of heating by gas compares very favourably with the cost of heating by coal.

Where domestic cooking alone is the consideration, or when rooms require to be rapidly heated and kept at an even temperature for short periods, gas-fires are not only more convenient, but will cost less than coal-fires, even with gas at its present price.

#### EFFECTS OF GAS-FIRING ON THE ATMOSPHERE.

Finally, we may be permitted to add a few words upon the effects that the more general adoption of gas-firing in dwelling-houses and other occupied premises would have upon the atmosphere of the city.

As previously stated, the perfect combustion of either gas or coal yields products chemically identical—differing only in the proportion in which they are produced. The perfect combustion of a fuel necessitates that the temperature of the fuel and its products must be maintained at or above their ignition point; while at the same time each particle of fuel must be brought into contact with an adequate supply of air. By the employment of a gaseous fuel, such as coal gas, these conditions are easily secured, and require only the intelligent use of a modern gas fire or stove. On the other hand, the perfect combustion of coal in an ordinary domestic grate is an impossibility, as the two essential conditions for perfect combustion can only be imperfectly fulfilled. We are therefore confronted with the fact that the atmosphere is constantly being vitiated with the discharge from domestic chimneys of the visible and invisible products of the incomplete combustion of coal. The general conception of smoke and its composition is that it consists almost entirely of finely-divided particles of unconsumed carbon, and that the obnoxious qualities of smoke are proportional to its density and colour. This is incorrect. Smoke is a body of great complexity; its composition depending not only on the nature of the substance burned, but on the temperature prevailing during the formation of the smoke.

In order to demonstrate the polluting nature of the discharges from domestic chimneys, we made a series of estimations of the principal products of incomplete combustion. The results are tabulated, and indicate very plainly that, by the adoption of gas as the domestic fuel, the pollution of the atmosphere would be greatly reduced. We might, with advantage, make a few observations on the results obtained.

#### Proportion of Products of Incomplete Combustion in Flue Gases.

	Coal-Fires.	Gas-Fires.
Carbon and other solid matter	13·58 lbs. per million cubic feet	Nil
Hydrocarbons	5·40 " " " "	Nil
Carbon monoxide	24·17 parts per 100,000 parts flue gas	3·2 parts
Sulphur dioxide	1·36 " " " "	Trace
Ammonia	0·822 " " " "	0·085 part

#### Solid Impurities.

From the tabulated statement, it will be observed that the chimney gases from a coal-fire contain, on an average, 13·58 lbs. of solid matter per million cubic feet; while the chimney gases from a gas-fire are entirely devoid of any trace of solid matter. In order to impart to the lay mind a practical conception of what the 13·58 lbs. per million cubic feet means, we may state that this quantity is equivalent to fully 5 per cent. of the coal consumed.

#### Semi-Gaseous and Gaseous Impurities.

As we have demonstrated by former experiments, the domestic coal-fire is the source of what, to our mind, is the most objectionable constituent of smoke—namely, hydrocarbons. These compounds are produced by the partial distillation of coal which occurs in ordinary domestic fires. They are practically solid at ordinary temperature, black in colour, and when liquefied possess physical properties akin to a heavy oil. As the result of washing the gases formed in an open fire-grate by means of a spray, a considerable quantity of the impurities were collected, which on analysis gave the following results:—

Mineral matter	22·0 per cent.
Carbonaceous matter	41·1 " "
Oily hydrocarbons	36·9 " "

From a series of experiments which we conducted over several months, it was found that a million cubic feet of chimney gases from an ordinary domestic fire, burning under usual conditions, contained 5·4 lbs. of these hydrocarbons. These impurities are most objectionable, as besides being conducive to the formation of that abomination black fog, they retard its dispersion, because on a reduction of atmospheric temperature they are condensed and precipitated with the accompanying moisture—forming an oily envelope surrounding the globules of condensed water, which prevents evaporation to a very considerable extent.

The tabulated results show that not only are coal-fires the source of solid and semi-gaseous impurities, but they also discharge a considerable amount of gaseous impurities into the atmosphere—notably that poisonous gas carbon monoxide. A



perusal of the tabulated results can lead to only one conclusion—namely, that by the general adoption of gas as a domestic fuel not only would our atmosphere be rendered more pellucid, but that the evils arising from that abomination black fog would be greatly minimized.

The Royal Commission on Coal Supplies accepted 32 million tons as representing the domestic consumption of coal for the year 1903. As we have shown, fully 75 per cent. of the available heat contained in these 32 million tons of coal is lost; and fully 5 per cent., or 1½ million tons, of unconsumed carbon are annually thrown into the atmosphere, thereby increasing the density of fogs and necessitating untold expense.

CONCLUSION.

We feel assured that, after a careful study of the facts and figures herein presented, the citizens will readily acknowledge that the smoke-producing, wasteful domestic coal-fire must be replaced by the more cleanly, evenly, and healthy gas-fire before we can hope to obtain a purer atmosphere, or even begin in earnest with the work of air purification.

In closing, we beg to acknowledge the services of Mr. T. Cockburn, who, under the directions of the Corporation Chemist, carried out the elaborate series of experiments upon which this report has been based.

APPENDIX I.—Radiation Tests of Gas-Fires.

No. of Fire.	Pressure in Tenths of an Inch.	Consumption in Cubic Feet per Hour.	Area of Fuel in Square Inches.	Height of Galvano- meter in Feet.	Galvanometer Readings.								Common Standard.
					Left.	Centre.				Right.	Total.		
						1	2	3	4			5	
1	17	19.8	84	1	12	17	19	19	10	18	12	116	86
				2	4	4.5	7	8	7.5	5	4	40	
				3	2.5	4	4	4	3.5	2	24		
				4	1	1.5	1.75	2	1.5	1.5	1	10.25	
2	17	22	100	1	12	21	21.5	22	21.5	21	12	131	81
				2	3	6	8	9	8	6	3	43	
				3	2.5	3.5	4	5	4	3.5	2.5	25	
				4	1	1	1.5	2	1.5	1	1	9	
3	16	40	105	1	17	28	38	40	38	27	17	20.5	70
				2	5	10	22	24	23.5	13.5	7	105	
				3	3.5	6	8	10	8.5	6.5	3.5	46	
				4	2	2.5	3.5	3.5	3	2	1.5	18	
4	16	29.8	105	1	18	30	39	40	39	30	18	214	91
				2	15	27	31	34	31	27	15	180	
				3	4	7	10	12	10	7	4	54	
				4	2	3	4	4.5	4	3	2	22.5	
5	16	34	Iron frets	1	26	47	56	60	57	47	25	318	90
				2	19	33	43	47	44	37	20	243	
				3	10	20	26	26	24	17	9	132	
				4	3	3.5	11	13	11	4.5	3	49	
6A	16	33	132	1	25	43	58	70	59	46	25	326	135
				2	25	36	44	49	45	35	24	258	
				3	9	20	25	29	25	21	9	138	
				4	4	7.5	7.5	9	8	7.5	5	48.5	
6B	14	20	..	1	7	16	23	28	23	16	7	120	82
				2	5	15	22	25	23	15	5	110	
				3	5	10	15	17	14.5	10	5	76.5	
				4	4	5	6	7	6	5	4	37	
7A	15	40	108	1	24	47	67	78	65	46	23	350	120
				2	23	36	48	57	48	36	23	271	
				3	12	23	30	34	30	22	11	162	
				4	4	11	17	19	17	10.5	3.5	82	
7B	14	34	Four centre bunsens off	1	24	32	44	51	43	31	23	248	91
				2	20	27	35	42	34	26	20	204	
				3	12	18	25	28	25	18	12	128	
				4	4	10	14	15	14	10	4	71	

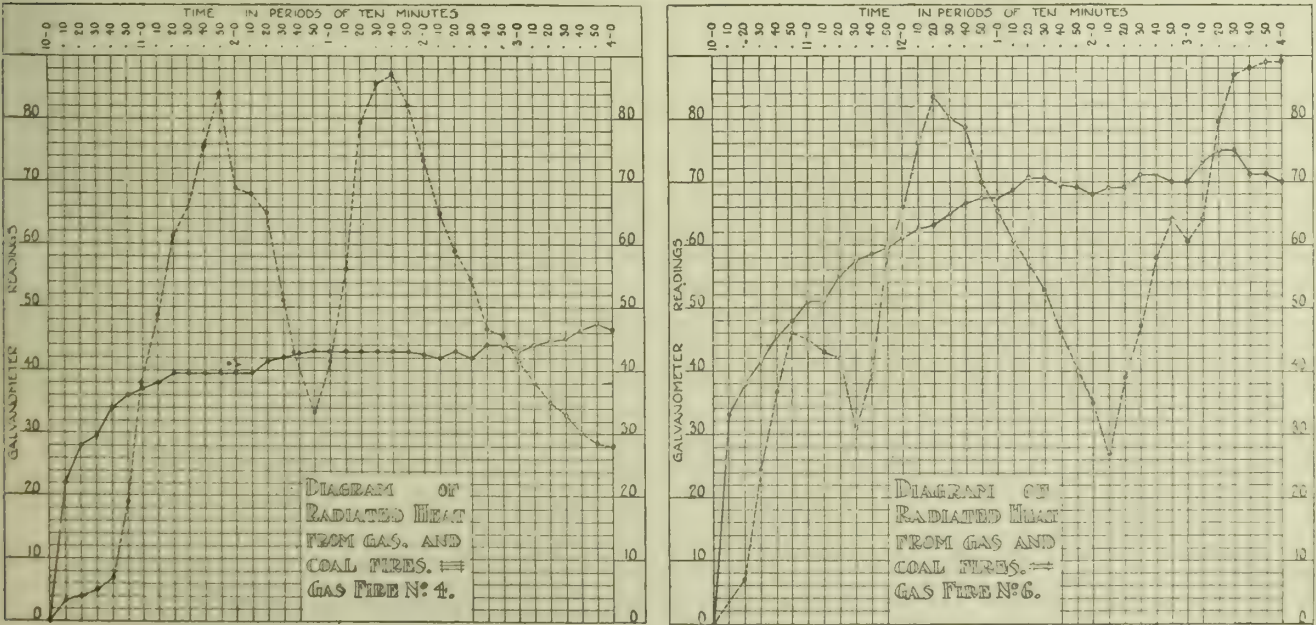
A semicircle 3 feet in diameter was marked off on the floor, with the middle fret of the fire as the centre, and galvanometer readings were taken with the thermopile placed on the semicircle, at a height of 1 foot, and at distances of 1 foot apart, beginning from the left. Seven readings were taken. This was repeated at heights of 2, 3, and 4 feet.

The calorific value of the coal gas as determined was 623 B.Th.U. (gross) per cubic foot. The figures in the last column were obtained from the readings at a height of 1 foot by the formula.

Total readings,  $\times 100 \times 600 \div$  actual consumption,  $\times 623 \times 7$  (number of galvanometer readings).

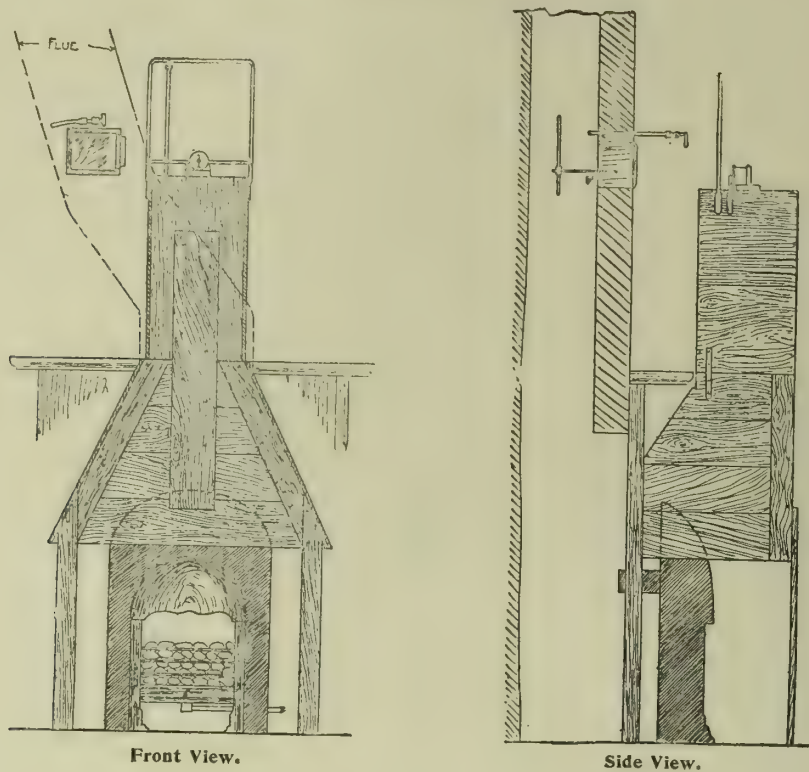
The figures are thus reduced to a common standard of 100 cubic feet consumption of gas with a calorific value of 600 B.Th.U. (gross) per cubic foot.

APPENDIX II.





APPENDIX III.



APPENDIX IV.—Convected Heat from Gas-Fires.

Room.	No. of Fire.	Pressure in Tenths of an Inch.	Gas Consumed in Cubic Feet per Hour.	Total Heat Units Generated per Hour.	Temperature of Air in Degrees Fahr.			Anemometer Reading.	Air passing through Hood per Hour (corrected to 62° F.)		Heat in Air passing through Hood.		Carbon Monoxide. Parts per 100,000.		Carbonic Acid in Percentage.			CO <sub>2</sub> passing up Hood in Cubic Feet per Hour.	Total CO <sub>2</sub> Produced in Cubic Feet per Hour.	Waste Gases Bypassing per Hour.
					At Inlet.	At Outlet.	Difference.		In Cubic Feet.	In Lbs.	B.T.U.'s.	Per cent. of Total.	In Flue Gas.	In Heated Air.	Inlet.	Outlet.	Excess at Outlet.			
1.	2.	3.	4.	5.	6.	7.	8.	8b.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
A	1	17	19.8	12,335	55.2	63.5	8.3	105	6,279	439	874	7	1.6	Nil	.066	.068	.002	0.12	10.29	1.0
B	2	16	21.5	13,394	55.4	73.9	18.5	140	8,210	574	2548	19	1.3	Nil	.059	.060	.001	0.08	11.18	0.8
A	3	17	40.0	24,920	59.9	81.5	21.6	155	8,962	627	3240	13	1.2	Nil	.057	.059	.002	0.17	20.80	0.8
B	4	16	30.0	18,690	61.7	90.8	29.1	160	9,096	636	4441	23	*10.9	Nil	.060	.065	.005	0.45	15.60	2.0
A	5	14	34.0	21,182	61.5	76.8	15.3	155	9,040	633	2324	10	9.8	Nil	.098	.108	.010	0.90	17.68	5.0
B	6	18	33.0	20,559	61.7	83.4	21.7	160	9,217	645	3359	16	2.0	Nil	.156	.195	.039	3.60	17.16	20.0
A	7	12	42.0	26,166	73.4	118.4	45.0	185	10,231	716	7732	29	4.3	2.0	.164	.205	.041	4.20	21.84	19.0
	Ball fuel fire	14	42.0	26,166	55.4	72.0	16.6	100	5,946	416	1657	6	..	Nil	..	..	..	..	..	..

\* Using columnar fuel raised 1½ inches above the bunsens, and adjusting the flame until it was very hard, this figure was reduced to 2.4.

Note, in column 14, if the air of the room be taken as a standard, instead of the outside air, no carbon monoxide was given off by the fires, with the exception of No. 7.

NOTES.

The calorific value of the gas as determined was 623 B.Th.U. (gross) per cubic foot.  
Column 5 is the multiplicand of the above value and column 4.  
Column 6 is the average of the readings of two thermometers at a height of 3 feet from the floor, screened from direct radiation.  
Column 8b was obtained by an average of several anemometer readings.  
In column 9 the volume was reduced to 62° Fahr. (16.6 C.).  
Column 10 was obtained from the factor "1 cubic foot of air weighs 0.07 lb.," using the corrected volume above.

NOTES.

Column 11 is the multiplicand of columns 8, 10, and 0.24 (specific heat of air).  
The sample for CO<sub>2</sub> (column 15) was taken in the same position as for the ingoing temperature; that in column 16 was taken 6 inches below the top of the hood.  
Column 18 was obtained from columns 9 and 17.  
Column 19 is obtained by multiplying the figure in column 4 by 0.52 (the CO<sub>2</sub> produced by the combustion of 1 cubic foot of gas).  
Column 20 is the percentage ratio of columns 18 and 19.

APPENDIX V.—Convected Heat from Coal-Fire.

Time.	Temperature in Degrees Fahrenheit.			Anemometer Reading.	Air passing through Hood per Hour (corrected to 62° Fahr.).		Heat in Air passing through Hood.	
	In Room.	At Top of Hood.	Difference.		In Cub. Ft.	In Lbs.	B.Th.U.'s.	Percentage of Total.
10.30 a.m.	53.6	56.3	2.7	67	4064	284	185	
11	55.0	62.6	7.6	90	5392	377	691	
11.30	54.7	59.5	4.8	80	4821	337	388	
12 noon	56.3	65.8	9.5	108	6431	450	1026	
12.30 p.m.	58.1	67.6	9.5	100	5934	415	946	
1	60.0	69.4	9.4	103	6091	426	961	
1.30	58.3	68.3	10.0	98	5807	406	974	
2	57.2	63.5	5.3	75	4486	314	391	
2.30	57.2	61.7	4.5	70	4200	294	307	
3	58.4	67.9	9.5	104	6169	432	985	
3.30	60.6	70.6	10.0	108	6374	446	1050	
4	60.2	77.9	17.7	102	5938	415	734	
							8661	2.3

Note. Total weight of coal used, 28 lbs. Calorific value = 7417, equivalent to 13,350 B.Th.U.'s per lb. of coal.



APPENDIX VI.—Flue Heat from Gas-Fires.

Room.	No. of Fire.	Gas Consumed in Cubic Feet per Hour.	Pressure in Tenths of an Inch.	Total Heat Units Generated per Hour.	Temperature in Degrees Fahrenheit.			Anemometer Reading in Flue.	Waste Gases passing up Flue (corrected to 62° F.).		Heat Carried Away in Waste Gases.	
					In Room.	In Flue.	Difference.		In Cub. Ft.	In Lbs.	B.Th.U.'s.	Percentage of Total.
1	2	3	4	5	6	7	8	9	10	11	12	13
A	1	19.8	17	12,335	55.2	86.9	31.7	150	6,440	450	3,768	30
B	2	21.5	16	13,394	55.4	104.0	48.6	192	7,993	559	7,063	52
A	3	40	17	24,920	59.9	117.5	57.6	350	14,181	992	14,858	59
A	4	30	16	18,690	61.7	190.5	28.8	230	9,810	686	5,136	27
A	5	34	14	21,182	61.7	105.8	44.1	190	7,884	551	6,317	29
A	6	33	18	20,559	61.7	118.4	56.7	170	7,050	493	7,267	35
A	7	42	13	26,166	73.4	93.2	41.8	210	8,913	623	6,770	26
H	Ball fuel fire	42	14	26,166	55.4	127.4	72.0	290	11,592	811	15,182	58

Taking the area of the chimney flue as  $\frac{3}{4}$  square foot, column 10 is obtained by multiplying column 9 by ( $\frac{3}{4} \times 60$ ), and then bringing to a temperature of 62° Fahr. (16°6' C.). The calorific value of the coal gas, as determined, was 623. Column 11 is the multiplicand of column 10 and 0.07 (weight of 1 cubic foot of air). Column 12 is the multiplicand of column 8, column 11, and 0.26 (specific heat of waste gases).

Note.—In gas-fire No. 7, when the air shutters of the back of the fires were closed, the anemometer reading in the flue was only 30 feet per minute, and the temperature was 132.8 Fahr. The carbon monoxide in the flue was 8.1 parts per 100,000, and at the top of the hood 4.6 parts per 100,000. The carbon dioxide in the room at 4 p.m. was at inlet of hood 0.217 per cent., and at top of hood 0.256 per cent.

APPENDIX VII.—Flue Heat from Coal-Fire.

Time.	Temperature in Degrees Fahrenheit.			Anemometer Reading in Flue.	Waste Gases passing up Flue per Hour (corrected to 62° Fahr.).		B.Th.U.'s in Waste Gases passing away.
	In Room.	In Flue.	Difference.		In Cub. Ft.	In Lbs.	
10.30 a.m.	53.6	179.6	126.0	450	16,519	1156	37,870
11	55.0	122.0	67.0	380	15,331	1073	18,691
11.30	54.7	131.0	76.3	410	16,290	1140	22,615
12 Noon	56.3	185.0	128.7	510	18,565	1399	46,813
12.30 p.m.	58.1	222.8	164.7	520	17,880	1251	53,570
1	60.0	210.2	150.2	460	16,158	1131	44,167
1.30	58.3	143.6	85.3	480	18,670	1307	28,986
2	57.2	93.2	36.0	400	16,979	1188	11,119
2.30	57.2	150.8	93.6	480	18,452	1291	31,417
3	58.4	185	126.6	490	17,836	1248	41,078
3.30	60.6	167	106.4	510	19,098	1336	36,959
4	60.2	167	106.8	510	19,098	1336	37,098

APPENDIX VIII.—Comparative Heating Value and Humidity Tests of Gas and Coal Fires.

The corresponding rooms were aired all night, and the temperature taken in the morning 15 minutes after the windows had been closed. The fires were then lit simultaneously, and the temperatures recorded by wet and dry bulb thermometers; No. 1 being situated 5 feet from floor, and No. 2 at the ceiling. The fires were replenished simply as they would be in a house—that is, a certain quantity of coal was put on, allowed to burn until the fire was dying down, when a fresh quantity was added. The humidity is expressed as the ratio of the amount of water actually in the air to the amount which would be necessary to saturate it at the observed temperature, this "saturation quantity" being taken as 100.

Test No. 1.

GAS-FIRE No. 1.										COAL-FIRE.										
Room.	Time.		Pressure in Tenths of an Inch.	Gas Consumption in Cubic Feet per Hour.	Thermometer Readings.						Room.	Time.		Coal Used.	Thermometer Readings.					
					5 Feet above Floor.			At Ceiling.							5 Feet above Floor.			At Ceiling.		
					Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.					Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.
A	10	a.m.	16	20	38	36	83	38	36	83	C	10	a.m.	{ 7 lbs. sticks }	39	36	77	40	37	76
	10.30	"	"	"	39	37	84	40	37	76		10.30	"	..	42	38	72	41	38	77
	11	"	"	"	42	39	78	43	40	78		11	"	..	45	41	72	45	41	72
	11.30	"	"	"	42	39	78	43	40	78		11.30	"	7 lbs. more	47	43	73	47	43	72
	12 noon	"	"	"	43	40	78	44	41	77		12 noon	"	..	47	43	73	47	42	67
	12.30 p.m.	"	"	"	44	41	77	45	42	78		12.30 p.m.	"	7 lbs. more	48	43	67	48	43	67
2	"	"	"	"	45	42	78	45	42	78		2	"	..	52	45	59	51	45	63
2.30	"	"	"	"	46	43	79	46	43	79		2.30	"	..	53	46	59	51	45	63
3	"	"	"	"	47	44	79	47	44	79		3	"	..	52	45	59	51	45	63
3.30	"	"	"	"	47	44	79	47	44	79		3.30	"	..	52	45	59	51	45	63
4	"	"	"	"	47	44	79	48	44	73		4	"	..	51	45	63	51	45	63

Test No. 2.

GAS-FIRE No. 2.										COAL-FIRE.										
B	11	a.m.	15	22	39	37	84	39	37	84	D	11	a.m.	{ 7 lbs. 1 lb. sticks }	39	37	84	39	37	84
	11.30	"	"	"	41	39	84	42	40	85		11.30	"	"	43	40	78	42	39	78
	12 noon	"	"	"	44	41	77	45	42	78		12 noon	"	7 lbs.	45	42	78	45	42	78
	12.30 p.m.	"	"	"	44	41	77	45	42	78		12.30 p.m.	"	"	45	42	78	44	41	77
	2.30	"	"	"	48	44	73	50	45	68		2.30	"	7 lbs.	47	44	79	47	43	73
	3	"	"	"	48	44	73	50	45	68		3	"	"	46	43	79	45	42	78
	3.30	"	"	"	49	45	73	51	46	68		3.30	"	"	50	45	68	51	45	63
	4	"	"	"	50	46	74	53	47	64		4	"	"	52	47	69	53	48	69
	5	"	"	"	51	46	68	53	48	69		5	"	"	51	46	68	53	48	69

Test No. 3.

GAS-FIRE No. 3.										COAL FIRE.										
A	10	a.m.	14	Thermometer Readings.						C	10	a.m.	{ 7 lbs. 1 lb. sticks }	Thermometer Readings.						
				36	42	39	78	42	39					78	44	40	71	44	40	71
	10.30	"	"	"	45	42	79	46	43	79		10.30	"	7 lbs.	46	42	73	46	42	73
	11	"	14	35	50	46	74	53	48	69		11	"	"	48	43	67	48	43	67
	11.30	"	"	"	52	48	74	55	49	65		11.30	"	"	51	46	68	50	45	68
	12 noon	"	15	32	54	49	69	57	51	65		12 noon	"	10 lbs.	52	47	69	52	46	64
	12.30 p.m.	"	"	"	55	50	70	59	52	61		12.30 p.m.	"	"	53	48	69	53	47	64
1	"	"	"	"	56	51	70	59	52	61		1	"	"	54	48	64	54	47	59
1.30	"	"	"	"	57	51	65	60	53	62		1.30	"	4 lbs.	56	49	60	56	48	50
2.30	"	"	"	"	58	52	66	61	53	58		2.30	"	7 lbs.	57	49	57	57	48	53
3.30	"	"	"	"	59	53	66	62	54	58		3.30	"	"	60	51	54	60	50	50
4	"	"	"	"	59	53	66	62	54	58		4	"	"	62	52	50	61	51	50



Test No. 4.

GAS-FIRE No. 4.										COAL-FIRE.									
Room.	Time.	Pressure in Tenths of an Inch.	Gas Con- sumption in Cubic Feet per Hour.	Thermometer Readings.						Room	Time.	Coal Used.	Thermometer Readings.						
				5 Feet above Floor.			At Ceiling.						5 Feet above Floor.			At Ceiling.			
				Dry Bulb.	Wet Bulb.	Humi- dity.	Dry Bulb.	Wet Bulb.	Humi- dity.				Dry Bulb.	Wet Bulb.	Humi- dity.	Dry Bulb.	Wet Bulb.	Humi- dity.	
B	10 a.m.	15	29.8	43	41	84	45	42	78	D	10 a.m.	{ 7 lbs. 1 lb. sticks }	43	41	84	44	41	77	
	10.30 "	"	"	46	44	86	47	44	79		10.30 "	..	45	42	78	45	42	78	
	11 "	"	"	51	47	74	52	48	74		11 "	7 lbs.	47	45	86	49	45	73	
	11.30 "	"	"	53	48	69	55	49	65		11.30 "	..	49	45	73	50	45	68	
	12 noon	"	"	54	49	69	57	51	65		12 noon	7 lbs.	52	48	74	53	48	69	
	12.30 p.m.	"	"	56	50	65	58	52	66		12.30 p.m.	..	54	50	74	53	48	69	
	1 "	"	"	56	50	65	59	52	61		1 "	..	56	50	65	56	50	65	
	2 "	"	"	59	53	66	62	64	58		2 "	7 lbs.	56	50	65	57	50	61	
	2.30 "	"	"	60	54	66	63	55	59		2.30 "	..	56	50	65	56	49	60	
	3 "	"	"	61	54	62	63	55	59		3 "	3 lbs.	56	50	65	56	49	60	
	4 "	"	"	62	55	62	64	55	55		4 "	..	61	54	62	62	53	54	

Test No. 5.

GAS-FIRE No. 5.										COAL-FIRE.										
A	10	a.m.	15	35	50	48	86	50	48	86	C	10	a.m.	{ 10 lbs 1 lb. sticks }	51	49	86	51	49	86
	10.30	"	15	36	52	50	86	53	50	80		10.30	"	..	54	51	80	54	51	80
	11	"	"	"	56	52	75	57	53	75		11	"	10 lbs.	57	53	75	57	53	75
	11.30	"	"	"	58	54	76	60	55	71		11.30	"	..	58	53	71	58	53	71
	12	noon	"	"	59	54	71	60	55	71		12	noon	..	59	53	66	59	53	66
	12.30	p.m.	"	"	61	56	72	62	56	67		12.30	p.m.	10 lbs.	62	55	62	62	55	62
	1.30	"	"	"	63	57	67	65	58	63		1.30	"	..	65	56	55	64	55	55
	2	"	"	"	64	57	63	65	58	63		2	"	..	67	58	56	67	57	52
	2.30	"	"	"	64	57	63	66	58	60		2.30	"	7 lbs.	65	57	59	65	56	55
	3	"	"	"	65	58	63	67	58	56		3	"	..	65	57	59	65	56	55
	3.30	"	"	"	66	58	60	67	58	56		3.30	"	..	67	57	52	66	56	52
	4	"	"	"	67	59	60	68	59	56		4	"	..	68	58	52	67	57	52

Test No. 6.

GAS-FIRE No. 5 (WITH VARYING GAS CONSUMPTION).										COAL-FIRE.										
A	10	a.m.	16	38	49	47	86	49	47	86	C	10.15 a.m.	{ 14 lbs. 1 lb. sticks }	50	48	86	50	48	86	
	10.30	"	"	"	52	50	86	56	52	81		10.45	"	"	52	48	74	52	48	74
	11	"	"	"	56	52	81	60	54	66		11.15	"	"	56	51	70	56	51	70
	11.30	"	"	"	58	54	76	62	55	62		11.45	"	"	59	52	61	59	52	61
	12	noon	"	"	60	54	66	63	56	63		12.15 p.m.	14 lbs.	61	54	62	61	54	62	
	12.30 p.m.	"	"	"	61	55	67	64	56	59		12.45	"	"	60	53	62	60	53	62
	1	"	"	"	63	55	59	65	57	59		1.15	"	"	60	53	62	60	53	62
	2	"	"	"	67	59	60	70	60	53		2.15	"	"	62	55	62	62	55	62
	2.30	"	14	29	67	59	60	71	61	53		2.45	"	7 lbs.	62	55	62	62	55	62
	3	"	"	"	67	59	60	70	60	53		3.15	"	"	64	56	59	64	56	59
	3.30	"	"	"	66	58	60	69	59	53		3.45	"	"	66	57	56	66	57	56
	4	"	"	"	66	58	60	69	59	53		4.15	"	"	66	53	42	66	53	42

Test No. 7.

GAS-FIRE No. 6.										COAL-FIRE.										
B	10	a.m.	13	33	Thermometer Readings.						D	10	a.m.	{ 10 lbs. 1 lb. sticks }	44	42	84	44	42	84
					44	42	84	44	42	84										
	10.30	"	"	"	49	46	79	50	47	80		10.30	"	7 lbs.	47	44	79	48	44	73
	11	"	"	"	54	50	74	55	50	70		11	"	..	49	46	79	50	46	74
	11.30	"	"	"	57	52	70	59	52	61		11.30	"	..	53	49	74	54	48	64
	12	noon	13	30	58	53	71	60	53	62		12	noon	8 lbs.	55	50	70	57	50	61
	12.30	p.m.	"	"	60	54	66	61	55	67		12.30	p.m.	5 lbs.	56	50	65	57	50	61
	1.30	"	"	"	63	56	63	64	56	59		1.30	"	..	62	53	54	64	54	51
	2	"	"	"	64	57	63	66	57	56		2	"	7 lbs.	63	55	59	65	55	51
	2.30	"	"	"	65	58	63	66	57	56		2.30	"	..	62	54	58	64	54	51
	3	"	14	26.5	66	58	60	68	58	52		3	"	3 lbs.	65	55	51	68	56	46
	3.30	"	"	"	67	59	60	68	58	52		3.30	"	3 lbs.	66	56	52	68	56	46
	4	"	"	"	68	59	56	69	60	56		4	"	..	67	57	52	69	57	47

(Note.—A strong cold draught was blowing in at windows and doors.)

Test No. 8.

GAS-FIRE No. 6 (WITH VARYING GAS CONSUMPTION).										COAL-FIRE.									
B	10.15 a.m.	18	35	48	45	79	48	45	79	D	10.15 a.m.	{ 8 lbs. 1 lb. sticks }		47	44	79	47	44	79
												6 lbs.	51						
10.45	"	"	"	52	48	74	54	49	69	10.45	"	6 lbs.	51	47	74	53	48	69	
11.15	"	"	"	57	52	70	58	52	66	11.15	"	"	54	49	69	55	49	65	
11.45	"	16	32.5	59	53	66	60	53	62	11.45	"	7 lbs.	58	52	66	60	52	58	
12.15	p.m.	"	"	61	54	62	61	54	62	12.15	p.m.	"	59	52	61	61	52	54	
12.45	"	"	"	63	55	59	64	55	55	12.45	"	10 lbs.	62	54	58	64	54	51	
1.45	"	"	"	65	57	59	66	57	56	1.45	"	"	63	54	55	64	54	51	
2.15	"	16	21.5	66	57	56	67	57	52	2.15	"	"	66	56	52	68	56	46	
2.45	"	"	"	67	57	52	69	58	50	2.45	"	7 lbs.	67	58	56	68	58	52	
3.15	"	"	"	68	58	52	70	59	50	3.15	"	"	69	58	50	71	58	44	
3.45	"	"	"	70	60	53	70	59	50	3.45	"	"	70	58	47	72	58	42	
4.15	"	"	"	70	60	53	72	60	48	4.15	"	"	70	58	47	72	58	42	



Test No. 9.

GAS-FIRE No 7.										COAL FIRE.									
Room.	Time.	Pressure in Tenths of an Inch.	Gas Consumption in Cubic Feet per Hour.	Thermometer Readings.						Room	Time.	Coal Used.	Thermometer Readings.						
				5 Feet above Floor.			At Ceiling.						5 Feet above Floor.			At Ceiling.			
				Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.				Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.	
A	10 a.m.	14	42	45	43	85	45	43	85	C	10 a.m.	{ 7 lbs. sticks }	45	44	92	47	45	86	
	10.30 "	"	"	50	48	86	54	50	74		10.30 "	7 lbs.	47	46	93	50	46	74	
	11 "	"	"	58	53	71	62	55	62		11 "	"	49	47	86	52	47	69	
	11.30 "	12	25	52	56	67	66	58	60		11.30 "	10 lbs.	51	49	86	55	49	65	
	12 noon	"	"	63	57	67	66	57	56		12 noon	"	51	51	80	58	51	61	
	12.30 p.m.	"	"	63	57	67	66	57	56		12.30 p.m.	3 lbs.	58	52	66	59	52	61	
	2 "	"	"	64	57	63	67	57	52		2 "	7 lbs.	59	52	61	60	53	62	
	2.30 "	"	"	64	57	63	67	57	52		2.30 "	"	60	52	58	61	53	58	
	3 "	"	"	64	57	63	67	57	52		3 "	"	61	53	58	63	54	55	
	3.30 "	"	"	65	58	63	68	58	52		3.30 "	3 lbs.	63	54	55	65	55	51	
	4 "	"	"	65	58	63	68	58	52		4 "	"	64	54	51	66	55	48	

This fire (No. 7) was provided with three taps at the bottom. At 11.30 a.m. one of the taps was screwed down, and the consumption lowered to 25 cubic feet per hour.

REGISTER OF PATENTS.

Gas Manufacture.

MEUNIER, S., of Stockport.

No. 23,263; Oct. 31, 1908.

This invention—relating to “the production of gas by the distillation of coal in gas-retorts, and the collection of the gas by means of a hydraulic main, and the usual scrubbers for delivery into a gasholder”—is fully dealt with on p. 29 of this week’s issue of the “JOURNAL.”

Laying Pipes to a Desired Gradient.

LOCKHART, J. M., and JENKINSON, H. J., of Pendleton.

No. 25,224; Nov. 24, 1908.

This invention relates to an appliance devised to facilitate the laying of pipes to a desired fall or gradient—similar to the “Gradiograph” described in last week’s “JOURNAL,” p. 890.  
The patentees claim: (1) A self-contained instrument, combining a spirit level, a longitudinally arranged and graduated scale attached to the part carrying the level, shiftable scale influencing means acting on the longitudinally arranged scale, and a lockable casing—the scale and its influencing means being contained within the lockable casing.  
(2) In an instrument for the indicated purposes, the combination of a swivelling spirit level, a longitudinally arranged and graduated scale, and a travelling cursor moving on the scale, with or without means for minutely adjusting the cursor.

Gas-Burners of the Automatic Lighting and Governing Type.

GOZZARD, A., of Sheffield.

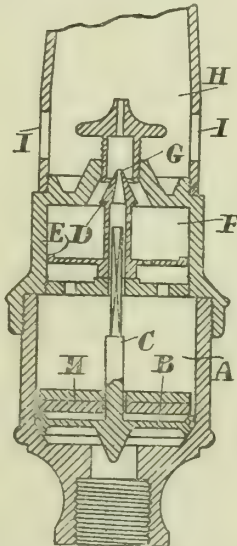
No. 1671; Jan. 23, 1909.

This invention relates to a burner which regulates the supply of gas as the pressure in the main varies. The patentee claims to be able to so adjust the valves that, beyond regulating the supply to maintain a constant illuminating power within a considerable range of pressure, he can also, with burners constructed for use in street-lamps and the like, so adjust the burner, by the addition or removal of small weights in the form of discs on the main valve, that when the night pressure is reduced at daybreak the main jet at the burner is extinguished, leaving only the pilot light, and so that when the night pressure comes on the valve again opens and the illuminating jet is relighted—all movements being effected automatically.

In the lower part of the burner shown is a cylindrical valve-chamber A (which also acts as a gas-reservoir), large enough to carry a piston valve B, of sufficient area to be actuated by the lowest range of working pressure. The valve is provided with several projecting lugs on its upper face, which fit the interior of the reservoir and steady the valve when it rises off its seat, and also ensure its return directly on to its seat. On the upper part of this valve is a spindle or stalk C, long enough, when the valve is on its seat and closed, to extend upwards into the stalk or body of a small cylindrical conical ended valve D, provided with flanges E, to fit as a piston in the cylindrical lower portion F of an upper cone-ended valve-chamber formed in the cover of the main valve-chamber, which also forms the seat for the last-named valve. A hole G is provided in the apex of the cone-shaped end of this small valve, which communicates with a larger central orifice in the apex of the cover previously referred to, through which the supply of gas is conducted to the mixing-chamber H of the burner—air inlets I being formed in this mixing-chamber in the usual way. The upper part of the spindle of the main valve may be made square or triangular, so as to provide a passage for gas along the flattened surfaces so formed, into the interior of the body of the small valve, so that when this valve is forced upwards on to its seat by the action of the increased pressure on the main valve, the gas will pass through the central orifice of this small valve into the larger central orifice previously referred to—the

orifice in the smaller valve being large enough to supply the requisite amount of gas for a full-sized jet at high pressure.

The action of the burner is as follows: When a slight increase above day pressure comes on, the gas causes the main valve B to rise from its seat, when sufficient gas is admitted into the chamber A to supply a jet of normal power. In this condition the main valve has not risen high enough to lift the governing valve D on to its seat, and sufficient area is therefore left round the outside of the governing valve and through the centre of it to supply the larger central orifice in the apex of the small valve-chamber of the main valve-chamber, whence the gas passes through the mixing-chamber H to the jet. As the pressure increases, the conical-ended



Gozzard's Automatic Lighting Governor.

valve D is gradually forced upwards on to its seat, and the gas then passes into the interior of the small valve between it and the flattened surfaces on the stalk or spindle of the main valve, and through the central orifice into the larger central orifice, and thence through the mixing-chamber to the jet, as before. Subsequently, as the pressure is gradually reduced, the small conical valve first drops from its seat, and, as the pressure is further reduced to the ordinary day pressure, the main valve drops on to its seat, and the jet is then automatically extinguished.

By the simple adjustment of weights K, in the form of discs, placed above the main valve, the burner can be adapted to street-lamps or for indoor use, and by forming a thread in the central orifice in the cover of the valve-chamber, and introducing into it a screwed plug with a central orifice and a valve-seat at its lower end (so that when the valve E lifts it fits into the seat on the lower end of the screwed plug instead of the seat in the cover), the lift of the valve can be varied and regulated.

Automatic Gas Lighting and Extinguishing Apparatus.

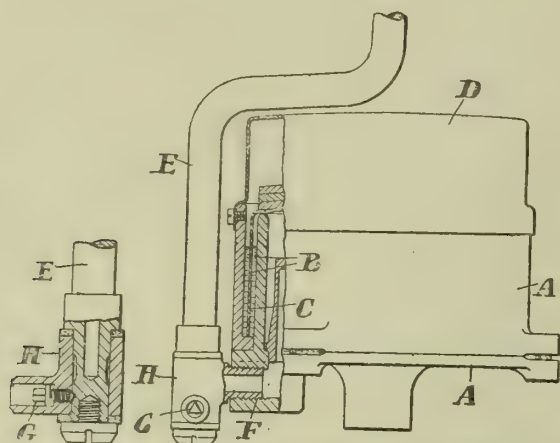
ANDERSON, J., of New Grange Works, Edinburgh.

No. 3190; Feb. 9, 1909.

The object of this invention is to provide automatic gas lighting and extinguishing apparatus with locking means, to prevent successful tampering; also to prevent dust having access to the mercury seal. It consists in forming the up-pipe to the burner with a swivel, and bending it into close proximity with the top of a cover which closes the device, and providing the up-pipe with locking means, so that when the pipe is in its normal position it is impossible to remove the cover.

There is provided a vessel A, having a mercury seal B, and a bell C





Anderson's Locking Arrangement for Automatic Lighting Apparatus.

operated by gas pressure and actuating a step-by-step valve or other device (not shown) whereby the gas to the burner is controlled—the mechanism being preferably enclosed within the bell, as described in patent No. 19,039 of 1905. Projecting within the vessel may be provided guiding means for the bell, which is protected by a cover D, overlapping the mercury seal, and thereby preventing access of dust to the seal. The up-pipe E is swivelled to the burner at its junction with the gas-exit F from the vessel A, and is provided with any suitable means for locking it in position.

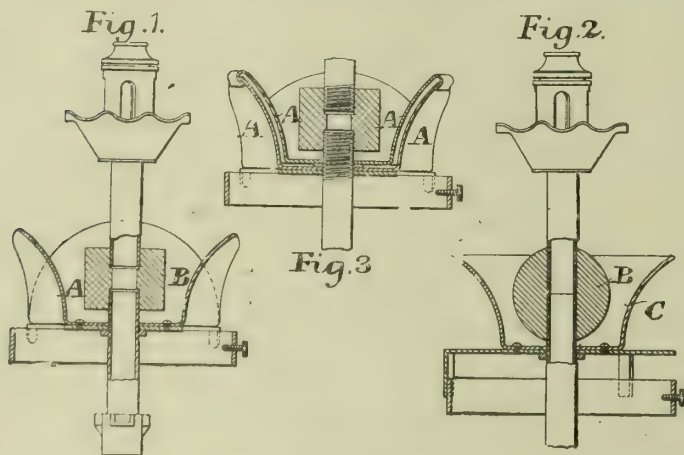
These means may consist of a stud G, screwed into the part H of the swivel joint attached to the vessel, and arranged to screw into recesses I formed in the up-pipe to the burner. The stud can be made with any desired shape of head and placed in a recess, so that only a key having a similar shaped end and long enough to reach to the end of the recess can engage with the stud to lock or release the up-pipe. The up-pipe is bent into close proximity to the cover of the vessel, so that when it is locked in its normal position over the cover it is impossible to remove the latter and so gain access to the interior of the apparatus. When, however, the up-pipe is unlocked and moved away from the cover, easy access to the interior of the apparatus is possible.

### Inverted Incandescent Gas-Burners.

TURNER, A., of Amersham.

No. 3859; Feb. 16, 1909.

This inverted incandescent gas-burner is so constructed that the heat imparted to the nozzle or lower part of the burner-tube is not communicated to the mixing-chamber, although the use of insulating material is dispensed with altogether—that is to say (as regards the burner-tube, the deflecting cone, and the burner tip or nozzle), the burner-tube is provided intermediate between its ends with a projecting "body of very considerable bulk or dimensions of heat absorbing and radiating material in conductive connection with the burner-tube."



Turner's Inverted Gas-Burner.

In all the figures of the illustration, the burner-tube, the nozzle at the lower end of the tube, the ring for supporting the globe, the mixing-chamber provided with air admission holes and a gas-nipple, and the shield secured below, and partly surrounding, the air admission holes of the mixing-chamber, are of well-known construction.

In fig. 1, however, the burner-tube is provided at an intermediate portion of its length and above the disperser A with a mass B of heat absorbing and radiating material in conductive connection with the burner-tube, and made not only of a size which is exteriorly of very much greater diameter than the outside of the burner-tube, but also of considerable depth. The upper and lower sections of the burner-tube are screwed into the mass, which consists of a nut of cylindrical or drum shape.

In fig. 2, the mass B is of bulbous form; and the disperser consists of a flat plate secured by lugs to the globe-supporting ring which carries a mask C for hiding the mass.

In fig. 3, two dispersers are used, each consisting of a flat base and a number of upwardly and outwardly bent wings separated from one another, except at their upper edges. In this case, the lower disperser is of ceramic substance, while the upper one is of metal, and serves as a protector for the lower disperser.

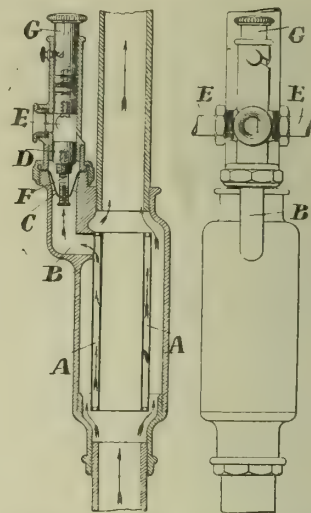
By providing a burner-tube formed of good heat-conducting material intermediate between its ends with a mass of conducting and radiating material, the patentee says that it is possible to superheat the lower end of the burner-tube. "The same effect cannot possibly be obtained if the burner-tube is provided with a number of projecting ribs or discs, for he has found that these ribs do not exercise a cooling effect on the burner-tube, but attract the heated air rising from the burner tip or nozzle."

### Temperature Regulators for Gas-Heaters.

RAMASSOT, M., of Lyons, France.

No. 10,215; April 29, 1909. Date claimed under International Convention, March 3, 1909.

The automatic temperature regulators for gas-heaters according to this invention are shown in the engraving.



Ramassot's Gas-Heater Regulator.

The apparatus is mounted on a chamber intercalated at a convenient point in the piping conducting the water from the heater. In it is an annular reservoir A containing an expansible liquid (such as glycerine or a mixture of glycerine and distilled water) and communicating with the channel of the casting B. The liquid contained in A takes the temperature of the water, and in expanding or contracting it acts on a cupped membrane C made of rubber, and causes a vertical movement of a piston D for governing the supply of gas. The piston is of cylindrical shape, and slides in a tube traversed at a right angle by a pipe E conducting the gas to the burners. The orifice of the pipe is proportionally reduced by the plug as the temperature of the water goes up in the water-pipes. An initial regulation of the plug is obtained by varying its position on the rod F which connects it to the cupped membrane. The gas supply can be initially regulated by blocking the orifice of E. For this purpose, in the tube above the orifice is a simple plug G, having a screw passing through a helicoidal slot in the wall of the tube. It is sufficient to turn the plug in one direction or the other to cause it to rise or descend and mask more or less the orifice of E. The course of the plug is calculated so that in the lowest position the piston does not completely close the orifice of E, and, consequently, does not entirely cut off the gas supply to the burners. Further, a screw is arranged which slightly projects below the bottom of the plug G and prevents the complete cutting off of the gas at the time of the rise of the plug D. The screw can be regulated according to the minimum consumption of gas required.

### Coking and Gas Generating Ovens.

KOPPERS, H., of Essen-Ruhr, Germany.

No. 12,363; May 25, 1909.

This invention relates to coking and gas generating ovens of the type wherein gas is burnt in heating flues in the walls separating the oven-chambers, and wherein the air for combustion and the products of combustion traverse flues below the chambers. The invention relates, in particular, to the arrangement of the gas-ducts by means of which the several heating flues are fed, and to the means whereby access is had to the flues and gas-ducts for cleaning purposes.

The invention substantially consists in feeding the heating flues by vertical channels, which are coaxial with the several flues and extend directly through the flue-supporting walls from longitudinal gas-channels extending through the walls. The patentee says he finds that with this arrangement the gas traversing the ducts is adequately preheated by the adjacent flues traversed by the products of combustion; and the arrangement has the advantage that the structure is less weakened than if the gas is fed from a single main into a heating chamber extending through the furnace. Another advantage is that by providing apertures in the oven-roof, above the heating flues, access can be had to the gas-ducts by means of a bar inserted from above through the flue.

### Jointing Pipes.

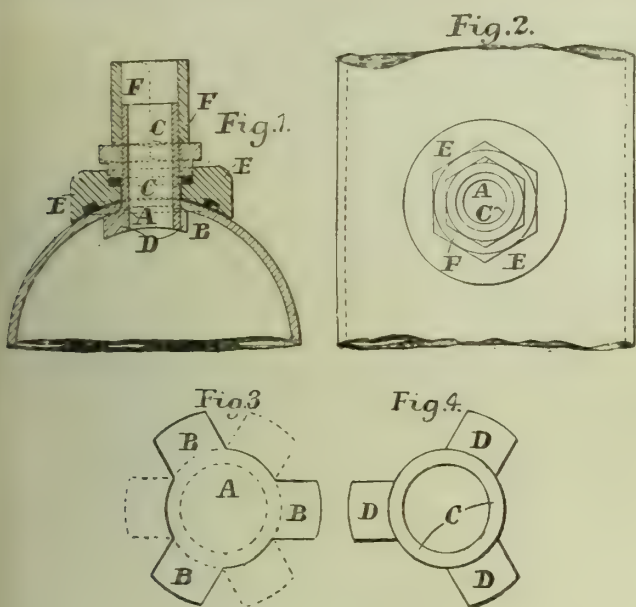
STEWART, J. G., of Glasgow.

No. 13,997; June 15, 1909.

This invention relates principally to the method of connecting branch pipes to main pipes, by means of flanges formed on the branch pipe and entered through correspondingly shaped openings in the main pipe.

Fig. 1 is a transverse sectional elevation of a main pipe fitted with the means referred to for connecting a branch pipe thereto. Fig. 2 is a





Stewart's Pipe-Joint.

plan. Fig. 3 is a plan of a portion of the main pipe with the fittings removed and formed with an opening of a certain shape. Fig. 4 is a further detail.

An orifice A is made in the pipe at the point where it is desired to connect a branch pipe. The orifice may be circular with any desired number of radial parts or sections B of the circle cut away in its circumference (as shown), or it may be square or triangular. Through the orifice there is passed a short pipe connection C formed with flanges at one end and with screw threads from its other end and for the greater part of its length. There are three parts (in fig. 3) cut away from the circumference of the orifice, or (as shown by fig. 4) there are three flanges D formed on the end of the pipe connection—that is, the flange at the end of the pipe connection would be of the same shape as the orifice and of a slightly smaller size, so as to pass through it. After the end of the pipe connection formed with the flanges is inserted into the orifice A, it is given part of a turn so as to take up the position shown by the dotted lines in fig. 3. A circular plate or cover E, formed with a recess and a hole or passage, is placed around the pipe connection. The plate is of such a size as to cover the orifice; and lead or other packing is fitted (preferably in a groove) between it and the main pipe. A nut is screwed on to the pipe connection so as to enter the recess of the plate E, and packing is fitted between the bottom of the recess and the nut. The surfaces of the plate E next the main pipe, are formed of the same contour as the pipe itself; so that the nut will secure the plate and the pipe connection to the main pipe. A tubular connection F is now screwed on to the pipe connection, and to this connection the branch pipe is screwed.

#### APPLICATIONS FOR LETTERS PATENT.

- 29,672.—COX, F. J., "Production of air gas." Dec. 18.  
 29,693.—BURBACH, E. W., "Ferro-concrete reservoirs." Dec. 18.  
 29,718.—TWEEDALE, C. L., "Chimneys and globes." Dec. 20.  
 29,720.—PRESTON, J. N., "Gas-governor." Dec. 20.  
 29,752.—EVANS, E. V., "Purification of gas." Dec. 20.  
 29,778.—DAPINE, E., "Generation of gas from liquid hydrocarbons." Dec. 20.  
 29,798.—CLUDERAY, E. S., "Pressure-recording apparatus." Dec. 20.  
 29,872.—BAILEY, F. J., "Preparing pipes for jointing." Dec. 21.  
 29,930.—FABRY, R., "Removing tar from gas." Dec. 22.  
 29,948.—NEMEROVSKY, J. M., EVERETT, L. C., and NEMEROVSKY, F., "Inverted mantles." Dec. 22.  
 29,972.—HEAD, WRIGHTSON, AND CO., LTD., and WRIGHTSON, T. G., "Combined plant for conveying and treating coke." Dec. 22.  
 30,002.—GIORGI, A., "Inverted gas-lamps." Dec. 22.  
 30,058.—PATERSON, R. H., and GREIG, F. W., "Valves and cocks." Dec. 23.  
 30,060.—MELHUISH, A. G., "Gas-pressure raisers or gas-making apparatus." Dec. 23.  
 30,066.—FALK STADELMANN, AND CO., LTD., and ELLIOTT, G. W., "Incandescent burners." Dec. 23.  
 30,131.—GUEST, A. A., and GIBBONS, W. P., "Discharging and charging gas-retorts." Dec. 24.  
 30,148-9.—UNRUH, M. VON, "Incandescing bodies." Dec. 24.  
 30,162.—SCHLÖSSER, C., "Automatic gas-valve." Dec. 24.  
 30,198.—JOHNSON, J. Y., "Valvular arrangements for controlling the flow of gases from coal-distilling retorts." A communication from Maschinen und Armaturenfabrik vorm. H. Bruer and Co. Dec. 24.  
 30,229.—BOULT, A. J., "Utilization of natural gases." A communication from Albrecht von Groeling. Dec. 24.  
 30,235-6.—SHANKS, J., "Valves." Dec. 24.

**Gas Coal Contracts of the Manchester Corporation.**—By their contracts, the Gas Committee of the Manchester Corporation are favourably fixed as to prices and supplies of coal up to August next. When, in September, they placed orders for 400,000 tons, the purchases were made at a saving of more than £13,000 compared with the preceding year. In the following month, when the Railway Companies were considering coal contracts, the prices were on the basis of an extra 6d. per ton.

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### Air-Testing of Gas Plant.

SIR,—Dr. R. Lessing has done good service in calling attention, in his letter in the "JOURNAL" for Dec. 21 (p. 823), to the advantages of employing a more or less inert gas, such as flue gas, in place of air for the testing of new gas plant. He might, I think, at the same time have re-called attention to the extensive use to which flue gases were put for the displacement of air (prior to the admission of coal gas) from practically the whole of the new plant and new distributing system of the Municipal gas undertaking of Vienna in 1899. You shortly afterwards described in your columns the procedure followed on that occasion [see "JOURNAL," Vol. LXXVIII., p. 1657].

A similar precaution is even more necessary when new acetylene plant is being brought into use, owing to the much wider range of composition over which mixtures of air and acetylene are explosive, as compared with mixtures of air and coal gas. In the text-book on "Acetylene," by the late Mr. F. H. Leeds and myself, which was published in 1903, the use of chimney gases for the expulsion of the air from the plant and mains prior to the introduction of acetylene was recommended with large installations. I believe the plan has been followed in some cases.

66, Victoria Street, S.W., Dec. 24, 1909.

W. J. A. BUTTERFIELD.

### Cost of Air-Gas Lighting.

SIR,—I would like to call attention to what appears to be a glaring mistake in the communicated article "Air-Gas Lighting," in the last number of the "JOURNAL." Under the heading "The Safety of Air-Gas," and half-way down that section, the costs are given; and it says that 1000-candle power per hour can be got for a cost of 1s. 4d. Further down it is claimed that this cost is considerably less than that for coal gas, electric light, &c. Work out this cost on a basis of 20 candles per cubic foot (which is a very low estimate of efficiency), and you will find that this figure would require to be  $\frac{1}{3}$  to substantiate the writer's claim.

Dec. 30, 1909.

INSPECTOR.

## LEGAL INTELLIGENCE.

### RATING OF LIVERPOOL WATER-WORKS.

A case in which the Liverpool Corporation were the appellants, and the Chorley Union Assessment Committee and the Overseers of the Withnell Union were the respondents, and which raised a new question in regard to the rating of water-works, recently came before the Magistrates at the Preston Quarter Sessions.

Mr. MACMORRAN, K.C., and Mr. OULTON appeared for the appellants; Mr. RYDE, K.C., and Mr. GORDON HEWART for the respondents.

Mr. RYDE explained that this was in substance a test case to determine whether the Corporation were liable to be rated at all for the gathering-ground of their water-works, and, so far as a general principle could be laid down, on what principle the ground was to be valued. Originally some seventeen items were to be appealed against; but sixteen had been struck out, leaving the first item. By agreement, the sole question had been left as to whether the land used as gathering-ground was assessable; and, if so, to what amount. The assessment in dispute was £1165; and they were concerned with only 1100 or 1200 of the 10,000 acres acquired. To preserve the purity of the water, the Corporation reduced the number of inhabitants by amalgamating farms, and had also started a very extensive system of planting, in order to prevent the soil being washed away in times of heavy rainfall. They had erected some four miles of fencing, and endeavoured to keep the public off the moorland. In some parts, too, they had put in water channels and pipes to collect the water; and he submitted that, as a matter of law, these acts would constitute the Corporation the owners and occupiers of the land in question. They asked the Court to say that £1 per acre was a fair value to place on the acreage with which they were concerned.

Evidence having been given, Mr. MACMORRAN said the case was certainly one of the most extraordinary that had arisen, and it sought to assert a principle which, if recognized, would lead to the most extraordinary results all over the country. He wished to emphasize the fact that legal possession was not equivalent to occupation. The Corporation were in legal possession of the ground, and though they could maintain trespass against any person who came unlawfully on it, this was not occupation. He submitted that the mere enclosure of property did not amount to rateable occupation. Counsel added that the principle sought to be established there would work almost a revolution in the law of rating if his friend succeeded in establishing that the turning off of trespassers by an owner constituted an act of occupation. He wished further to emphasize the fact that no one was employed to control the land. If the Bench accepted this view, the rate of £1165 would have to be substantially reduced to such value (which was a small figure) as they would put on the plantations and nurseries.

Evidence having been given by Mr. RYDE (of Messrs. Ryde and Sons) and Mr. Joseph Parry, M.Inst.C.E., the appellants' Water Engineer, in order to show that there were no acts of occupation in connection with the ground,

Mr. RYDE replied that the value of the land as a gathering-ground far exceeded its value as mere pasture or farm land. If it was found that the respondents could only assess the plantations, he asked that



they should not be limited to the prairie value, but to the value of them for the growing of timber and also for the collection of water. Occupation consisted of a number of rights all taken as a whole; and in this case it was no answer for his friend to take one right out of half-a-dozen and say that by itself it did not amount to occupation.

Mr. MACMORRAN said, presuming the Bench found that there was rateable occupation, he contended that the land was not worth £1 an acre per annum. This was based on an all-round figure of £45 an acre; but the price paid was only £20 16s. 8d. an acre.

Judgment was reserved; Counsel intimating that whatever might be the decision they would ask the Magistrates to state a case.

A Bogus Gas Department Employee.

At the Huddersfield Borough Police Court, Walter Lyons, a canvasser, was charged with obtaining 9d. by false pretences from Ann Potter and 4½d. from Mary Wood. In the first case, prosecutrix said that on Dec. 13 prisoner came to the house saying he was from the Huddersfield Gas-Works, and that he was advertising mantles made by the Gas Department. He was asking 9d. each; but if purchased elsewhere, they would cost 9½d. If the mantles broke within two years, she could have another free of charge from the department. Witness purchased one for 9d. Florence Rowe, manageress for an incandescent gas-fitting dealer, said that from time to time during the last twelve months prisoner had purchased mantles at the shop. She had sold him mantles similar to the one produced at 1s. 6d. per dozen. Mr. J. Crosland, Chief Clerk in the Gas Department of the Corporation, said prisoner had no connection with the department; and, further, they did not deal in mantles. In the second case, the prosecutrix gave evidence that prisoner called saying he was from the gas-works. There had been, he said, innumerable complaints at the works from consumers in respect of mantles; but he had with him some which the Gas Department guaranteed for two years; and if they broke within that period those who had purchased them could go to the office and have them replaced free of charge. Witness bought for 4½d. a mantle for which prisoner said she would have to pay 9d. at certain shops. The Chief Constable remarked that there had been six convictions for false pretences against the prisoner from August, 1904, to April, 1909. Prisoner pleaded guilty, and was sentenced to six weeks' imprisonment in each case, the terms to run consecutively.

Illegally Removing a Gas-Meter.

At the Tottenham Police Court last Thursday, Mr. Charles Gordon, of Rosebery Gardens, Harringay, was summoned by the Tottenham and Edmonton Gas Company for disconnecting a gas-meter without giving notice of his intention to do so, and also for detaining the meter, which was valued at £1 10s. Mr. C. Williams, who appeared for the Company, explained that the defendant entered into occupation of the premises, which the Company were already supplying with gas. They did not know he was there until some time afterwards, when he complained that the meter was not working properly. A new one was supplied, and defendant was called upon to sign the usual contract, which was forwarded to him. He returned the document, saying it was unreasonable, and that it would be against public policy for him to sign it. He was notified that, unless he signed it, the meter would be taken away. He did not do so; and when the Company's servants went to the house, he refused to admit them. They, however, obtained entrance, and then found that the meter had been disconnected. The defendant declined to say where it was. Evidence bearing out this statement having been given, the defendant said he was under no contract with the Company. He found the meter at the house, and used it. The Company took away the first meter with money in it, for which he had not had sufficient gas. He had asked for the return of the money, but had not received it; and he was suing the Company for it. These proceedings were the outcome of that action on his part. The Clerk pointed out that as defendant was a consumer he had no right to disconnect the meter without notifying the Company. It was not a question of contract. Mr. Williams said the Company sent the first meter to be tested, and directly they received the certificate they paid into Court the money claimed by the defendant. It was only 5d. The Bench imposed a fine of 10s. and costs on the first summons. The second was dismissed, as the Court were not satisfied with the evidence that a demand was made for the meter. The defendant said he would appeal; and the Clerk told him he would have to enter into a surety of £50 if he intended doing so.

Reduction in Price at Winsford.—Members of the Winsford (Cheshire) Urban District Council, at their last meeting, had again under discussion the question of reducing the price of gas. The matter was debated at length; and, in the end, a resolution was adopted reducing the price from 3s. 3d. to 3s. per 1000 cubic feet. When the Council acquired the works in 1901, the price of gas was 4s. 2d. per 1000 cubic feet, and each succeeding reduction has brought with it a considerable increase in consumption. This fact was made much of by the advocates on the Council for cheaper gas.

Gas Labourer's Tragic Death.—A labourer employed at the Brierfield (Lincs.) Gas-Works was found in an unconscious state lying in the retort-house, and died later at the Infirmary. At the inquest, it was stated that the deceased, along with a fitter, was working on the top of the retort-stack, and had occasion to go for a tool which the fitter required. As he did not return, the fitter went in search of him, and discovered the man lying unconscious in the retort-house. The man was removed to the Infirmary, where it was ascertained that he had been badly burned on the left side. Deceased had to cross over the retort-stack by planks; and it was suggested at the inquiry that he must have slipped, and, alighting on the back of his head, was rendered unconscious, and therefore unable to call for assistance. As smoke was rising from the stack at the time, the fitter would not be able to see what happened. In returning a verdict of "Accidental death," the jury recommended that a handrail be constructed on the retort-stack for the safety of the workers.

MISCELLANEOUS NEWS.

SALE OF GAS BY PREPAYMENT METERS.

Interesting Report from Edinburgh.

The Edinburgh and Leith Gas Commissioners had before them on Monday last week a further report by Mr. W. R. Herring, the Engineer and Manager, upon the supply of gas by the prepayment meter system; additional information having been received since the issue of Mr. Herring's report of the 25th of June last, which was given in the "JOURNAL" for July 20 (p. 195).

In his former report, Mr. Herring states, he pointed out that there are 56,906 small consumers, using on an average 10,250 cubic feet, and 11,881 prepayment consumers, with an average use of 5500 cubic feet. The costs of administration are necessarily at per consumer; and as the prepayment consumer burns only one-half the gas, this would alone involve greater expense than in an ordinary case. As a matter of fact, owing to the more frequent reading of the meters and the collection of the money on the spot, the actual cost to the Commissioners, as supplied to Mr. Herring by the collectors' department, was 3'76d. per 1000 cubic feet of gas greater than it was for ordinary consumers. In other words, the prepayment system cost 4'7d. for surveyors, rental- ledger clerks and collectors, and loss by stealing; and as the average for the ordinary consumer was only 0'94d., he had deducted this sum from the 4'7d., making it 3'76d. The increased capital outlay involved further expenditure of 1s. 8d., or 3'63d. per 1000 cubic feet of gas sold. This was made up by the fact that a prepayment meter cost 16s. 7d. more than an ordinary meter, upon which 10 per cent. for interest, depreciation, and maintenance, amounted to 1s. 8d., and on a consumption of 5500 cubic feet, equalled 3'63d. more than it cost in the case of an ordinary consumer. The meters were more complicated, and necessitated more frequent attention, they required more frequent adjustment, and were more often put out of gear through bent coins or tokens being inserted instead of pennies. This was represented by an additional charge of 2s. per consumer, to which he had added the extra cost for repairing the meter when sent to the makers, which in the case of an ordinary meter amounted to 7s., and in that of a prepayment meter to 11s. each; thus making a grand total of 12'2d. per 1000 cubic feet in excess of what it cost to supply a consumer by the ordinary means. No allowance had been made for the fact that they were required to lay a service-pipe for a prepayment supply, which was used to only half the extent that it would be in the case of an ordinary small consumer.

Mr. Herring communicated with meter makers and gas managers upon the subject of the conversion of ordinary 2-light and 3-light dry meters into prepayment meters, and submitted the result of his inquiries in the accompanying table:—

	Average Consumption by Prepayment Meter.	Ordinary Rate for Gas.	Prepayment Rate for Gas.	Increase.	Increase per Cent.
	Cubic Feet.	s. d.	s. d.	s. d.	
Edinburgh . . . .	5,500	3 0	4 2	1 2	38'80
Glasgow . . . . .	7,416	2 0	2 7	0 7	29'16
Manchester . . . .	9,077	2 3	2 9	0 6	22'20 (a)
Birmingham . . .	14,500	1 10½	2 6	0 7½	33'30 (b)
Gaslight and Coke Co.	13,950	2 5	3 1	0 10	34'40 (c)
Newcastle . . . .	11,341	2 0	2 10	0 10	41'60 (d)
Bradford . . . . .	..	2 1	2 11	0 10	40'00 (e)
Leeds . . . . .	12,400	2 2	2 8	0 6	23'00 (f)
	(with cooker)				
South Metropolitan Co.	..	..	..	..	(g)
Croydon . . . . .	17,150	Rates same; have system of winding on.			
					(h)

REMARKS.

- (a) Never converted ordinary to prepayment meters.
- (b) Found it more profitable to buy new prepayment meters than convert.
- (c) Never converted ordinary to prepayment meters.
- (d) Never converted ordinary to prepayment meters. All prepayment consumers new.
- (e) Do not encourage prepayment meters. Have system of landlord responsibility. Have found it unnecessary to convert.
- (f) Converted a few; practice found disadvantageous, and was discontinued.
- (g) Have converted some hundreds of three lights, and find the practice satisfactory. Thorough overhaul, and repair and convert at 60 per cent. of price of new prepayment meter.
- (h) Only experimented with conversion; have given up prepayment meters.

The report proceeds: The question at issue is as to whether the Commissioners can sell gas by the prepayment system at a cheaper rate than is at present charged—viz., 1s. 2d. per 1000 cubic feet over and above the ordinary lighting rate—without placing an additional burden on ordinary consumers. In my report of June 25, I have set forth the extra expense incurred in supplying gas by this system, and on these data have expressed the opinion that the 1s. 2d. in excess of the present rate is not more than is justified by the circumstances.

In the event of a reduction in the price being made, are there any grounds for the fears expressed in my report of the 25th of June as to the Commissioners having returned on their hands a large number of ordinary meters which would require to be scrapped? The experience of Glasgow may be mentioned. Glasgow commenced to fix prepayment meters in earnest in the year 1906. They then had 231,184 ordinary meters, and 11,100 prepayment meters. In 1909, they had 225,422 ordinary meters, or 5762 less, and 43,900 prepayment meters.

Can the ordinary meters that would be displaced by prepayment meters be converted to the prepayment system? There are at present 32,791 two-light meters, which cost to-day 21s. 3d. each, and 24,115 three-light meters, which cost to-day 25s. 6d. each. I have already stated



that, in my opinion, this cannot be done, as it amounts to spending at a minimum 20s. to 21s. on each meter, which originally cost 21s. 3d. and 25s. 6d. each respectively, in order to convert it to the prepayment type, which now, with stopcock, lock, stamping fee, &c., complete, cost 36s. 9d., and does not make any allowance for possible repairs to the meter itself, which, in view of the fact that they will average fifteen years old, is almost inevitable when once the old meter is opened up. In Glasgow, they have commenced to convert their three-light meters for the following reason:—"As the number of ordinary meters was being reduced, I did not like the idea of having to scrap them." As far as I can ascertain, no other undertaking is following such a practice; and the meter makers themselves do not recommend it.

In view of the fact that the increased cost per prepayment meter has its origin in the extra cost of the apparatus, meter reading, and collection, &c., this necessarily decreases in proportion to the quantity of gas consumed; but it amounts to the same per individual consumer, whether the consumption is 1000 or 10,000 cubic feet.

If the sliding-scale is adopted which forms the conclusion of my report of the 25th of June, it will have the effect of reducing the price of gas by this system in proportion to the consumption, and is founded on the basis of 20 cubic feet of gas for 1d. up to 5000 feet, and a rebate of 1d. for every additional 1000 feet. Thus a consumer of 10,000 feet per annum would get a rebate of 5d. per 1000 feet, which amounts to a deduction of 4s. 2d. from his annual bill; the rebate being payable to the consumer at each May term for the previous twelve months.

Consideration of the report was postponed to a future meeting of the Commissioners.

## THE FATAL FIRE AT CLAPHAM JUNCTION.

### The Origin of the Fire.

The inquiry into the circumstances attending the fatal fire which occurred on the premises of Messrs. Arding and Hobbs, at Clapham Junction, on the 20th ult., which was opened by Mr. John Troutbeck at the Battersea Coroner's Court on the 23rd ult., and adjourned for a week, was resumed last Thursday.

Among the representatives of the various interests concerned who were in attendance were Mr. J. J. WASHINGTON, for the South Metropolitan Gas Company, and Mr. P. CAUDWELL for the Battersea Borough Council, who supplied the electricity employed on the premises.

Evidence was given by Mr. Benjamin Pemberton, the Counting-House Manager, to the effect that, when the fire occurred, he was in the restaurant with Mr. Herbert Arding, the son of the proprietor, and they were first alarmed by all the electric lights going out. There was only electric light in the restaurant; but there was gas in the rooms above. On approaching the scene of the outbreak, witness saw a flash under an electric light reflector; and at the same time a volume of smoke came through from another room.

Mr. Herbert Arding stated that about a month before Christmas they had two gas-lights in the window where the outbreak occurred; but the pendants were taken down and plugged up by their own experienced gas-fitter, and an electric installation was put in. They intended, however, to restore the gas-lights after Christmas. There were about 40 electric lights in the window, and the current was supplied from a different main from that which served the restaurant. The electric installation was put in by Messrs. Holmes and Cooper, and though the firm (Messrs. Arding and Hobbs) desired the work done speedily, they insisted that it should be done thoroughly; and he believed it was carried out under the Phoenix Fire Office rules, which were very strict. Notice was given to the Borough Council to fix the meter and connect the main.

George Lansdell Sander, an assistant window dresser at the window where the outbreak occurred, said he was in the act of removing a Venetian necklace which was suspended in the front of the window by a wire when he heard an explosion which seemed to come from below where he was standing. He was on the shop floor, and reaching into the window. Witness explained that he meant that the sound came from the window below him as he was reaching over. He thought the explosion took place about the middle of the window. The cotton wool with which the window was lined flared up, and he tried to beat out the flames with his hands. His impression was that an electric globe exploded; but he did not know that anything fell on the globe. The globes were not resting on cotton wool, but were 3 inches above it. Pressed as to why he thought a globe blew out, witness said that when he worked at another establishment he once heard a similar noise, and a globe, larger than the one in question, blew out, but the light went out directly it exploded. There were some celluloid and other combs in the front of the window. Questioned by a juror, witness could not say whether the electric light in the window went out after the explosion.

Robert Hutchings said he dressed the window where the outbreak occurred. It was covered with a layer of cotton wool, and was arranged in three tiers. The electric lights ran along the top of the highest tier, and were 9 inches from the wool, while the celluloid combs were in the bottom of the window; and he thought it quite impossible for one of them to have come in contact with the electric light. Witness was in and out of this particular window every day, and at no time had observed anything to suggest an escape of gas. He had had previous experience of electric globes exploding. Once when he was employed in an establishment at Pimlico a globe exploded; but there was no fire. It would not, however, have been a metallic filament lamp, like those used by Messrs. Arding and Hobbs. He had not any experience of an explosion with a metal lamp. He had seen a good many glass globes break and fall on cotton wool without catching fire.

Mr. F. W. BIDDLE, representing Mr. Arding, said that on a future occasion evidence would be called as to the behaviour of metallic filament lamps.

In further examination, witness said it was quite usual to set out show goods in close proximity to electric lamps. He remembered a case at Streatham where a suspended electric lamp came in contact

with a fur, and set it on fire. The electric lights in the window he dressed for Messrs. Arding and Hobbs were rigidly fixed on iron shoulders, and he believed no flexible wire was used; but there were pendant lights hanging at the top of the window.

In reply to the CORONER, witness said there were many ways in which the fire might have occurred; but he could not say which was the most probable. Pressed to name some of the ways, witness said the electric wires might have fused.

The CORONER: You suggest that?

Witness: That is as probable as anything else.

The CORONER: Not by a gas explosion?

Witness: There is a possibility that a wrong lamp was put in.

The CORONER: You cannot think of anything else?

Witness replied in the negative.

The inquiry was then adjourned until Jan. 4 (to-day).

## THE AUSTRALIAN COAL STRIKE.

### Effect on the Gas Supply of Sydney.

A copy of the issue of the "Sydney Morning Herald," dated Friday, Nov. 26, which came to hand yesterday morning, contains, as would naturally be expected, a great deal of information with regard to the deplorable coal strike, the effects of which have been so widespread; and among other things, there are the following statements with regard to the gas supply.

Mr. R. J. Lukey, the Secretary of the Australian Gaslight Company, stated during an interview yesterday [Nov. 25] that the Company only had coal supplies sufficient to last three weeks; and he could not say where they would get any fresh supplies. At the end of that period, unless something unforeseen occurred, the works would have to be closed down, and 1100 men thrown out of employment. "I think we can run for three weeks more," Mr. Lukey said. "The Board are very sorry that the Company cannot extend the mains or services, or supply any new consumers during the currency of the strike. Such a course would not be fair to the present consumers."

The Australian Gaslight Company consume from 3300 to 3500 tons of coal a week. Their present rate of consumption is the lower figure. There are 1100 men in the employ of the Company, the whole of whom will be thrown out of work in the event of the gas-works closing down. There are also a large number of incidental trades that would be affected. The Sydney works have been running for over seventy years; and the present outlook appears more serious than any that has occurred for a long time.

Mr. Morland, the Manager of the North Shore Gas Company, said on the same day that the Company had between three and four weeks' stock of coal. He did not know whether any further coal would be available.

It will be remembered that in last week's "JOURNAL" there was a paragraph to the effect that the Railway Companies furnished a supply of coal to the North Shore Gas Company; but unfortunately it turned out to be unsuitable for making gas. The result was that the district was in darkness on Monday night (Dec. 20), to the great inconvenience of everybody. According to a telegram dispatched on the following day, a supply of coal from the Western district was expected in two days; and a telegram dated Dec. 23 brought the news that the supply of gas had been resumed.

## THE CALCUTTA LIGHTING CONTRACT.

### Suggestions by Mr. Mansfield.

The new contract with the Oriental Gas Company for the public lighting of Calcutta having now been sanctioned by the Government, a discussion has been proceeding with regard to the Lighting Department. In this connection, Mr. Alfred Mansfield, who has been advising the Corporation all through, has made the following suggestions for completing the scheme for the lighting of the city.

1.—A general survey of the public lights in Calcutta should be made, and instructions given for the alteration of their positions when they are found to be on one side of the road only.

2.—The positions of some of the lights do not appear to have been selected with due regard to efficiency and economy, and should be altered.

3.—Each lamp should be provided with a consecutive number. This is very important, in order to make sure of the correct number in use, and to identify lamps readily.

4.—In my opinion, a plan should be prepared, to a large scale, showing the positions and consecutive numbers of all the public lights in Calcutta. As it is probable that lights of different powers will be used, it will be convenient to indicate these by several circles, one inside the other, or by some other convenient method. For instance, a 40-candle power light might be indicated by one circle, a 60-candle power light by two circles, &c.

5.—A general survey of the pressures at all points should then be taken during the hours of public lighting, and when the private consumption is heaviest, in order to ascertain the minimum pressure which may be expected at any lamp. These pressures should be marked on the plan in different colours; so that, when completed, the whole plan will show at a glance any unevenness of pressure. If on completion the plan is not found to be satisfactory, owing to great unevenness of pressure, steps should be taken to insist on the Gas Company using every endeavour to distribute the pressure evenly. I need hardly point out that this work must be entrusted to someone who has an intimate knowledge of the subject, and who can make certain that the pressure at the gas-works, or conditions which occur owing to fluctuations of private lights, do not lead him into recording incorrect pressures. It is reasonable to expect that no pressure will be higher than 3 inches; and in accordance with the terms of the contract no pressure must be less than 2 inches.



6.—I recommend that pressures should be taken to the nearest tenth of an inch; a separate colour being used on the plan for (say) each tenth of an inch between 2 and 3 inches. When a final plan has been prepared and agreed to by the Gas Company, these pressures will be accepted as pressures it is possible to maintain for an extended period and at which tests of the consumptions of nipples will be made.

7.—Having finally settled the plan of pressures, the next step is to ensure that these pressures are maintained. For this purpose, positions must be selected for fixing recording pressure-gauges to the best advantage. This will necessitate some careful consideration. Each recording pressure-gauge should be an index of the pressure of a considerable number of lamps. For instance, it will be found that a pressure-recorder fixed in a certain position indicating a pressure of  $2\frac{1}{2}$  inches shows that every lamp within a certain area is getting not less than 2 inches. If nipples are tested and gas paid for at these pressures, care must be taken that the penalties are exacted for any fall of pressure on the recorder below  $2\frac{1}{2}$  inches. A table of penalties will be prepared in connection with each pressure-recorder. For the convenience of the Accounts Department, the effect of a reduction of pressure by each tenth of an inch at each pressure-recorder would be converted into rupees for the purpose of recovering penalties due from the Gas Company.

8.—It is proposed to provide and fix 8000 new lanterns in Calcutta. Tenders for these were advertised for in England, and estimates and samples by the leading lamp makers are now in Calcutta. A selection from these should be made, as soon as possible, in order to ensure their erection in time for the new contract.

9.—The selection of suitable burners is a most important matter. Tenders were advertised for in England; and samples and quotations from leading manufacturers are now in Calcutta. These should be tested in the new gas testing laboratory, which is now complete. The Gas Committee can then decide the size and type of burners which will be used in the various positions in Calcutta.

10.—After all these preliminary arrangements have been made, it will be necessary to consider who will be responsible for the faithful carrying out of the whole scheme. This should fall to the lot of a Lighting Department. It is necessary to decide whether this department will be entrusted to the Gas Company, as in the past, or whether it will be advisable to establish a Municipal Lighting Department, as is done in England. It must be remembered that, even if you decide to entrust the Lighting Department to the Gas Company, it will still be necessary to maintain a certain staff to ensure the due fulfilment of the terms of the contract, both in the laboratory and outside. The present and past lighting of Calcutta, as carried out by the Gas Company, will not, I think, encourage you to hope for anything better in the future. Unless they can prove to your satisfaction that they will provide a much better staff, and system, for this important work than in the past, I do not think that you have any alternative but a Lighting Department.

11.—Should you decide to establish such a department, I think you will find the following of interest. I have endeavoured to give figures for each item which are in excess of the actual requirements.

12.—The items to be considered in connection with the public lighting of Calcutta are as follows: A.—The supply of 9000 new lanterns. B.—The cost of painting and repairing lanterns and posts. C.—The supply of burners and replacements. D.—The cost of lighting, extinguishing, and cleaning lamps. E.—The cost of renewing mantles, rods, and chimneys. F.—The cost of supervision and establishment. G.—The cost of gas.

Item A.—In their original tender, it was thought that the Gas Company agreed to supply 9000 new lanterns each costing Rs. 55 if the contract was arranged for twenty years; but I now think that this was not the case in their reduced tender. I suggested, and you have agreed, that it is not necessary to provide more than 3000 lanterns at present. The remainder can be replaced in the future. I proposed, however, to assume that all the 9000 lanterns will be changed at once, as this will show the estimate in the most unfavourable light. The cost of the new lanterns and burners, according to the quotations and samples now with you, should not exceed Rs. 40 each, and Rs. 3,60,000 for the 9000 lanterns. Interest and sinking fund at 5 per cent. will require an annual payment of Rs. 18,000 under this head.

Item B.—The cost of painting and repairing the lamp-posts and lanterns will be amply met by an allowance of Rs. 1.8 per annum for each light, or a total of Rs. 13,500 per annum.

Item C.—The cost of burners will probably be between Rs. 2 and Rs. 3 each. In order to allow an ample margin, I propose to allow twelve annas per light per annum for depreciation of burners, or a total of Rs. 6750 per annum.

Item D.—This item consists chiefly of labour; but a small amount must be added for materials for lighting and cleaning. The number of lamps which a man can light and extinguish is generally controlled by the time allowed for lighting. This is about an hour. Lamp-lighters in England light, clean, and extinguish and exchange mantles in from 90 to 120 lamps. I propose, however, to fix an average of 50 lights for each lamplighter. In addition to this, I suggest that you provide ten special men whose sole duty shall be the renewal of mantles. As each mantle is calculated to last for one month, each man will replace 900 mantles per month. The pay of the lamplighters I suggest should be an average of Rs. 12 per month each, and that of the mantle renewers Rs. 20 per month each. There would be 180 lamplighters required, and (say) 10 extra men in case of sickness. The cost of Item D would therefore be as follows: 190 lamplighters at Rs. 12 per month, Rs. 2280; 10 mantle renewers at Rs. 20, Rs. 200; materials for lighting, &c., (say) Rs. 50—total cost of Item D per month, Rs. 2530; total cost per annum, Rs. 30,360.

Item E.—The cost of mantles, mantle-rods, and glassware is dependent on the quality. The mantles at present used by the Gas Company are of inferior quality, and can be supplied to you at half the cost I propose to allow in this estimate. The Gas Company state that the average life of their mantles is one month. The better quality mantle will have a longer life; but I propose to allow one mantle per month, or Rs. 3.12 per annum, for each light for renewal of mantles, mantle-rods, and glassware—or a total of Rs. 33,750 per annum.

Item F.—I suggest that the lighting area be divided into four sections,

each having its headquarters at the district offices of the Corporation. There should be four overseers at Rs. 60 per month each, and four supervisors at Rs. 150 per month each. These men will be responsible for the supervision of the lamplighters, the issuing of new mantles, and receipt of old mantles (which are worth Rs. 7-8 per pound), the care of pressure-recorders, &c. It will also be necessary to place a capable man in charge of the laboratory, who will make tests and see the conditions of the contract are faithfully fulfilled. In addition to this, he must be capable of undertaking outdoor work, the general supervision of the lighting, and the tabulating of all the records and accounts from the various districts. This laboratory assistant must be a superior well-paid man. In addition to this, it is advisable that supreme charge should be given to a responsible official of the Corporation. He should be familiar with instruments of precision, and have had experience in laboratory work. He should be able to understand and appreciate the difficulties of distributing gas over an extended area, and rigidly enforce the penalty clauses of the contract when desirable. Your Chief Engineer (Mr. MacCabe), who has been associated with me in all my work in connection with the new contract, is, in my opinion, eminently capable of undertaking this work. He has an excellent knowledge of the subject, and is skilful in the laboratory. As it is probable you will desire to debit the Lighting Department with a portion of this official's salary, I propose to make an allowance for the official, laboratory assistant, and expenses, of Rs. 15,000 per annum. In order that you may be satisfied that the whole department is working in the most efficient manner, that records are being accurately kept, instruments in perfect order, lights working at their best, and no excess of gas being paid for, I suggest that you should allow a sum of 100 guineas per annum for the fee of an independent expert to investigate and report fully once a year on the working of the whole system. The total cost of this item will therefore be: Four overseers at Rs. 60 per month, Rs. 2880; four supervisors at Rs. 150 per month, Rs. 7200; proportion of official's salary, for laboratory assistant, &c., Rs. 15,000; expert report, Rs. 1525—total Rs. 26,605.

Item G.—In arranging the burners for the lighting of Calcutta, I suggest that the average consumption should be  $3\frac{1}{2}$  cubic feet per hour. This is the quantity which is considered reasonable in English towns. The total consumption of 9000 lights burning for 3914 hours per annum each, consuming on an average  $3\frac{1}{2}$  cubic feet per hour, would be 123,291,000 cubic feet, which, at Rs. 2.8 per 1000 cubic feet, would cost Rs. 3,08,227.8.

#### SUMMARY.

The total cost of lighting Calcutta in the liberal manner I have now described will therefore be as follows: Item A.—New lanterns, Rs. 18,000. Item B.—Painting and repairs, Rs. 13,500. Item C.—New burners, Rs. 6750. Item D.—Lighting, cleaning, and extinguishing, Rs. 30,360. Item E.—Mantles, mantle-rods, and glasses, Rs. 33,750. Item F.—Supervision and establishment, Rs. 26,605. Item G.—Cost of gas, Rs. 3,08,227. Total, Rs. 4,37,192.

In connection with this subject, I asked the Directors of the Oriental Gas Company to quote their price for lighting, cleaning, and extinguishing the lamps. They stated in a letter dated Sept. 7, 1909, and addressed to me in England, that their price would be annas 12 per lamp per month. I asked whether a lamp meant a single light, as in some cases there were two lights to each lamp. They replied that their price would be annas 12 per lamp whether single or double lights, provided the Corporation would exempt them from payment of municipal rates and taxes. I do not think that you will entertain such an offer, because annas 12 per light per month, or Rs. 9 per light per annum, for 9000 lights would amount to Rs. 81,000 per annum for Item D only. This compares very unfavourably with the price at which I estimate the Corporation can do the work in a much more efficient manner.

In a note appended to this report, by the Chairman of the Special Gas Committee, some slight modifications of the scheme are suggested, as the result of which the cost would work out as follows.

*Non-Recurring Expenditure.*—First year, 3000 lanterns, Rs. 1,20,000. The following six years, 1000 lanterns a year, Rs. 40,000 a year, Rs. 2,40,000. Total, Rs. 3,60,000.

*Recurring Expenditure.*—B.—Painting and repairing, Rs. 13,500. C.—New burners, Rs. 6750. D.—Lighting, cleaning, and extinguishing, Rs. 31,800. E.—Mantles, mantle-rods, and glasses, Rs. 33,750. F.—Supervision and establishment, Rs. 27,655. G.—Cost of gas, Rs. 3,08,227. Total, Rs. 4,21,682.

#### SMOKELESS FUEL IN GLASGOW.

At a Meeting of the Gas Committee of the Corporation of Glasgow on Friday, Dec. 24, there were submitted for inspection two samples of coke, the results of recent experiments at the gas-works in connection with the production of a smokeless fuel for domestic purposes. The nature of the samples was explained by Mr. A. Wilson, the Gas Engineer. One was that of coke which had been treated with certain chemicals in the retort. The use of these chemicals, it was stated, improved the quality of the coke, and made it more suitable for household use, as it kindled quickly, and no clinker was formed. The other sample was ordinary coke which had been cooled without the application of water. It had been tested in an ordinary fire, and was found to kindle easily, with the customary incentive of sticks and paper. It burned brightly, yet without flame, and sent out a good, radiating heat. It is believed that the use of coke such as both experiments produced would do much to mitigate the black smoke nuisance.

The Gas Committee viewed the results of the experiments with much interest, and agreed to remit to a Sub-Committee and the General Manager to inquire into, and report on, any process of gas making which would produce a form of coal residue that might be available for use in ordinary domestic grates.

The Committee also agreed to a proposal that a Committee be appointed to arrange for a series of lectures in various halls throughout the city, for the purpose of demonstrating what can be attained by the most recent and improved appliances for the utilization of gas for domestic lighting and cooking.



## AN AMALGAMATION CELEBRATION.

## Gaslight and Coke—West Ham Concert.

On Saturday evening, the amalgamation of the West Ham Gas Company with the Gaslight and Coke Company was appropriately commemorated by a concert which was given by the combined prize bands of the Kilburn Branch of the Gaslight and Coke Company and of the West Ham Gas-Works. The chosen spot was the Bow and Bromley Institute, in Bow Road, just on the border of the West Ham district; and there a large audience assembled to enjoy an excellent programme of music, song, and recitation, which was rendered in a manner that elicited warm praise from all present. The Chairman was Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company; and the Vice-Chairman, Mr. A. G. Snelgrove, who has for long past occupied the position of Secretary of the West Ham Gas Company. They were supported by a number of other officials of the two undertakings. During the evening, short addresses were delivered by the Chairman and the Vice-Chairman. To the many good features of the concert it is unfortunately impossible specially to refer here; but some of the points made by Mr. Milne Watson and Mr. Snelgrove, in the course of their remarks, are given below.

Mr. Milne Watson, who was received with loud applause, remarked that it gave him great pleasure to be present on such a pleasant occasion. It was quite possible that a good many people down West Ham way had, in a sense, been dreading the coming of the Gaslight and Coke Company; but he trusted they had found the "marriage-day" not nearly so bad after all. It seemed to him a good augury for the future that the two bands had that evening played so harmoniously together. They were assembled in the hall to celebrate the coming together of these two important Companies; and he hoped it would prove to be the beginning of a very long and happy career of usefulness together. The Gaslight and Coke Company were coming down to the East End of London with every good wish for the officials and workmen of the West Ham undertaking who were joining them that day. It appeared to him that the most important thing for them all was to forget as soon as possible that they were West Ham or Gaslight and Coke—to thrust from their minds, as it were, all thought of their origin. This, he believed, would be the best way of continuing their work of fighting the common enemy. There were some things in which, no doubt, the Gaslight and Coke Company could help the West Ham officers and men. There was a Rifle Club, at which anyone from the Stratford works would certainly be most heartily welcomed. It was hoped soon to have a similar club at Stratford. Then there were allotments at Bromley, some of which would be available for men who had been in the employ of the West Ham Gas Company. In these little ways it was the desire of the Gaslight and Coke Company to show their perfect friendliness towards their new comrades. If this feeling was sincerely shared by each individual officer and man, he was convinced that they would all march triumphantly forward. He regretted that not all the old West Ham officials were coming into the amalgamated undertaking. Mr. Snelgrove, for instance, was not coming with them. He had grown grey in the service of the West Ham Company, and would be missed. They heartily wished him long life and prosperity in his retirement. There were also others who were not coming along with them—Mr. Wright, Mr. Gwinn, Mr. Madge, Mr. Clark, and Mr. Lethbridge. These gentlemen carried away with them the best wishes of all who were connected with the combined undertaking. In conclusion, he assured those present that a strong forward policy would be pursued; and he was certain that if the amalgamation so auspiciously celebrated that day was worked on right lines—all going hand in hand together—it would prove to be the opening of a bright day for officers and men, as well as for the combined undertaking for which they worked.

Mr. Snelgrove, who was also enthusiastically greeted, remarked that the previous speaker had already said some of the things which he himself had intended to say. He must first of all thank Mr. Milne Watson on behalf of the retiring staff of the West Ham Gas Company for the extremely nice way in which he had spoken of them. But he thanked him more still for the kindly words with regard to the future. He himself had no doubt of the complete welding together which would take place. Mr. Milne Watson had told them what the feelings of the Gaslight and Coke Company were; and he (the speaker) was sure that their intentions were just as they had been represented to be, and that they desired all distinction between the two undertakings to disappear. The West Ham men would not be backward in accepting this position. He himself had no doubt whatever of the real sincerity of the sentiments they had heard expressed that evening; and he was sure the men had none. There would in the future be the happiest feelings among the employees of the combined undertaking. There would be no separate distinctions, but simply one entity; and Mr. Milne Watson would have the satisfaction of knowing that he had very largely contributed to this. He thanked him for coming down to the Institute with his distinguished staff, and inaugurating in their midst the new condition of affairs. The hall in which they were assembled was practically speaking in West Ham. He did not know who originated the idea of having the concert; but whoever was the author, it was an extremely happy one. He took it that the concert and the harmony which had prevailed that evening between the two combining forces were merely a forecast of what would be the actual state of affairs in the future. They had seen how well, in concert and in harmony, the men could play; and he was perfectly satisfied they would work in concert and harmony equally well.

**Maryport Water Scheme.**—The Maryport Urban District Council have let the contract for their new water scheme to Messrs. Bushby and Sons, of Leeds, whose tender—£10,586—was the lowest. The works are supplementary to the present pumping scheme, and include an additional pipe from the River Derwent at Cockermouth. The original estimate of the total outlay was £17,000; but now it is considered that £13,000 will cover the cost, including land. Local labour must be employed.

## ELECTRIC LIGHTING IN DUBLIN.

## Losses on the Scheme—Warning by the City Treasurer.

In a report on the Dublin electric lighting scheme which was to come before the Corporation at their meeting yesterday, the Electric Lighting Committee announced the necessity of bringing again before the Council the question of the deficit in the electricity undertaking, and the advisability of, at least slightly, increasing the rates of charge. An increase of 10 per cent. on current supplies for lighting purposes was proposed; this being estimated to bring in £3500 additional per annum—the increase to take effect from the 31st of March next.

A letter from the City Treasurer (Mr. E. W. Eyre) was appended to the report. He gives it as his opinion that the increase should be at least 3d. per unit. The loss involved in the general change by consumers from the old carbon to the new metallic filament lamps is estimated at £15,000 at least. The Committee stated that they did not consider that a small increase in the charge would materially influence the growth of consumers, the number of which on Dec. 15, 1908, was 2080, and on Dec. 15, 1909, 2570. This increase (the Committee stated) would have gone a considerable way towards removing the loss in working, and possibly have cleared off the loss altogether, but for the fact that this year nearly all the consumers who had continued to use the old style of lamp changed to the new metallic filament lamps (which are now in almost general use), and the income derived from these consumers has decreased to a very large extent. As a result, the Committee expressed regret that they could not anticipate that the working of the undertaking for the year ending the 31st of March next could be carried through without some charge on the rates; and they asked for the opinion of the Council on the question of the increase in the charge for current.

In the letter above alluded to, Mr. Eyre refers to his earlier report on the subject (given in the "JOURNAL" for Feb. 16 last), in which he says it was clearly shown that current was being sold at less than the average cost of manufacture, when the capital charges were included. This report, for reasons which Mr. Eyre gives, was not fruitful of results; and the concern is still being run at a loss. There is not provision for renewals or depreciation, and the bank overdraft (now amounting to upwards of £43,000) continues to increase. Mr. Eyre proceeds: "I must now, for my own protection, protest against a deliberate course of action which involves a continued indifference to that liability. If your Committee cannot induce the Council to approve of a readjustment of your lighting charges, so as to provide at least for the wiping-out of this debt, I will be forced into the position, for my own safety, of refusing to allow the Committee any longer to avail themselves of the circumstances of existing credit balances on other accounts as a means of carrying on the undertaking, especially in view of the facts and figures set out in report No. 34, and particularly in view of the circumstance that your Committee itself agreed as to the absolute necessity of an increase in price for current."

## PROPOSED WATER BOARD FOR RHYMNEY VALLEY.

## Conference of Local Authorities.

A Conference of Delegates from the District Councils on the Glamorganshire and Monmouthshire sides of Rhymney Valley was recently held at the offices of the Gelligaer Urban District Council, to consider a proposal for the formation of a Joint Water Board. When the Glamorgan Water Bill was before Parliament in the past session, it was intimated that the Rhymney Valley would be excluded from its operations; but the opinion was expressed that, owing to the complex character of the valley, it was imperative that a Water Board should be formed to control the district. It may be remembered that the Bill was rejected; but, in view of the expression of opinion above referred to, the Caerphilly District Council took the initiative by convening a meeting of the several authorities so as to discuss the whole situation, especially in relation to the Rhymney and Aber Valleys Gas and Water Company and the New Tredegar Gas and Water Company on their respective sides of the valley. Places represented were Caerphilly, Gelligaer, Bedwellty, Mynyddislwyn, St. Mellons, and Rhymney. Mr. C. S. GOODFELLOW (Caerphilly) was chosen to preside.

The CHAIRMAN, in opening the proceedings, said the question of the necessity for the formation of a Joint Water Board had been mooted throughout the valley for a considerable time; and it was now generally agreed among the authorities that one should be established. They in the lower end of the valley had suffered, as no doubt the other parts had done, from want of a sufficient supply of water; and the formation of the valley lent itself to the establishment of an ideal Water Board. There were a number of instances where these Boards had worked successfully; so that the technical management of such an organization could be followed on somewhat similar lines. The first thing to ascertain, however, was the opinion of the several authorities in the district; and in order to do this, he would ask for a resolution. If anyone was prepared to move one, an amendment could be submitted, and by this means a discussion could be opened. If the Board was formed, the present Company (Rhymney and Aber Valleys Company) would have to be bought out.

Rev. T. JESSE JONES (Gelligaer) said the first fact was that at the present time the valley had not a proper water supply. The monopoly of the supply was in the hands of the Rhymney and Aber Valleys Gas and Water Company, who were under statutory obligations to construct a reservoir; and the only penalty for the non-fulfilment of this obligation was that their powers would cease. He did not think the Company had started this work yet; and he did not know that the local authorities had taken any steps to see that it was done. It was the duty of the District Councils to urge upon the Company to meet their statutory obligations. He believed they were honestly striving to do their duty; and he must say that they were improving their service. With reference to the water companies in the valley, he took it that the different Councils would jointly be in the position of a party in treaty with them, and would ask them if they wished to sell their



undertakings. If so, they would have to state their terms. The companies would reasonably look into the future, and could reasonably expect a great improvement in their financial position. At the same time he would not be a party to paying anything to cover such prospective improvements, but would take the value of the Company's assets with interest. In a matter of this kind, it would be unfair to expect the Rhymney and Aber Valleys or the New Tredegar Companies to give up the rights that they now held without some consideration for them; but, having regard to their own interests, would it be fair or reasonable to pay upon the prospective value of their undertakings? The magnitude of the question before them was such that they should consider it from all points.

Mr. W. S. NASH (Mynyddislwyn) said if the proposed Water Board were formed, and the monopoly of the supply of water transferred to them, it seemed to him that the larger District Councils in the valley, who would have to pay the greater proportion of the purchase money, should control the scheme. The Mynyddislwyn district had but a small portion of their area in the proposed watershed, and therefore could not really claim the same interest in the Board as the larger and more responsible districts. He felt, as he always had done, that the water supply should be in the hands of the local authorities. The longer the purchase was delayed, the greater would be the amount they would have to pay; and therefore the sooner the supply was transferred the better it would be all round.

Mr. HUBERT JENKINS (Caerphilly) said his Council were prepared to go on with the Joint Board scheme, and he had a mandate to this effect. He thought if the members present would go back to their Councils with a strong recommendation that the Board should be formed, there would be no difficulty about the matter.

After some further remarks, it was decided that the representatives should recommend their authorities to approve of the formation of a Water Board; and that the next conference should be held the first Thursday in February.

### POCKET-BOOKS, CALENDARS, &c.

Since penning the acknowledgments under this heading which appeared in last week's "JOURNAL," we have received an attractive fancy casting in the shape of a combined match-box holder and ash-tray, made at Messrs. Thomas Glover and Co.'s and Messrs. R. & A. Main's Gothic Works, Edmonton. From Messrs. Drakes, of Halifax, there is an ingeniously contrived inkstand, in a form which renders it particularly suitable for the desk of a gas engineer—that is to say, it is an excellently modelled retort-mouthpiece. Messrs. F. C. Sugden and Co., of East Parade, Leeds, forward one of their neatly arranged pocket diaries for 1910, with £1000 accident insurance coupon. In addition to general information, notes are given on the construction of the firm's various types of settings; and there is a description of the Hudson patent producer, as applied thereto. Mr. Henry Thomas, of Mawson Chambers, Manchester, sends a compact calendar, in white and gold, which slips into a case, for the waistcoat pocket. A large wall calendar is to hand from the Economical Gas Apparatus Construction Company, of No. 19, Abingdon Street, S.W.; and a tear-off date block, with exceptionally bold figures, from Messrs. Simon-Carvès, Limited, of No. 20, Mount Street, Manchester. A wall-calendar from Messrs. George Glover and Co., of Chelsea, is an artistic production which will be an ornament to any room. Mr. A. C. Scriviner, of Birmingham, has a desk calendar, with monthly changeable cards.

### Early Days of Gas in New York.

The number of our American contemporary "Gas Logic" for the past month contains some reminiscences by Dr. Thomas Hunter, who was Principal of an important Grammar School in New York from 1850 to 1869. He went to America from Ireland in 1846; and he says it was in Dublin that he first saw gas used for purposes of illumination. Referring to its employment in New York, he says it was introduced gradually and at different periods; it was not general until after its superiority to the oil-lamps caused it to supplant them altogether. The principal streets were lighted with it almost uniformly in 1851; but the lamp-posts were not so close together as they are now. It was not deemed necessary to have all the streets lighted exclusively by gas; and it was not at all uncommon to find the gas-lamps alternated with oil-lamps in the side streets. When the schoolhouse was first built, in 1846 or 1847, oil-lamps and candles were used when a particularly dark day made it necessary to light up; but when Dr. Hunter became a teacher, these primitive methods had to give way to gas. In the days referred to by him, the total number of inhabitants of old New York was not within 150,000 of the number of consumers now supplied with gas. "Light is the great humanizer," says Dr. Hunter; "and the light supplied by gas is one of the most important factors in our civilization."

**Fatal Gas Escape at Smethwick.**—Ida Parkes, a twelve-year old girl, who was staying with a married sister, met with her death under sad circumstances just before Christmas. At the inquest, the brother-in-law stated that when he went to her bedroom to wake her, she was lying over the side of the bed, with her head almost touching the floor. He did not think he was affected by the gas-fumes, neither was his wife. There was a gas-bracket in the child's room; but this was turned off, and the bedroom door was also open. Benjamin Skidmore, an Inspector in the employ of the Smethwick Corporation Gas Department, said when he got to the house he found the gas had been turned off at the meter; but there was a distinct smell of stale gas. The fittings and pipes were in good condition, with one exception. He found there was a split in the pipe of the hall-lamp about an inch in extent. From this there would probably be an escape of gas of from 15 to 20 feet per hour. Dr. Pitt said when he was called to see the child she was dead. He thought that more gas must have found its way into her bedroom than into the room of the other people. The girl apparently tried to get out of bed at a time when she was too far gone; and she collapsed. The jury returned a verdict of "Accidentally poisoned by gas."

### NOTES FROM SCOTLAND.

#### From Our Own Correspondent.

Saturday.

Though the incidence of the Christmas holiday, and, I suppose, the difficulties of the Post Office in grappling with their vast business at the season, led to my inability to furnish you with a few notes upon some events which marked the course of the gas industry in Scotland in the year 1909, it may not be out of place that I should now put down some random thoughts upon the subject. There is nothing of a very outstanding nature to chronicle. Perhaps one of the most satisfactory features in the year's working was that in the early summer, when coal contracts were being entered into, the market was easier than it had been before or than it is now, with the consequence that supplies were obtained at rates which have allowed of a general reduction in the price of gas. Large reductions have not been the rule, having been in most instances only 1d. per 1000 cubic feet. In Glasgow, the reduction made was from 2s. 1d. to 2s.; in Dundee, from 2s. 4d. to 2s. 3d.; in Aberdeen, from 2s. 7d. to 2s. 6d.; in Alloa, from 2s. 2d. to 2s. 1d.; and in Dumfries, from 2s. 11d. to 2s. 10d. In Arbroath, the reduction was from 2s. 11d. to 2s. 8½d.; in Hamilton, from 2s. 1d. to 1s. 10½d.; in Edinburgh and Broughty Ferry, from 3s. to 2s. 10d.; and in Stirling, from 2s. 10d. to 2s. 6d. Outputs of gas have been well maintained. In 1908, the climatic conditions were very much better than last year; and for this reason chiefly, with perhaps the circumstance that there had been an enormous extension of incandescent gas lighting, the outputs that year were in many cases adversely affected. The dull and cold weather in 1909 led to an augmented demand for gas; so that the year compares very favourably with its immediate predecessor in the matter of gas consumption. This aspect of the year's working was, too, greatly affected by the fact that on two occasions, in November and December, there were dense fogs, particularly in the West of Scotland, during which there was a very greatly increased demand for gas in quite a number of places. But these local experiences, welcome in themselves, do not displace the fact that, all over, there has been an advance in the gas consumption, pointing to the conclusion that the loss of output consequent upon the advent of the incandescent burner has touched bottom, and that normal increases may now be looked for from year to year.

Entirely new gas-works were opened at Kennoway in March; at Cardenden, in July; and at Fauldhouse, in August. Gas-works extensions to be noted consisted of a new 400,000 cubic feet gasholder, which was inaugurated at Arbroath in September; and a new gasholder of 150,000 cubic feet capacity, which was inaugurated at Burntisland in November.

The joint-stock companies formed last year were five in number—Lochmaben, in February; Fraserburgh, in April; and Cove and Kilcreggan last week, to take over existing Companies; and Cardenden in February and Fauldhouse in March, which were both new concerns. During the year, Provisional Orders were obtained by the Coatbridge Gas Company and the Musselburgh Gas Company, both already incorporated Companies, authorizing them, among other things, to reduce the illuminating power of their gas—in the case of the former from 20 to 15 candles, and in that of the latter from 22 to 14 candles.

Notices of application for Provisional Orders have been given by the Corporation of Glasgow, who are seeking to have their Gas Acts consolidated; and by the Corporation of Kirkcaldy, who wish further powers than are conferred by the General Acts, after they have acquired the undertaking. For the purpose of promoting transfer of gas undertakings, the Burghs Gas Supply (Scotland) Act was adopted by the Corporation of Kirkcaldy, in May; by the Corporation of Carnoustie, in July; and by the Corporation of Fraserburgh, in September. At Stonehaven, the other day, a Committee of the Town Council was appointed to endeavour to ascertain on what terms the Gas Company would sell their undertaking. A similar Committee was appointed by the Town Council of Markinch in May.

Changes in *personnel* have been somewhat numerous. Mr. W. Bartholomew, the Manager of the Ochiltree Gas-Works, died in January, from the effects of an accident he sustained within the works; Mr. G. Malan, of Dumfries, died in April; and Mr. John P. Scott, of Bridge of Allan, died in August. Mr. A. Bell, sen., retired from the managership at Dalkeith early in the year; Mr. W. M'Lean Ross resigned the managership at Stonehaven in May, on account of his having received an appointment in Australia; and in July, Mr. A. Robertson resigned at Alyth. Mr. R. W. Cowie, of Lockerbie, was appointed Manager at Dalkeith in March; in May, Messrs. J. Smith and S. Dickie were appointed Joint Managers at Dumfries; in June, Mr. W. Fred Vernon, of Coupar Angus, was appointed to Stonehaven; Mr. W. Brown was appointed Manager of the new Company at Cardenden, his place at Lasswade passing to Mr. J. Macmillan, of Lochgilphead. Mr. S. M'Lusk was appointed to fill the vacancy at Coupar Angus; Mr. A. Watt, of Banchoy, was appointed to Alyth; and Mr. Gavin Muir, of Stonehouse, was appointed Manager of the Neilston Gas Company.

A meeting of the Edinburgh and Leith Gas Commissioners was held on Monday, at which, among other matters of interest, it was intimated that the Commissioners have resolved to apply to the Board of Trade for arbitration with respect to the increased rates and charges proposed by the railway companies to be exacted in terms of their circular of Aug. 1, 1908. The Commissioners had before them the important document, given on another page, relating to the charge for gas sold by means of prepayment meters. No resolution was arrived at on the subject; there being evidently a desire on the part of some of the Commissioners to break down Mr. Herring's resolution to maintain the existing extra charge of 1s. 2d. per 1000 cubic feet. There is a tendency in many towns, on the part of some councillors, to pander to the least desirable class of gas consumers. Mr. Herring is not on that side of opinion; and the position he has taken up will help to strengthen those who think sanely on the subject.

Another document of supreme importance sees the light this week, in the report by Glasgow Corporation officials upon the effect on the atmosphere of the use of gas-stoves in dwelling-houses. A perusal of this document shows how thorough the inquiry was. The conclusions arrived at will be commensurately valuable. The publication of this



report will give impetus to a movement which is taking shape in other places than in Glasgow.

The Corporation of Glasgow are already moving in the matter of air purification, having recently passed a resolution which asked the heads of municipal departments to consider how far it would be possible to use smokeless fuel in the public service. The replies of the heads of departments have now been given. Mr. F. W. Harris, the Corporation Chemist, states that he could with advantage substitute gas-fires for coal-fires. Mr. W. C. Menzies, of the City Improvement Department, reports that he has been experimenting with coke as fuel, and is now burning it in a number of places under his charge; and that he is endeavouring to get gas-fires installed in some Corporation property. Mr. D. M'Coll, the Cleansing Superintendent, found that in office fires ordinary coke gave off sulphurous fumes, which rendered it quite unsuitable. Malting coke, which could be bought for 19s. per ton, was fairly suitable. Anthracite coal was of little use for heating a room. Mr. A. Wilson, the Gas Engineer, considers that there would be no difficulty in substituting gas-fires of a thoroughly satisfactory description for coal-fires in his department; but before this should be done, he proposes to make experiments with gas-works coke, treated in a special manner to make it suitable for household purposes. Mr. S. B. Langlands, the Lighting Inspector, reports that he has nine gas-fires and 38 coal-fires in his department. He is replacing some of the coal-fires with gas-fires, and considers that he can extend this throughout all the offices without an unreasonable increase in the cost. Mr. Thomas Nisbet, the Master of Works, as the result of trials he has been making in connection with road-rollers, expects that in future he will be able to arrange that more coke and less coal shall be used. Mr. T. Melvin, of the Sewage Department, suggests the use of anthracite coal in his department. Mr. C. M'Donald, of the Weights and Measures Department, suggests that generally gas-fires should be substituted for coal-fires. Mr. A. W. Lachie, the Electrical Engineer, states that in his department there is only one coal-fire, for which a radiator could easily be substituted. The offices are heated by hot-water apparatus, in which 62 tons of coke are burned yearly. In their generating stations, about 84,000 tons of coal are burned yearly; and no other form of fuel could be in the meantime substituted for coal. The Air Purification Committee have resolved to have the replies of the officials printed before they take up consideration of the subject.

The Gas Committee of the Dundee Town Council on Tuesday considered a proposal that application should be made for an increase in the borrowing powers connected with the gas undertaking. The proposal was explained by Mr. Soutar, the Corporation Treasurer. The Gas Department, he said, was never in a more satisfactory state, or under better management. Their present borrowing power was £400,000; but they had over-borrowed to the amount of £25,960. Looking forward in a business-like way, with a sound degree of discretion and prudence, it had become evident to Mr. Yuill—and he thought there was no more competent manager in Scotland than he—and to the Gas Treasurer, Mr. Burke, that they must have additional borrowing powers to meet the estimated capital expenditure on works during the

next ten years. Up till 1920, it was estimated there would be spent on works an amount of £120,000; and it was for this sum they thought it advisable to get additional borrowing powers. Against the amount which they wanted power to borrow, they had a book value of works of £443,031, and a marketable value, as calculated by Mr. Yuill, of £796,746, which, on a make of 875,347,000 cubic feet of gas per annum, equalled a capital expenditure of £908 per million cubic feet of gas delivered. When the gas-works were taken over in 1869, this figure stood at £1278. Lord Provost Urquhart said he had been in the complacent belief that their gas-works were up to date, and that their large capital expenditure had really come to an end. He was therefore surprised at the proposal, and thought the matter should be remitted to a Committee to consider. This course was unanimously agreed to.

The deputation from the Dumfries Town Council which was recently appointed to visit the gas-works at Stirling, Falkirk, and Kilmarnock, with a view to advising upon the proposal to reconstruct the retort-house and coal-store, and to introduce mechanical stoking, at an estimated cost of about £11,000, have prepared their report, which is favourable to the proposal. All the managers, they state, when questioned as to manual labour, stated that stoking by machinery was the more economical method of manufacture. The increase of profits might be placed at from £1500 to £2000 per annum. From the apparatus seen and the results given, the deputation are certain that by the reconstruction of the retort-house and coal-store an increased saving may be annually obtained, as well as a considerable reduction in the price of gas.

The Lochwinnoch Gas Company have paid a dividend of 4 per cent., free of income-tax, for the year 1908-09.

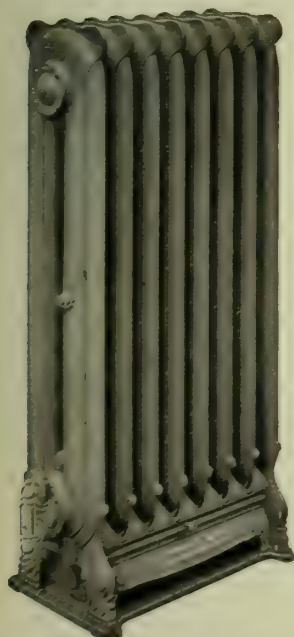
In the beginning of September, it was intimated that the Inverkeithing Gaslight Company were contemplating the extension of their works, and that the Town Council had taken up the consideration of the question of acquiring the Company's undertaking. It would seem, from what transpired at the annual meeting of the Company on Thursday, as if nothing is to come of the proposal for a transfer. The Directors recommended payment of a dividend of 6½ per cent., free of income-tax. They pointed out that during the year 324 tons of coal were carbonized, and 2,442,100 cubic feet of gas produced; these figures being records in the history of the Company. After the ordinary meeting, an extraordinary general meeting of the shareholders was held, at which it was reported that, in order to meet the increasing demand for gas, a feu adjoining the gas-works had been obtained, on which it had been decided to erect a gasholder of 25,000 cubic feet capacity, and to greatly extend the plant on the works, at an estimated cost of about £2000. A resolution was unanimously adopted to increase the nominal capital of the Company from £1500 to £5000, by the creation of 3500 additional shares of £1 each.

In the course of his employment at the Belfast Gas-Works, a man named Joseph Bingham was so severely burned that he had to be removed on an ambulance. It appears that his clothes caught fire from one of the furnaces.

## Confidence!

The "ST. ANDREW" led the way from the first—and still leads!

The "OFFICIAL" is rapidly achieving a reputation second to none for the heating of all places where a Radiator *with flue* is desirable.



The "St. Andrew."

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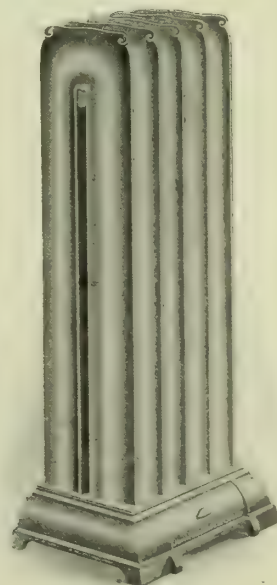
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meet all requirements, no matter  
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THE MINIMUM!**

**JOHN WRIGHT & CO.,  
The Radiator Experts,  
Essex Works, BIRMINGHAM.**



The "Official."



## CURRENT SALES OF GAS PRODUCTS.

## Sulphate of Ammonia.

LIVERPOOL, Dec. 31.

In spite of the holidays, the tone of the market has been good throughout the week, and consumers have been rather more in evidence. All parcels offered by makers have found ready buyers at full prices, and at the close the position is as firm as ever; the quotations being £11 7s. 6d. per ton f.o.b. Hull, £11 10s. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. No new business has transpired for forward delivery; but manufacturers continue to hold for £11 12s. 6d. per ton f.o.b., best ports, for January-June shipment.

## Nitrate of Soda.

This article remains quietly steady at 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality, on spot, with little business passing.

## Tar Products.

LONDON, Jan. 3.

Markets for tar products have been firm throughout the past week. In London, there is very little offering, and several of the manufacturers appear to be well sold. On the east coast, good figures are stated to have been paid; while on the west coast business is reported at very high figures. Regarding creosote, the London manufacturers are very firm indeed, as they are particularly well sold. This is likewise the case in the Midlands and Yorkshire; and makers here can obtain good prices. In the Manchester and Liverpool districts, however, figures are low. Benzol, 90 per cent., is still very firm indeed for prompt delivery. In London there is but little available, and in the North 6d. per gallon is being freely paid. In 50-90 per cent. benzol, the position is also firm for both prompt and forward delivery. Toluol appears to be decidedly scarce. Solvent naphtha is firm in all quarters, and there is a good demand for this for near delivery. Heavy naphtha is quiet. Carbolic acid is steadier. Naphthalene is quiet; but creosote salts are in good demand.

The average values during the week were: Tar, 13s. 9d. to 17s. 9d., ex works. Pitch, London, 28s. 3d. to 28s. 9d.; east coast, 28s. to 28s. 6d.; west coast, 28s. to 29s. f.a.s., 28s. f.o.b. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11½d.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

## Sulphate of Ammonia.

This article has been firm during the past week, and prices have an upward tendency. In London, the principal Gas Companies quote £11 10s. for prompt delivery. They are practically out of the market for this period, and quote £11 12s. 6d. for January-June; while ordinary makes are quoted at £11 3s. 9d. to £11 5s. upon Beckton terms for prompt, and £11 7s. 6d. for January-June. In Hull, £11 6s. 3d. to £11 7s. 6d. is about the price, and in the Liverpool district £11 7s. 6d. to £11 8s. 9d. In Leith, £11 10s. is quoted for prompt and £11 12s. 6d. for forward. The market closes firm all round, and with a decidedly better outlook than for some time past.

## COAL TRADE REPORTS.

## Northern Coal Trade.

The effect of the holidays has been to reduce considerably the output of coal in the North, and also to lessen the consumption for manufacturing purposes. The shipments have, however, been limited generally, and prices have been made rather uncertain. In the steam coal trade, best Northumbrian steams are quoted at about 10s. 10d. per ton f.o.b.; second-bests, from 9s. 6d. to 9s. 10½d.; and for steam smalls, from 5s. 3d. to 6s. 6d. The production will probably be limited for a few days yet. In the gas coal trade, the demand is naturally very full at this season; but the shipments have been restricted by the cause above stated, though fair quantities have in some cases been sent out. For Durham gas coals, the current price varies according to quality—from 9s. 6d. to 11s. 3d. per ton f.o.b. for the usual classes, and up to 11s. 9d. for "Wear" specials. There is less doing in contracts; but some of the coalowners have sold a considerable part of their output over the next three months, and prefer to wait a little before making further commitments until there is more settlement as to prices and probable production at some of the collieries is more exactly defined. It is possible that the output may show a reduction at first. Coke is very firm; and gas coke, though plentiful, maintains its price at about 13s. 3d. to 13s. 6d. per ton f.o.b. for good quality.

## Scotch Coal Trade.

The trade continues to be fully employed in all departments, and prices, though not higher, are firm. Forward orders are coming in satisfactorily. The collieries will be closed for a week for holidays. The prices now quoted are: Ell, 10s. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 6d. to 11s.; and steam, 10s. to 10s. 6d. The shipments for the week amounted to 318,827 tons—an increase of 7666 tons upon the preceding week, and of 30,044 tons upon the corresponding week. For the year, the total shipments were 15,235,969 tons—an increase of 711,132 tons upon 1908.

Best Wishes for

1910.

May gas be as popular with Consumers during 1910 as our "A.B.C." gas fires have been during 1909.

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RICHMONDS  
GEO. GLOVERS  
GEO. NEWTONS  
CLARK'S SYPHON  
STOVE CO., LTD.

RICHMOND GAS STOVE &amp; METER CO. LTD.

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### Electricity and Fire.

In a recent number of the "Municipal Journal," an article appeared on the above subject, as well as a statement by the Electricity Engineer of the Kingston Corporation, that the great fire at Clapham Junction was not due to the broken filament of an electric lamp falling upon any of the goods near it when the lamp was broken. Mr. D. H. Helps, of Reading, in a letter in the current issue, while agreeing that the filament could not have caused the fire, points out that the statements of those who were present when the lamp was broken make it clear that the fire was due to the electric fusion then set up. This fusion was, of course, not directly caused by the breaking of the globe, but by the short-circuit which occurred in the terminals of the lamp when it was forcibly struck. Mr. Helps once witnessed a similar occurrence, and he gives the following extract from a letter he wrote to the "JOURNAL" for Jan. 24, 1907: "I am writing to give a short account of an occurrence which took place in a house in which I was staying last September. This house had recently been fitted up with incandescent electric lights. A bottle was being uncorked in the dining-room, when the cork flew out and struck one of the electric lamps. The glass bulb broke, and there was immediately a blaze of light, owing apparently to the formation of an arc, which fused the brasswork of the fitting, with the result that the molten metal fell down, lighted the table-cloth, and caused other damage."

**Gas Companies' Standard Burner Bill.**—In accordance with the instructions of the General Purposes Committee of the Town Council, the Town Clerk of Plymouth has presented a report on the provisions of the above-named Bill; and he is to communicate with the other corporations interested to ascertain their views as to joint action being taken in the matter.

**Interference with Gas-Lighting Controllers.**—Mr. W. J. Couch, the Secretary of the Camborne Gas Company, has drawn the attention of the Camborne District Council to the conduct of a number of boys in the district in interfering with the working of the automatic controllers installed in the public lamps. In the cases to which particular attention was drawn by Mr. Couch, boys were seen to strike lamp-posts with pieces of iron, and kick and shake them, so as to affect the clockwork, and cause the burners to light up before the proper time. This vibration, he pointed out, not only put the clock out of order but broke the mantles, and caused irregularities in the lighting, of which complaint had been made. On the reading of the letter at the last meeting of the Council, Mr. Eddy said they ought to support the Gas Company. The Chairman (Mr. R. A. Thomas) agreed that it was a matter which could not be ignored. The Clerk, however, thought it was one which called for action by the police, and concerned the Company rather than the Council. It was pointed out that the lamp-posts were the property of the Council; and it was decided that notices should be issued warning persons against interfering with them.

**Australian Artesian Borings.**—An artesian boring at Woorra, Western Australia, has struck a supply of  $1\frac{1}{2}$  million gallons of water per day at a depth of 1226 feet. Some time since, a bore was put down 15 miles north of Woorra, and struck a supply of a million gallons per day at a depth of 1000 feet, while a Government bore which was put down 35 miles south of Woorra obtained a supply of 2 million gallons per day at a depth of 543 feet. It is only a few years since artesian water was discovered at Carnarvon, 70 miles from Woorra; and now this particular water basin is known to extend to the tertiary and recent strata, with few breaks along the coastal plains, to Perth, while a copious supply of true artesian water is also obtainable in the Collie coalfield area.

**Fatal Gas Explosion.**—As the result of an inquest at Dunstan on the body of Joseph Stephenson, Under-Manager at Norwood Colliery, the jury found that the deceased died from compression on the brain, from a fracture of the base of the skull, and cerebral hemorrhage, accidentally caused by an explosion of coal gas. The explosion took place in a building in connection with the colliery office, in which there were no gas-fittings. It was stated that a smell of gas had been noticed in the roadway which passed the office, and in the vicinity of which there was a gas-main. One witness said he drew the attention of two employees of the Newcastle and Gateshead Gas Company to the escape. He remarked that there was a hollow chamber beneath the office; and the Coroner said this was an important factor, because if there was an escape the cavity would form a gasholder.

**Alleged Pollution of the Exeter Water Supply.**—The question of the pollution of the River Exe, to which attention was recently called by the Exeter City Council, was again considered by the Dulverton District Council at their last meeting. The Town Clerk of Exeter wrote that the Water Committee were glad to hear of the steps which the Dulverton Council were taking to abate the fouling of the river by washings from a refuse heap near the town. The City Surveyor and the City Analyst, on a recent inspection of the leat at Dulverton, had, however, found signs of pollution; and there was no doubt in their minds that there were several properties along the leat which were not connected with the sewers, and discharged raw sewage into the water. The result of an analysis of the water proved very serious pollution by raw sewage. The City Water Committee thought it was necessary that every house on the leat should be separately examined, and if not already connected with the sewers, the owners should be compelled to connect it. The Clerk of the Dulverton Council said that since the receipt of the letter he had had an interview with the Town Clerk of Exeter, and had explained that it was proposed that the Medical Officer of Health and the Surveyor should report on the subject of the alleged pollution. The former (Dr. Slade King) remarked that the Dulverton Council were not obliged to provide Exeter with a pure water supply, but they certainly were bound, under the Rivers Pollution Prevention Act, to see that sewage was not turned into the river in a crude state. He thought a thorough examination ought to be made of places where crude sewage was likely to drain into the river. Instructions were given to the Surveyor to report on the subject at a future meeting.



# HARK BACK

TO OUR  
**NUMBER 5 SHOT**

See "JOURNAL OF GAS LIGHTING," Nov. 23, 1909.

It is as follows:—

## THE 'TORRID' GAS HEATED RADIATOR.

### PURE HEATED AIR.

**NO FUMES. NO FLUE REQUIRED.**

With Trivet Door Front and Back and Copper Reflectors.

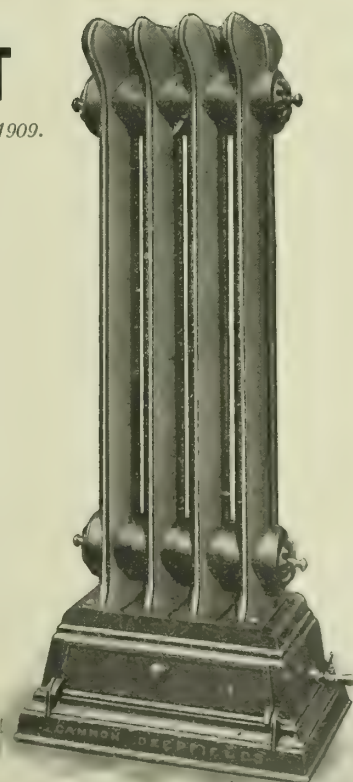
The Doors, Front and Back, can be opened, and form convenient Trivets, and at the same time, when opened, the Copper Reflector which is fitted inside becomes visible and produces a very pleasing appearance.

## CANNON IRON FOUNDRIES, LTD.,

DEEPFIELDS, Near Bilston, Staffs., Eng.

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**Coalite, Limited.**—The Directors of Coalite Limited announce that, in order to bring the accounts to the 31st of December in each year, the general meeting called for Dec. 30, 1909, was adjourned until March 23, 1910, when the report and accounts to the end of 1909 will be presented.

**Gas Poisoning in Dundee.**—On the afternoon of Sunday, the 26th ult., two women who occupied apartments at No. 30, Rose Street, Dundee, were found by neighbours lying on the floor of their dwelling in a state of unconsciousness. Two police officers applied artificial respiration while the women were being conveyed to the Royal Infirmary; and it is believed that but for this prompt action they would have lost their lives. Happily both of them recovered. It was found that gas had escaped from the prepayment meter, where solder had been melted by burning paper. It could not be learned from the women what had happened, but it is surmised that, a penny having been placed in the meter, gas had not come readily, and that, in the belief that the meter was frozen, it had been attempted to thaw it by holding flame to it.

**Serious Gas Explosion.**—A serious explosion of gas, by which five persons were injured (two very seriously) occurred last Thursday at Lydney Park, the residence of Mr. C. Bathurst, the Unionist candidate for South Wiltshire. Some of the servants were engaged in searching for an escape of gas in the housekeeper's room, when one of them raised the chandelier, which she thought had been drawn down too low. Jets of gas were burning in the room, and an explosion followed—the room being completely wrecked. The fire then passed to the kitchen, where considerable damage was done. One of the servants, named Annie Pearce, was blown into the passage and the upper part of her clothing and hair caught fire. Fears as to her recovery were entertained.

**Fatal Gas Poisoning in Belfast.**—An inquiry was recently held in Belfast into the circumstances attending the death of Mr. John Leeburn, who was found dead in his office on the morning of the 23rd ult. According to the evidence, the deceased went back to his office after the clerks had left. There was a gas-jet as well as a gas-stove in the room; but though there was a flue it did not carry away the fumes issuing from the stove. When the deceased was found, the gas was burning at the jet and in the stove, and he was lying on the floor quite dead. He was removed to the hospital, where an examination of the body was made; the conclusion arrived at being that death was the result of poisoning by carbon monoxide. The Coroner (Dr. James Graham) said it would be well for the Jury to make the recommendation that in future the Corporation should not supply any gas-stoves without seeing that there was in every case a proper flue or ventilation. The Jury agreed to add this to their verdict, which was that death had been caused by carbon monoxide poisoning, the result of inhaling the fumes arising from a gas-stove. A young woman was also found in the office when Mr. Leeburn was discovered. She was in an unconscious condition, and some hope was entertained of her recovery; but she died last Saturday.

**Reductions in Price.**—As from the 1st inst., the price of gas at Carmarthen has been reduced from 3s. 9d. to 3s. 3d. per 1000 cubic feet. Other reductions recently announced are 1s. per 1000 cubic feet by the Felton Gas Company, and 3d. per 1000 cubic feet by the Winsford Urban District Council. The Wilmslow and Alderley Edge Gas Company have reduced, as from the 1st inst., the price of gas to consumers throughout their district by 2d. per 1000 cubic feet.

**Failure of the Electric Light in Dublin.**—About ten o'clock last Tuesday night, many of the leading thoroughfares in Dublin were plunged into partial darkness by the failure of the electric light. Several of the arc lamps in Sackville Street and other principal streets were extinguished; while to add to the general discomfiture, private consumers were deprived of their light about 10.30, and much inconvenience was caused to shopkeepers. Private lighting was, however, restored after ten minutes; but the failure of the public supply continued during the night, and the streets presented a dismal appearance. This is the second failure of the light that has occurred within the past few weeks.

**Sudden Death of a Beckton Stoker.**—An inquest was recently held at Barking in regard to the death of William Thomas Turner, aged 59, which occurred at the Beckton Gas-Works a few days previously. Deceased was walking outside one of the retort-houses when he suddenly fell to the ground, though there was nothing to trip him up. In the evening a fellow-workman noticed that he was ill, and sent for a medical man. Dr. John Guest said he found the deceased quite unconscious, and in a profuse perspiration. Coma came on, and the man gradually died. There was nothing the matter with his head as the result of the accident; and he (witness) was of opinion that death was due to hemorrhage of the brain. The fall had nothing to do with it. The Jury returned a verdict in accordance with the medical evidence.

**Life-Saving Apparatus for Use in Noxious Atmospheres.**—In June 1907, the Council of the Royal Society of Arts offered (under the Fothergill Trust) a gold medal, or a prize of £20, for the best portable apparatus or appliance for enabling men to undertake rescue work in places where the air is noxious. In response to this offer, a certain number of answers were received. The Council had hoped to be able to make practical tests of the apparatus submitted; but the facilities which they had expected to obtain for the purpose were unfortunately not immediately available, and consequently the proposed trials had to be postponed. The Council are now informed that facilities for carrying out tests will shortly be available. So long a time has, however, elapsed since the original offer, that some inventors who notified their intention of competing have already made improvements in their apparatus, and applications have also been received from other inventors whom the Council would regret to exclude from the competition. After careful consideration of the circumstances, and having regard to the fact that the right was reserved of extending the time for sending in, the Council have now decided to cancel the original offer and to accept for competition any apparatus which may be submitted not later than the 31st of March next.

# Maughan Geyzers

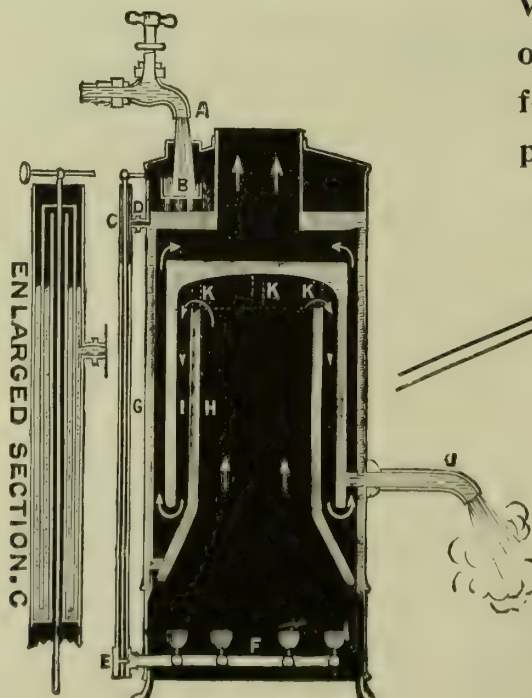
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The most perfect made

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Water Heaters  
of all kinds  
for all . . .  
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PARKINSON  
STOVE CO., LTD.

(Incorporating

MAUGHAN'S PATENT GEYSER CO.)

BIRMINGHAM:  
Stour Street,  
Spring Hill.

LONDON:  
129, High Holborn.



**Suicide of a Gas-Stoker.**—A Brighthouse gas-stoker, named Charles Bintliffe, aged 46, who had for some time been out of health, was found sitting in a chair with his head wrapped in a tablecloth. In his mouth was a piece of india-rubber tubing, the other end of which was fastened to a gas-bracket. The services of a doctor were immediately requisitioned; but on his arrival, the man was found to be dead.

**St. Ives Water Supply.**—An increase in the water rate from 1s. 3d. to 1s. 6d. in the pound was decided upon at the last meeting of the St. Ives (Cornwall) Town Council. Mr. R. S. Read explained that the increase was due to the action of the Local Government Board, who insisted on their carrying out the larger of two schemes for the provision of storage for the water. They had to make a reservoir capable of holding 22 million gallons instead of 14 millions, as at first proposed; and this meant an additional expense of £2000.

**Gas Fatality at Watford.**—A verdict of "Accidental death" was returned by a Coroner's Jury at Watford, who inquired into a sad occurrence by which the elderly wife of a carpenter named Waterman lost her life. It was stated that the couple had a gas-stove in their bedroom; and on Christmas morning Mrs. Waterman was found suffocated, while her husband, who subsequently recovered, was unconscious. The theory put forward was that a kettle on the stove boiled over, putting out the flames, and that the consequent escape of gas was responsible for the woman's death.

**Extensions at Rochdale Gas-Works.**—The Gas Committee of the Rochdale Corporation considered at a recent meeting plans for extensions at the gas-works, together with a report of the Engineer (Mr. T. B. Ball) on the matter. The proposals include one for the rebuilding of the old retort-house and the equipment of the new premises with vertical retorts, and the making of a new high-level road and coal-store; the estimated cost of the extensions being £25,000. It was stated that by the new system of carbonization the cost of production would be reduced from 1s. 9d. to about 9d. per 1000 cubic feet. It was resolved that a Sub-Committee should visit London and other places where vertical retorts have been installed.

**New Joint-Stock Companies.**—Owners of South Pelaw Colliery, Limited, is the title of a Company which has been formed with a capital of £80,000, in £1 shares, to take over the business carried on at the South Pelaw Collieries, Chester-le-Street, and to adopt an agreement with Messrs. T., R. W., & H. D. Foster, T. P. Griffiths, W. T. Dance, J. Hunter, and T. D. Fenwick. The Cove and Kilcraggan Gas Company was registered in Edinburgh last week with a capital of £2000, in 400 shares of £5 each. The public are not invited to subscribe. L. Sterne and Co., Limited (with a capital of £130,000, in £1 shares), has been formed to take over as a going concern the undertaking of Sterne and Co., Limited, and to carry on the business of manufacturers of gas-engines, calorific engines, &c.

Last Thursday, extensive damage was caused by a fire at the residence of Mr. R. C. Swann, Rockcliffe Park, near Darlington. It is stated that electricians were at work installing electric lighting in the mansion; and the supposition is that a wire fused. The fire broke out in the nursery, which was completely destroyed.

On the suggestion of the Town Clerk, the Manager of the Belfast Gas-Works (Mr. R. Sharpe) has been instructed to supply the men employed in cleaning and examining gas cookers and fires on consumers' premises with a uniform, cap, or badge, in order that the consumers may know that these men are appointed by the Gas Department to carry out such work.

At a meeting of the Corporation of Greenock on Tuesday, a letter with reference to a supply of gas for cooking purposes to the new torpedo factory was submitted from Mr. W. O. Fellowe, the Superintending Engineer at Rosyth, in which it was stated that the consumption will probably amount to about 1250 cubic feet per hour for (say) two hours in the middle of the day, and beyond this a considerable amount each day for other purposes. The Gas Manager reported that he was able to fulfil all the requirements.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situation Vacant.

FOREMAN (Tar Works). No. 5169.

### Situations Wanted.

CLERK OR TRAVELLER. No. 5170.  
IN LARGE FIRM OR GAS-WORKS (DESIGNING APPARATUS, &c.). No. 5168.  
SECRETARY, MANAGER, AND ACCOUNTANT. No. 5115.

### Patent Licence.

APPARATUS FOR GASIFYING RAW COMBUSTIBLE MATERIAL. S. F. Paul and Co., Doughty Street, W.C.

### Plant (Second-Hand) for Sale.

RETORTS AND FITTINGS, CONDENSERS, SCRUBBERS, PURIFIERS, GASHOLDERS, &c. MacAlister and Skipper, Cambridge.

### TENDERS FOR

#### Condenser, Exhauster, Washers, and Pumps.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by Jan. 14.

#### Fire-Clay Goods.

BURY CORPORATION. Tenders by Jan. 8.  
HEBEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Jan. 11.  
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 18.

### General Stores—

(Lead Pipe, Pig Lead, Cast Iron Work)—  
PLYMOUTH WATER DEPARTMENT. Tenders by Jan. 20.

### Hydrants, Stopcocks, Ferrules, Valves, &c.

PLYMOUTH WATER DEPARTMENT. Tenders by Jan. 20.

### Sewerage Works.

YEovil CORPORATION. Tenders by Jan. 31.

### Tar.

HARWICH GAS AND COKE COMPANY. Tenders by Jan. 10.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 21.

Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17-17½	..	5 14 3	4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5
298,955	10		7	Do. 7 p.c.	11½-12½	..	5 14 3	1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	110-121	..	4 19 2
200,000	5	Oct. 28	6½	Bombay, Ltd.	52-6	..	5 8 4	561,000	Stk.		10	Liverpool United A.	223-225	..	4 8 11
40,000	5		6½	Do. New, £4 paid.	48-48½	..	5 6 8	718,100	"	"	7	Do. B.	166-168	..	4 3 4
50,000	10	Aug. 26	15	Bourne- 10 p.c.	28½-29	+½	5 3 5	306,083	"	Dec. 29	4	Do. Deb. Stk.	162-164	..	3 16 11
311,810	10	"	7	mouth Gas B 7 p.c.	162-163	..	4 3 7	75,000	5	Nov. 26	6	Malta & Mediterranean.	4½-5	..	6 0 0
75,000	10	"	6	and Water Pref. 6 p.c.	152-153	..	3 16 2	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	59-102	..	4 18 0
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	250,000	100		4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
300,000	"	"	9½	Do. New	180-191	..	4 19 6	541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½-13	..	5 7 8
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	1,775,892	Stk.	July 29	4½	Newcastle & G'tesh'd Con	106-108	..	4 3 4
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	99-101	+1	3 19 3	518,795	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
246,320	"	"	8	Do. A Ord. Stk.	153-156	..	5 2 7	303,000	Stk.	Nov. 26	8	Oriental, Ltd.	137-139	..	5 15 1
460,000	20	Oct. 14	10	British	42½-43½	..	4 11 11	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
109,000	Stk.	Aug. 26	11	Bromley A 5 p.c.	118-120	..	5 0 0	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	60,000	50	"	12	Do. B.	129-131	..	4 19 3
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	100,000	50	"	10	Do. C.	122-124	..	4 16 9
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14-14½	..	4 16 7	398,490	5	Oct. 28	7	Primitiva Ord.	78-78½	+½	4 14 11
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	+1	4 0 0	796,983	5	July 29	5	Do. 5 p.c. Pref.	58-58½	..	4 13 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	483,000	100	Dec. 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Do. 4 p.c. Pref.	52-52½	..	—	1,900,000	10	Oct. 14	8	River Plate Ord.	17-17½	..	4 11 5
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48-49	+½	6 2 6	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
100,000	Stk.	Dec. 23	4½	Do. 4½ p.c. Deb. Stk.	80-82	..	5 9 9	250,000	10	Sep. 29	8	San Paulo, Ltd.	14½-15	..	5 6 8
157,157	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	62,500	10	"	6	Do. 6 p.c. Pref.	112-124	..	4 18 0
1,491,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
560,000	"	"	5½	Do. 3½ p.c. do.	103-105	..	4 15 3	135,000	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	80-82	+½	3 13 2	269,984	"	"	10	Do. B.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	523,560	"	Oct. 14	10	Do. C.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	127-139	..	5 0 9	70,000	10	Oct. 14	10	South African	124-124½	..	7 16 11
491,270	Stk.	"	5	Derby Con. Stk.	131-133	..	4 1 4	6,439,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	120-122	+1	4 7 4
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	82-84	..	3 11 5
14,000	"	Oct. 2	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	209,821	Stk.	Aug. 12	8	South Shields Con. Stk.	160-162	..	4 18 9
495,000	10	July 14	12	European, Ltd.	24½-25	..	4 16 0	605,000	Stk.	Aug. 26	5½	S'th Suburb'n Ord. 5 p.c.	120-122	+1	4 10 2
354,060	10	"	12	Do. £7 10s. paid.	18½-19	+½	4 14 0	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
15,141,545	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	87-89	..	4 9 8	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
2,620,000	"	"	3½	light 3½ p.c. max.	103-104	..	3 18 2	502,310	Stk.	Nov. 11	5	Southampton Ord.	109-111	..	4 10 1
3,799,735	"	"	4	Do. 4 p.c. Con. Pref.	103-105	..	3 16 2	120,000	Stk.	Aug. 12	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
4,173,975	"	Dec. 23	3	Coke 3 p.c. Con. Deb.	81-83	+½	3 12 3	453,940	"	"	58½	and B 3½ p.c.	111-113	..	4 15 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92-94	..	5 6 4	149,470	"	Dec. 29	4	Edmonton 4 p.c. Deb.	98-100	..	4 0 0
62,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	182,380	10	Dec. 29	8	Tuscan, Ltd.	9-9½	+½	8 8 6
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½-18	..	6 2 3	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	101-102	..	4 18 0
131,000	Stk.	Sep. 10	6½	Ilford A and C	144-146	..	4 9 0	230,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	110-112	..	4 9 3
65,781	"	"	5	Do. B	108-110	..	4 10 11	255,636	Stk.	Aug. 26	68	Wands- B 3½ p.c.	159-161	..	4 14 0
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	79,416	"	Dec. 29	3	worth 3 p.c. Deb. Stk.	72-74	+½	4 1 1

Prices marked \* are "Ex div."



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## O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

## SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
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## "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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See Advertisement on p. 1.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

## BROTHERTON &amp; CO., LIMITED.

Offices: City Chambers, LEEDS.  
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K. & A. WATER-GAS COMPANY, LTD.

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## GAS TAR wanted,

BROTHERTON AND CO., LTD., Tar Distillers.  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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## A. ROUX &amp; CO., Limited,

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
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JOHN E. WILLIAMS AND CO.,  
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.  
For all Gas Joints.  
For all Tar Joints.  
For all Ammonia Joints.

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## SPECIALLY prepared for Sulphate of AMMONIA Makers by

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BROTHERTON AND CO., LTD., Ammonia Distillers.  
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REPAIRS RECEIVE PROMPT ATTENTION.  
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## SPENT OXIDE PURCHASED IN ANY DISTRICT.

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DRIVING AND CONVEYOR CHAINS.

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Twice as Rich as Bog Ore.

Gives no back Pressure.

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CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Borubbers, Washers, Purifiers, Gas-holders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.  
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DUNDEE.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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## SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.  
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Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD, MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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Combine Brilliancy and Strength. British Made. Send for List.

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Best Percentages. For lowest Quotations to any Port,  
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Ammonia obtained from the use of this Vitriol, which  
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**WANTED, Regular Supplies of Sul-**  
phur from the Claus Process.  
Apply to HENRY ELLISON, LIMITED, Cleckheaton,  
YORKS.

**GAS COKE.**  
**THE G. J. EVESON Coal and Coke Com-**  
pany, Limited, Birmingham, would be glad to  
receive OFFERS of GAS COKE free into Trucks on  
Rail from Gas Companies having Surplus Quantities  
for Disposal.

**MR. W. B. MIMMACK, for many years**  
Secretary, Manager, and Accountant of the Crays  
Gas Company (111 Millions), now in Amalgamation,  
seeks APPOINTMENT in any or all of these Offices.  
Address No. 5115, care of Mr. King, 11, Bolt Court,  
FLEET STREET E.C.

**APPLICANTS for the Post advertised**  
in the "JOURNAL" on Dec. 14 (No. 5163), are in-  
formed hereby that the VACANCY HAS NOW BEEN  
FILLED. Will they kindly accept this Acknowledg-  
ment of the Particulars Furnished?

**CLERK (Age 29) desires Change. Twelve**  
Years' Experience with First-Class Firm Manu-  
facturing Retorts, Fire-Bricks, Sanitary Specialities,  
&c. Would Travel if desired. Moderate Salary. Ex-  
cellent References.  
Address No. 5170, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**ADVERTISER, a thorough Practical**  
and Experienced Man, DESIRES ENGAGE-  
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or Abroad. Well up in the Designing and Repairing  
of every kind of Wet and Dry Meters, Station Meters.  
Governors, Gauges, Brass Work, and other Gas Ap-  
paratus of all kinds to meet the keenest of Competition.  
A Good Organizer and used to the control of a large  
number of Men.  
Address No. 5168, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**WANTED—A Foreman for Tar-Works.**  
Apply, by letter, stating Experience and Wages  
required, to No. 5169, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
A. LOWCOCK, LIMITED, SREWSBURY.

**GASHOLDERS—Splendid, 45 feet dia-**  
meter, and New STEEL TANK fixed complete,  
to Plan and Specification. Also 50 feet Single-Lift  
and 60 feet Double-Lift. Cheap, with STEEL TANKS  
Can be seen temporarily erected.  
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

**FOR SALE.**  
**TENDERS are invited for the Purchase**  
of GAS PLANT, consisting of RETORTS and  
FITTINGS, CONDENSERS, SCRUBBER, PURI-  
FERS, GASHOLDERS, &c., and sundry CONNEC-  
TIONS; also Two large BOILERS, from an Institution  
where a different System is being Installed.  
Can be viewed on Site, or full Particulars obtained  
from MACALESTER AND SKIPPER, Architects, CAMBRIDGE.

**BOROUGH OF HEYWOOD.**  
**THE Gas Committee of the Corporation**  
of Heywood are prepared to receive TENDERS  
for the Supply of RETORTS and FIRE-CLAY GOODS.  
Specification and Quantities and Form of Tender may  
be obtained upon Application to Mr. W. Whatmough,  
Gas Manager.  
Sealed Tenders, endorsed "Retorts and Fire-Clay  
Goods," to be sent to me not later than Tuesday,  
Jan. 18, 1910.

By order,  
Geo. G. BOUCHIER,  
Town Clerk.  
Municipal Buildings,  
Heywood, Jan. 1, 1910.

**TO RETORT AND FIRE-BRICK**  
**MANUFACTURERS.**  
**THE Corporation of Bury are prepared**  
to receive TENDERS for RETORTS, FIRE-  
BRICKS, and FIRE-CLAY required at their Gas-  
Works.  
Forms of Tender may be obtained from Mr. H. Sim-  
monds, Engineer and Manager, Gas-Works, Bury.  
Sealed Tenders to be sent to the TOWN CLERK, BURY,  
not later than Saturday, Jan. 8, 1910.

**HARWICH GAS AND COKE COMPANY.**  
**TENDERS are invited for the Surplus**  
TAR produced at this Company's Works for the  
Year ending Dec. 31, 1910.  
The Tar will be delivered Free into Railway Tank-  
Waggons or Tank-Barges at this Works.  
Probable Quantity, 120 Tons.  
The Directors do not bind themselves to accept the  
highest or any Tender.  
Sealed Tenders to be delivered addressed to me not  
later than the 10th day of January, 1910.  
GEO. BAINES,  
Secretary.

**HEBDEN BRIDGE AND MYTHOLMROYD**  
**GAS BOARD.**  
**THE above Gas Board are prepared to**  
receive TENDERS for the Supply of RETORTS,  
FIRE-BRICKS, &c., required by them for Twelve  
Months ending Dec. 31, 1910.  
Further Particulars from E. J. Wellens, Engineer  
and Manager, Gas Offices, Hebden Bridge.  
Sealed Tenders, endorsed "Fire-Clay Goods," ad-  
dressed to James Simpson, Esq., Chairman of the Gas  
Board, Gas Offices, Carlton Street, Hebden Bridge, and  
delivered at these Offices not later than Tuesday, the  
11th of January, 1910.  
R. CRABTREE,  
Clerk to the Gas Board.  
Gas Offices, Carlton Street,  
Hebden Bridge, Dec. 28, 1909.

**PLYMOUTH CORPORATION WATER-WORKS.**  
**TENDERS are invited for the Supply of**  
the following GOODS and MATERIALS for the  
period of One Year:—  
Fire-Hydrants.  
Lead Pipe and Pig Lead.  
Stopcocks, Ferrules, &c.  
Cast-iron Work.  
Sluice-Valves.  
Particulars and Forms of Tender can be obtained at  
this Office on and after Jan. 1, 1910.  
The lowest or any Tender will not necessarily be  
accepted.  
Tenders, enclosed in Envelopes provided, to be  
delivered at this Office by Twelve o'clock Noon on  
Thursday, Jan. 20, 1910.  
FRANK HOWARTH, M.Inst.C.E.,  
Water Engineer.  
Municipal Buildings, Plymouth.

**SUTTON-IN-ASHFIELD URBAN DISTRICT**  
**COUNCIL.**  
**GAS-WORKS EXTENSION.**  
**PERSONS desirous of Tendering for**  
the Supply and Erection of a CONDENSER,  
EXHAUSTER, LIVESEY WASHER, ROTARY  
WASHER and PUMPS, in connection with the above,  
are requested to send their names and addresses to  
Messrs. Corbet Woodall and Son, Palace Chambers,  
Bridge Street, Westminster, S.W., not later than  
Friday, the 14th day of January, 1910, together with  
Deposit Cheque of £1 ls. for Copies of Specifications,  
Drawings, and Form of Tender.  
The Deposit will be returned on receipt of a *bond-fide*  
Tender.  
The lowest or any Tender will not necessarily be  
accepted.  
JOHN D. FIDLER,  
Clerk to the Council.  
Council Office,  
Sutton-in-Ashfield.

**YEovil CORPORATION.**  
**SEWERAGE WORKS.**  
**THE Corporation of the Borough of**  
Yeovil are prepared to receive TENDERS for the  
Construction of certain SEWERS, DRAINS, and  
OTHER WORKS within the Borough and in the Parish  
of Yeovil Without.  
Drawings may be inspected, and Specifications and  
Forms of Tender, with Schedules of Quantities, can be  
obtained, on Payment of the sum of Two Guineas (to be  
returned on receipt of a *bond-fide* Tender) on Applica-  
tion at the Office of the Borough Surveyor at Yeovil or  
at the Office of Messrs. T. and C. Hawksley, Civil  
Engineers, Caxton House, Westminster, S.W., on and  
after Monday, the 10th day of January 1910; and Tenders,  
marked "Sewerage," to be addressed to the Town  
Clerk, must be delivered at his Office in Yeovil at or  
before Noon on Monday, the 31st day of January, 1910.  
The Corporation do not bind themselves to accept  
the lowest or any Tender.

HENRY B. BATTEN,  
Town Clerk.  
Yeovil, Dec. 30, 1909.

**SALES BY AUCTION OF GAS AND WATER**  
**STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS beg to**  
notify that their SALES BY AUCTION OF NEW  
CAPITAL ISSUED UNDER PARLIAMENTARY  
POWERS, and of STOCKS and SHARES belonging to  
EXECUTORS and other PRIVATE OWNERS in LON-  
DON, SUBURBAN, and PROVINCIAL GAS and  
WATER COMPANIES, take place PERIODICALLY  
at the Mart, TOKENHOUSE YARD, E.C.  
Terms for Issuing New Capital, and also for including  
other Gas and Water Stocks and Shares in these Periodi-  
cal Sales, will be forwarded on Application to MESSRS.  
A. & W. RICHARDS, at 18, FINCHBURY CIRCUS, E.C.

**THE Proprietor of the Patent No. 2245,**  
of 1906, relating to "AN IMPROVED METHOD  
OF, AND APPARATUS FOR GASIFYING RAW  
COMBUSTIBLE MATERIALS," is desirous of en-  
tering into Arrangements, by way of LICENSE and  
otherwise, on Reasonable Terms, for the purpose of  
EXPLOITING the same and ensuring its full Develop-  
ment and Practical Working in this Country.  
All Communications should be addressed in the first  
instance to S. F. PAUL and Co., 60, DOUGHTY STREET,  
W.C.

*Testing Instruments.*  
**ALEXANDER WRIGHT & CO., LD.**  
WESTMINSTER.

**MIRFIELD GAS COAL.**  
**UNEQUALLED.**  
Sperm Value 87.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the  
**MIRFIELD COLLIERY COMPANY**  
**RAVENSTHORPE, NEAR DEWSBURY.**  
**LONDON: 16, Park Village East, N.W.**

**NOW READY.**  
Price, Bound in Cloth, 5s. 6d., Post Free.  
**TWENTY-SEVENTH YEAR**  
THE  
**Complete Reports**  
OF  
**PROCEEDINGS**  
OF THE  
**DISTRICT ASSOCIATIONS**  
OF  
**GAS MANAGERS**  
**FOR 1909.**  
Most of the previous Volumes are still on Sale.  
LONDON:  
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

**THOMAS DUXBURY & CO.,**  
**16, DEANSGATE, MANCHESTER,**  
Gas Engineers' Agents and Contractors for  
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND  
ALL OTHER GAS APPARATUS.  
Inquiries Solicited.  
Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1806.

**NEWBATTLE CANNEL.**  
Highest Results in Gas, & Excellent Coke.

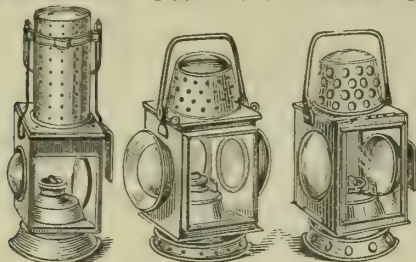
QUOTATIONS ON APPLICATION TO  
**THE LOTHIAN COAL COMPANY,**  
LIMITED,  
NEWBATTLE COLLIERIES,  
NEWTONGRANGE, MIDLOTHIAN.

**HEATHCOTE GAS COAL**  
from the  
**GRASSMOOR COLLIERIES,**  
**CHESTERFIELD.**

Rich in Illuminating Power and Yield of Gas.  
Above the Average in Weight and Quality  
of Coke.  
Maintains a High Standard in Residuals.



## ARMSTRONG'S PATENT CANDLE SAFETY LAMPS.



No. 1.

No. 2.

No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

## THOMAS TURTON AND SONS, LIMITED, SHEAF WORKS, SHEFFIELD, MANUFACTURERS OF FILES OF BEST QUALITY FOR ENGINEERS. STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,  
SPANNERS, RATCHET BRACES, LIFTING JACKS,  
ANVILS, VICES,  
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

## TROTTER, HAINES, & CORBETT, BRETTELL'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE  
FURNACE & BLAST-FURNACE BRICKS, LUMPS,  
TILES, and every description of FIRE-BRICKS.  
Special Lumps, Tiles, and Bricks for Regenerative  
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN &amp; Co.,

LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

## ALL the BOYS CALORIMETERS

which have been in daily use in  
all the Official Testing-Stations in  
London for the last Three Years

WERE MADE BY  
**JOHN J. GRIFFIN & SONS,**  
— LIMITED —  
KINGSWAY, LONDON, W.C.

Those desiring to obtain Gas Calorimeters  
as used in the Official Testing Places  
should see that the apparatus bears the  
name of the Original makers.

Descriptive Catalogue on Application.

## BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and  
Pelaw Main Collieries,

### GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNec-  
TIONS for Gas, Water, Steam, Electrical,  
Sanitary, and other purposes; also TANKS,  
COLUMNS of every description, Hydraulic,  
Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of  
our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.

London Offices:

46, CANNON STREET, E.C.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

## JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,  
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches  
in diameter, and make and erect to order  
RETORTS, PURIFIERS, and TANKS, with  
or without planed joints, COLUMNS,  
GIRDERS, SPECIAL CASTINGS, &c., re-  
quired by Gas, Water, Railway, Telegraph,  
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.  
These are cast in one piece, without Chap-  
lets; doing away with Bolts, Nuts, and Covers,  
and rendering Leakage impossible.

## CASES FOR BINDING QUARTERLY VOLUMES OF THE "JOURNAL" PRICE 2s. EACH.

**PROFESSOR DR. STRACHE,**  
Wassergas-u. Patentverwertungs-Gesellschaft, m.b.H.  
Alserstr. 71. WIEN. Alserstr. 71.

## PROJECTS AND INSTALLATIONS OF WATER-GAS-PLANTS

On the Strache System.

### STEAM-CONTROLLER for Water-Gas-Plants

RAISES the Calorific Value up to 3000 Calories.  
REDUCES the CO<sub>2</sub> Contents to 2 per cent.  
INCREASES the Capacity of the Unit-Time.  
DIMINISHES the Steam Consumption.  
INCREASES the Yield.

### AUTOLYSATOR

Apparatus for Use in Heating-Plants of All Kinds, registering  
continuously and visibly the CO<sub>2</sub>.

### GASOSCOPE

Apparatus serving to Find out the Leakage in Gas-Mains.

Representative for England:—G. PETTIGREW, THORNABY-ON-TEES, ENGLAND.

## A FACT!

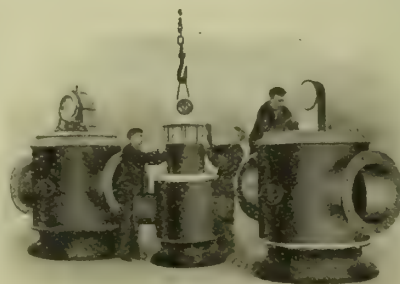
COKE is selling at . . . 11s. 8d. a Ton

COALEXLD is selling at . 20s. 0d. a Ton

IN THE SAME TOWN.

DATA GIVEN.

COALEXLD LTD., LANCASTER.



OVER 600  
ROTARY  
Station Meters

IN COMMISSION.

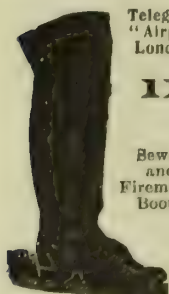
Particulars from—

T. G. MARSH,

28, Deansgate,  
MANCHESTER.

# CAST-IRON PIPES FOR GAS, WATER, & STEAM, also VALVES of all descriptions. R. LAIDLAW & SON, LTD.,

ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,  
And LAMBHILL FOUNDRY, GLASGOW.  
OFFICE: 147, MILTON STREET, GLASGOW.



Telegrams:  
"Airproof,  
London."

## THOMAS BUGDEN & CO.,

India-Rubber and Airproof Manufacturers and General Contractors,

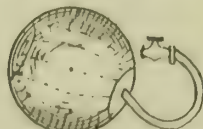
116-118, GOSWELL ROAD, LONDON, E.C.

Largest Manufacturers of Gas Main Bags.

### Patentees of the DENMAR BAG,

Impervious to Main Liquor and  
Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses,  
Sewer Boots, Tar Hose, Stokers' Mitts,  
Bellows, &c.



Gas Bags for repairing Mains,  
All Beams Stitched and Taped,



Gas Bags for repairing  
Mains. All Seams  
Stitched and Taped.



Contractors' and Miners'  
Jackets.



# GRAETZIN LIGHT

## *Important Improvements.*



### BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

## Munich Inclined Chamber Furnaces.

Plants already built and under Construction :

Total capacity: 45,000,000 c.ft. of pure Coal Gas per 24 hours.

The following Cities have adopted { Munich Chamber furnaces: { Berlin, Hamburg (second order), Paris, Munich, Kierstein, Moosach, Leipzig, Rome, Hanau, Regensburg.

For Particulars and Tenders apply to :

**The Coke Ovens and By-Products Co., Ltd.,**  
Palace Chambers, Westminster. S.W.

Gas Engineers of the most important Works are high in their praises of the Fire-Clay Goods supplied by

**MOBBERLEY & PERRY OF STOURBRIDGE.**  
LIMITED,

**GAS-RETORTS A SPECIALITÉ.**



The Inverted Burner has met with great success, but it has by no means

**KILLED the UPRIGHT.**

THE

# LUCAS LIGHT'S LONG LIFE

is proof of this.

The Lucas Light was the first and original self-intensive high-power lamp, and its steady sale to-day proves its value.

200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

No high pressure required.

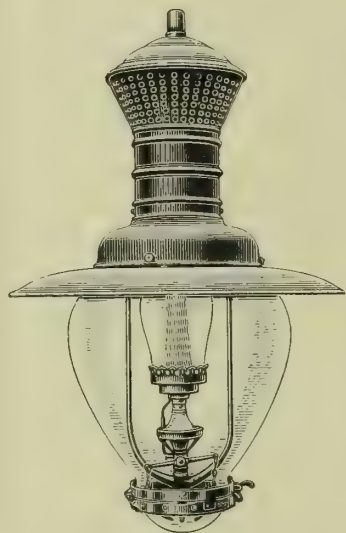
SIMPLE. BRILLIANT. RELIABLE.

The "Lucas" is the best lamp for Public Halls, Factories, Workshops, Streets, Railway Stations, &c., and the prices compare favourably with those of any similar type of lamp.

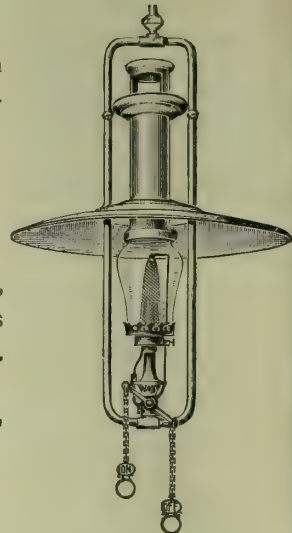
**WIND, DUST, and INSECT PROOF.**

**MOFFAT'S LTD.,**

13, FARRINGTON ROAD, LONDON, E.C.



OUTDOOR.



INDOOR.

## THE WIGAN COAL & IRON CO., LIM<sup>TD.</sup>

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Workop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."

<b>HANNA, DONALD &amp; WILSON, PAISLEY,</b> <b>ENGINEERS &amp; CONTRACTORS.</b>							
<p>LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.</p>	<p>CONDENSERS VARIOUS TYPES.</p>	<p>GAS AND WATER VALVES.</p>	<p>ROOFING STRUCTURAL WORK M'S &amp; C'S PURIFIERS.</p>	<p>GAS EXHAUSTER &amp; GAS ENGINE.</p>	<p>ROTARY GAS EXHAUSTER.</p>	<p>GASOMETER AND C.I. OR S.C. TANKS.</p>	<p>ADMIRALTY LIST. WAR OFFICE LIST. COLONIAL AGENTS. ETC.</p>

## JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

## ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

**VERY FREE FROM IMPURITIES.**

TELEGRAMS: "ATLAS SHEFFIELD."



## MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

**A.** The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

**B.** In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

**C.** In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

Aug. Klönne  
Dortmund 5. (GERMANY).

Chamber-Furnaces  
HORIZONTAL, VERTICAL, INCLINED  
FOR GAS AND COKE

SO FAR 97 CHAMBERS BUILT AND  
BUILDING FOR A DAILY PRODUCTION  
4 322 500 Cfeet.

IN POINT OF EFFICIENCY, COST OF  
PRODUCTION AND RESULTS

BEST FURNACES IN THE WORLD.

2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.

EVERITT'S Patent  
**TAR-FOG EXTRACTOR**  
AND  
**NAPHTHALENE REMOVER.**

SOLE MAKERS,

**ROBERT DEMPSTER & SONS,**

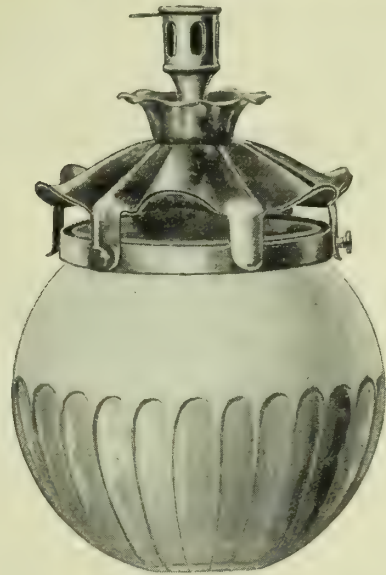
ROSE MOUNT IRON-WORKS, LTD.,

**ELLAND, Yorks.**

## THE "DARWIN"

PATENT

## INVERTED BURNERS.



No. 3 "DARWIN." 3½ in. Fitting.

Have been remodelled, and we now offer you

**BETTER BURNERS**

AT

**REDUCED PRICES**

And guarantee the highest finish and Workmanship.

Independent Test by a well-known Gas Manager of  
No. 3 Burner.

**CONSUMPTION . . . 3.55 ft.**  
of Gas at 15/10ths Pressure,

**CANDLE POWER . . . 122.76**

These figures speak for themselves.

Breakage of Mantles and

**MAINTENANCE CHARGES**

Reduced to a minimum.

Made in 3 SIZES and 8 PATTERNS

BY

**CHARLES JOYNER & CO.,**  
LIMITED,

Icknield Square,


**BIRMINGHAM.**



# CONTINUOUS CARBONIZATION

**GLOVER-WEST  
PATENTS.**

IN



**VERTICAL  
RETORTS**

*Description and  
Particulars of Tests  
will be forwarded  
on request.*

## COST OF LABOUR

REDUCED TO

**2  $\frac{3}{4}$  d.** PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

# WEST'S GAS IMPROVEMENT CO., LTD.,

104, QUEEN VICTORIA STREET,  
LONDON, E.C.

**Engineers,**

Telegrams—"STOKER, MANCHESTER,"  
"RADIARY, LONDON."

Telephones—Nos. 1339 and 5520 Manchester (Central).  
No. 14,406 London (Central).

**MILES PLATTING, MANCHESTER.**



# Welsbach

## LIGHT

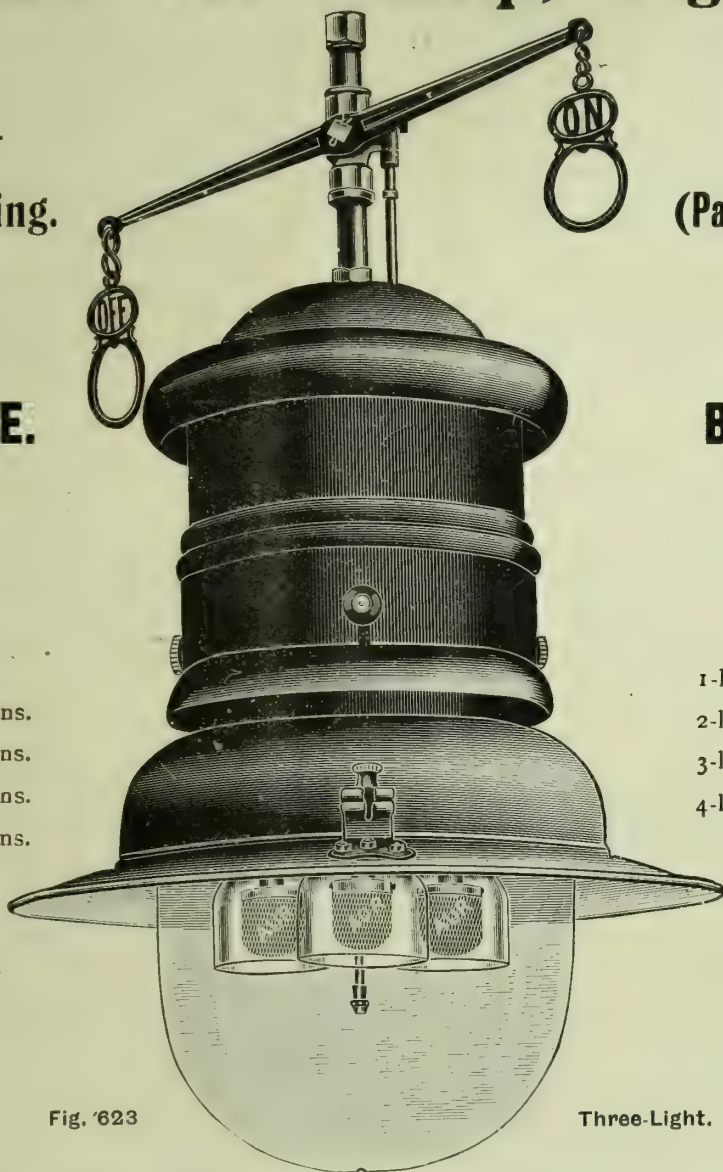
### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " "In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.



# SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.  
REGISTERED.

## THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.

**GREATER CONDUCTIVITY THAN ANY FIRE-CLAY RETORT.**

For Particulars and prices apply—

**JOSEPH MORTON, LTD.,**

*Cinder Hills Fire Clay Works,*

Telegrams: ESTABLISHED 1783. **HALIFAX.**  
"MORTON, HALIFAX." Tel. No. 134.  
London Agents: DOW & WILSON, 32, Fenchurch Street, LONDON, E.C.

## ARROL-FOULIS

Stoking Machinery

## HYDRAULIC COKE PUSHERS

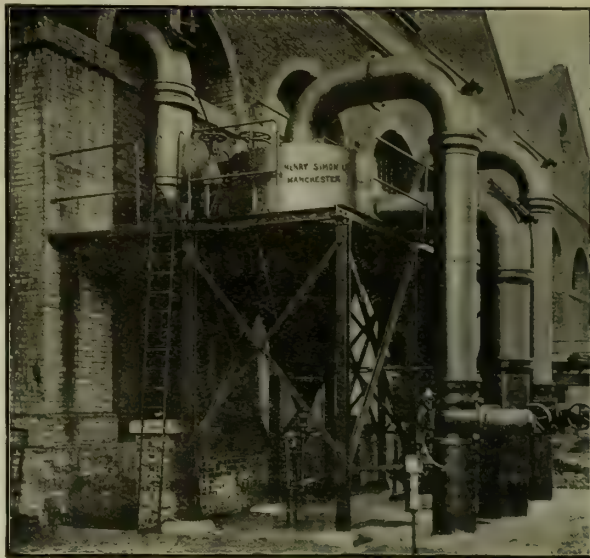
(HUNTER and BARNETT'S PATENT).

**WILL DISCHARGE A RETORT IN ONE OPERATION**  
**LARGE NUMBERS IN USE.**

Full Particulars may be obtained from the Sole Makers,

**SIR WILLIAM ARROL & CO., Limited,**  
**GLASGOW.**

[See Illustrated Advertisement, Dec. 21, p. 844.]



## "CYCLONE" TAR EXTRACTOR.

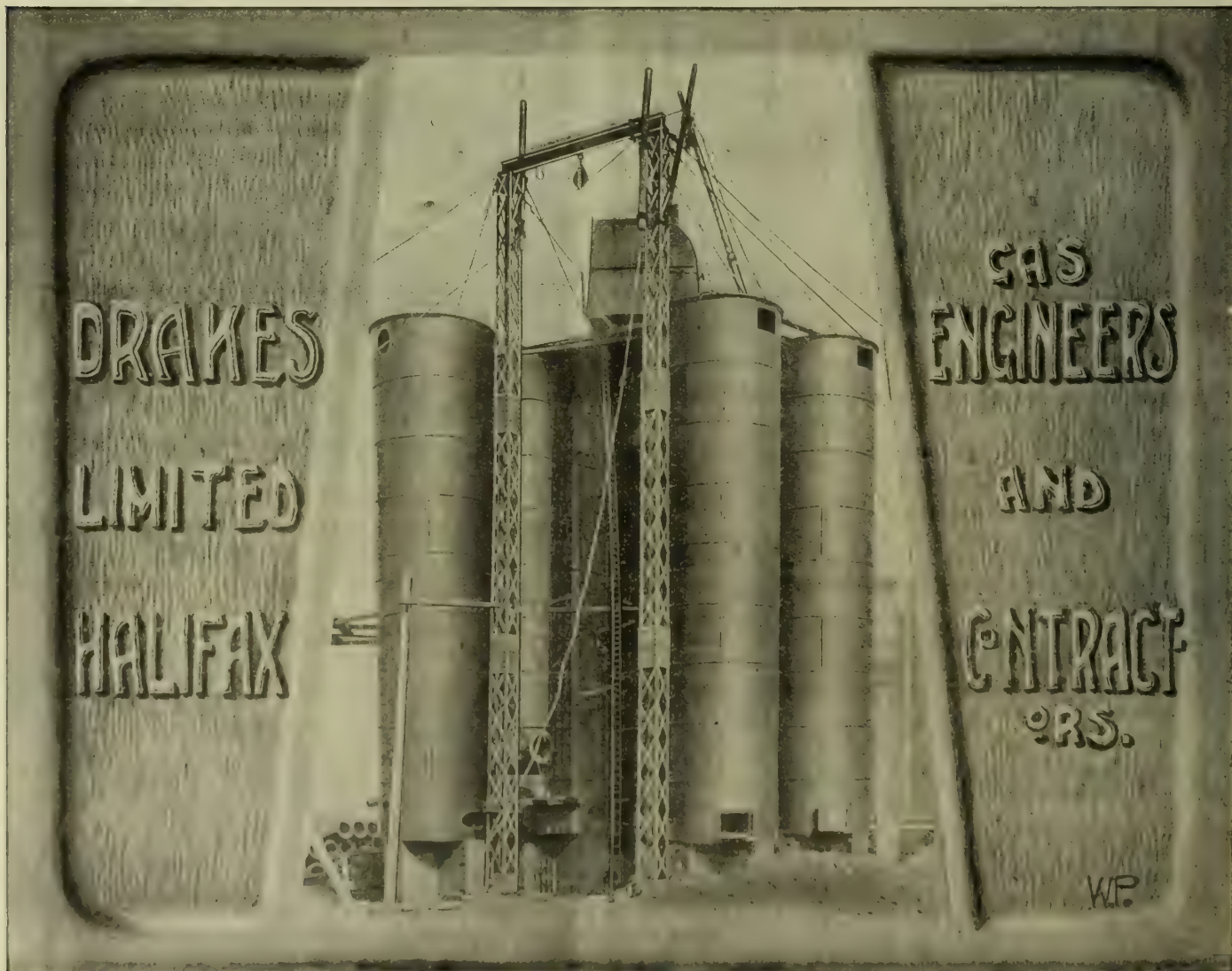
No Steam.

No Moving Parts.

No Power.

**HENRY SIMON, LTD.,**

20, Mount St., Manchester.





**GEO. K. HARRISON LTD.**

**STOURBRIDGE**

CONTRACTORS  
TO  
THE CHIEF GASWORKS  
IN THE BRITISH ISLES  
AND ABROAD.

**FOR**

MANUFACTURED FROM  
OUR  
CAREFULLY SELECTED  
AND  
WELL SEASONED STOCK  
OF  
OLD MINE FIRE CLAY.

**RETORTS**

**MECHANICAL  
COAL  
HANDLING  
PLANTS**

**OF ANY MAGNITUDE**

**MADE AND ERECTED  
BY**

**GIBBONS**

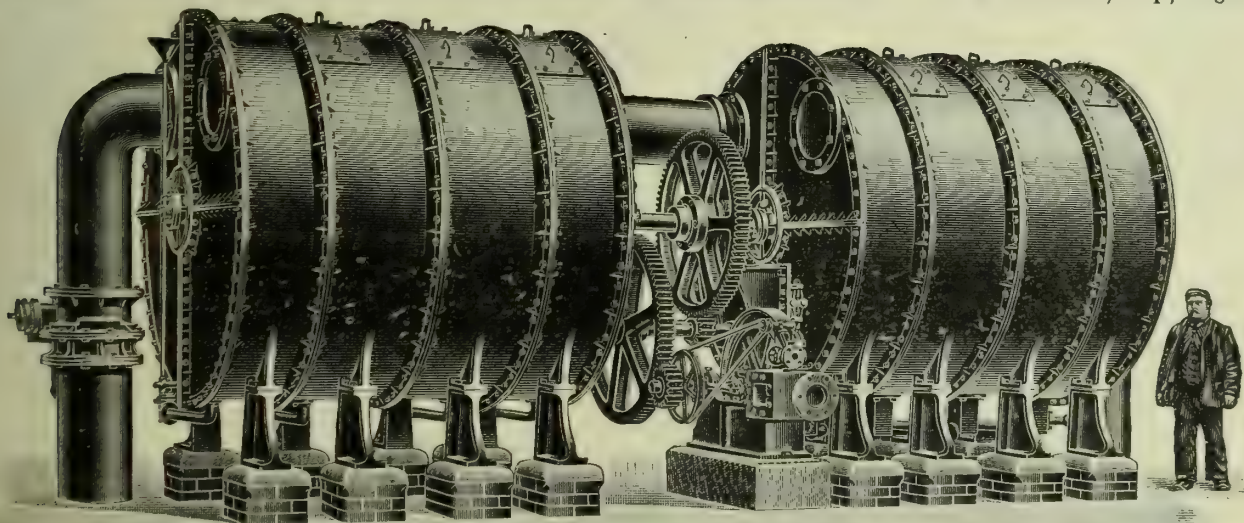
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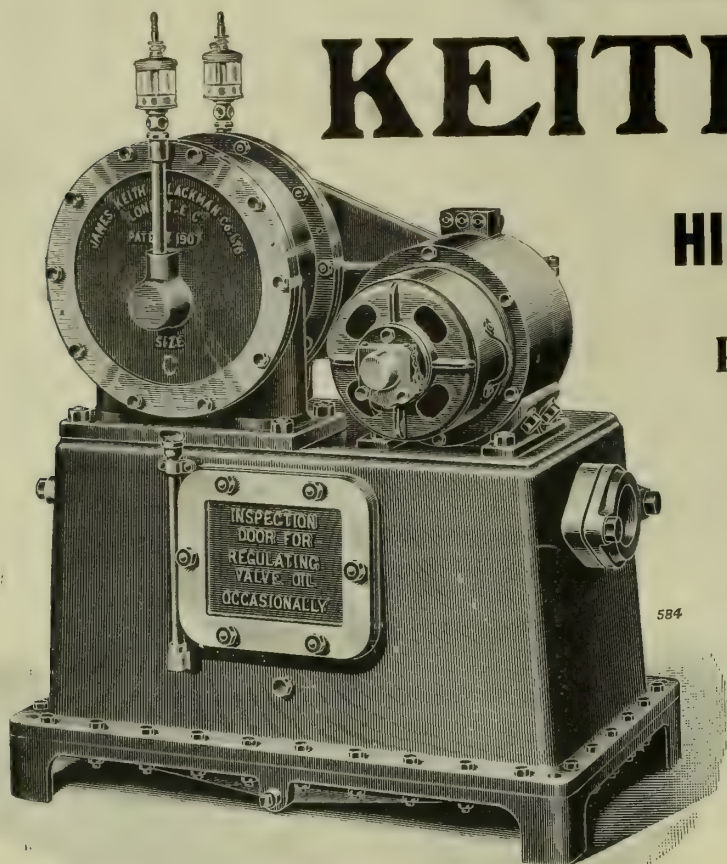
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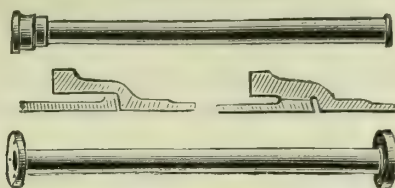
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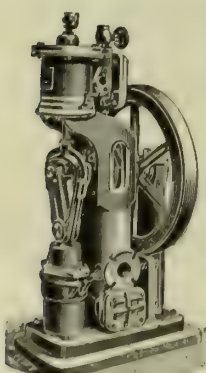


Fig. 705. "SINGLE RAM" STEAM-PUMP.

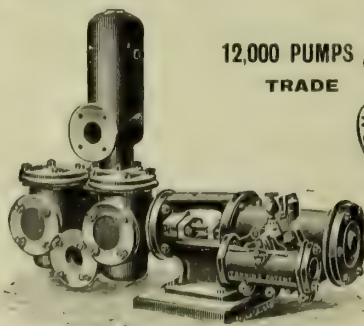


Fig. 699. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

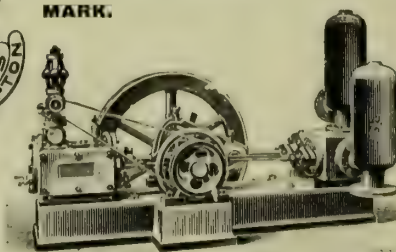


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

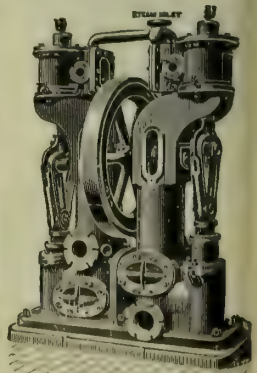


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.



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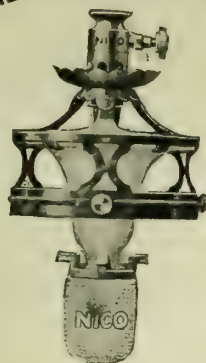
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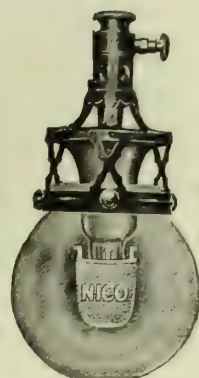
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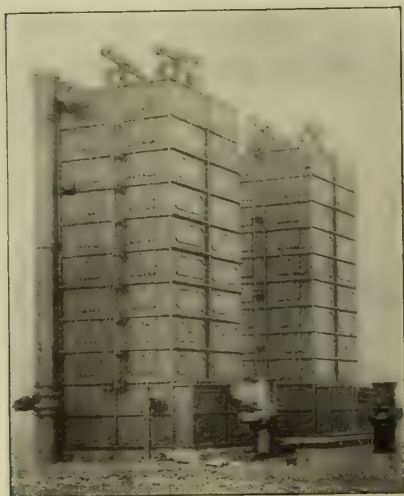
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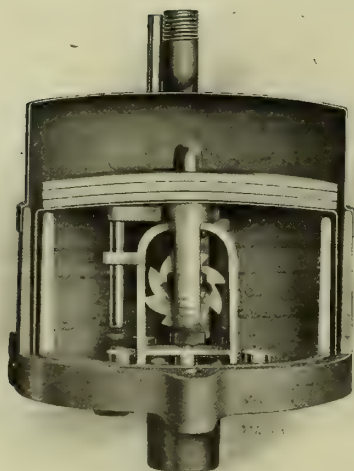
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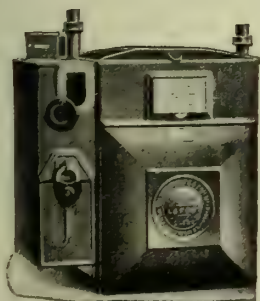
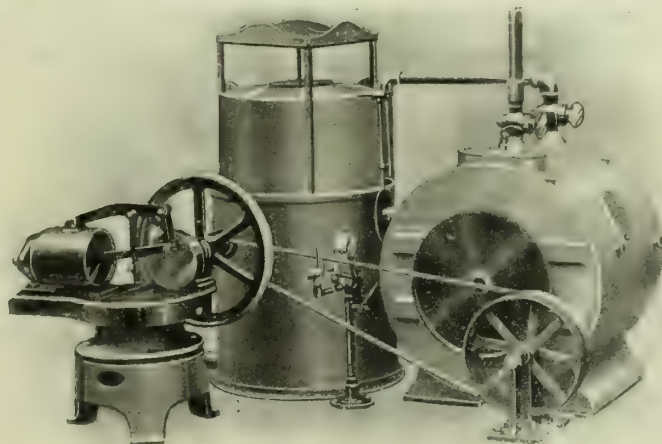
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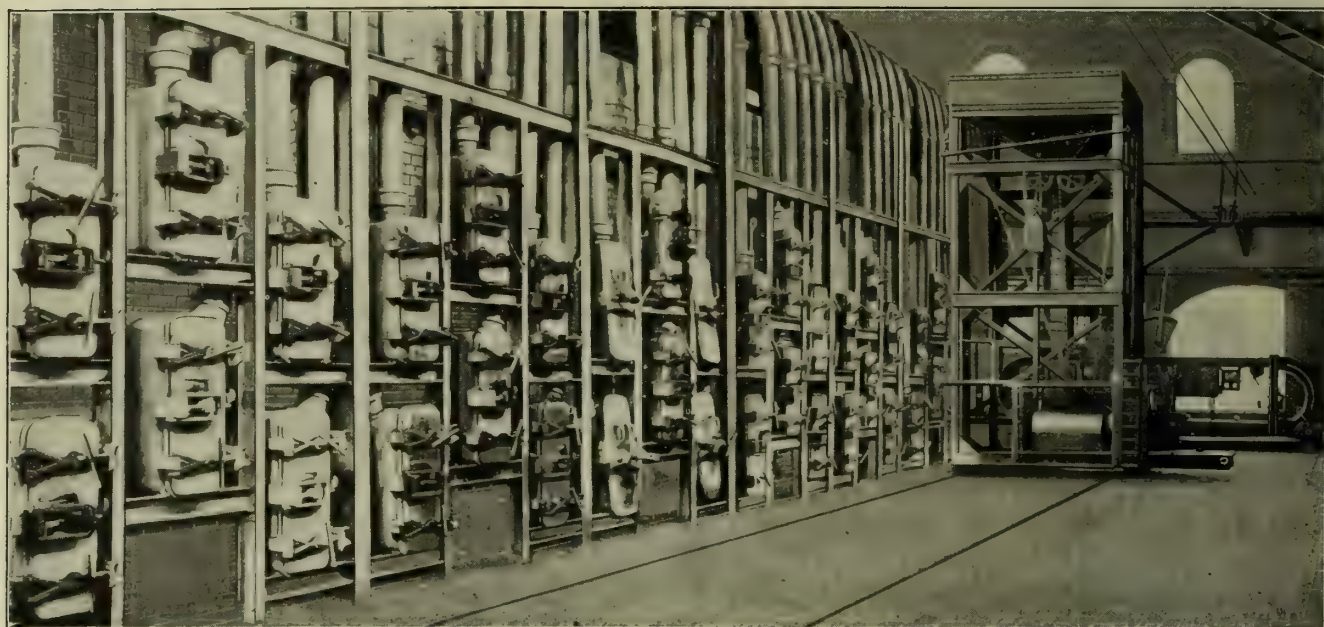
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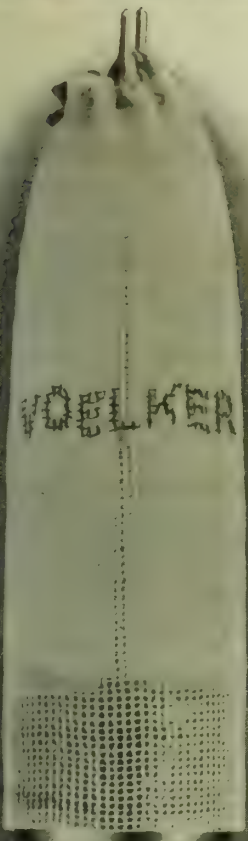
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Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

**A.** The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

**B.** In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

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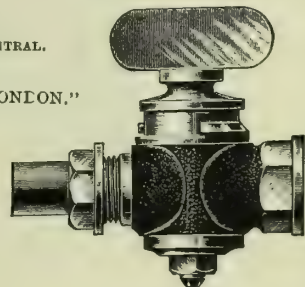
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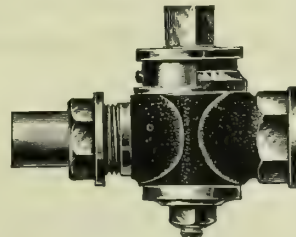
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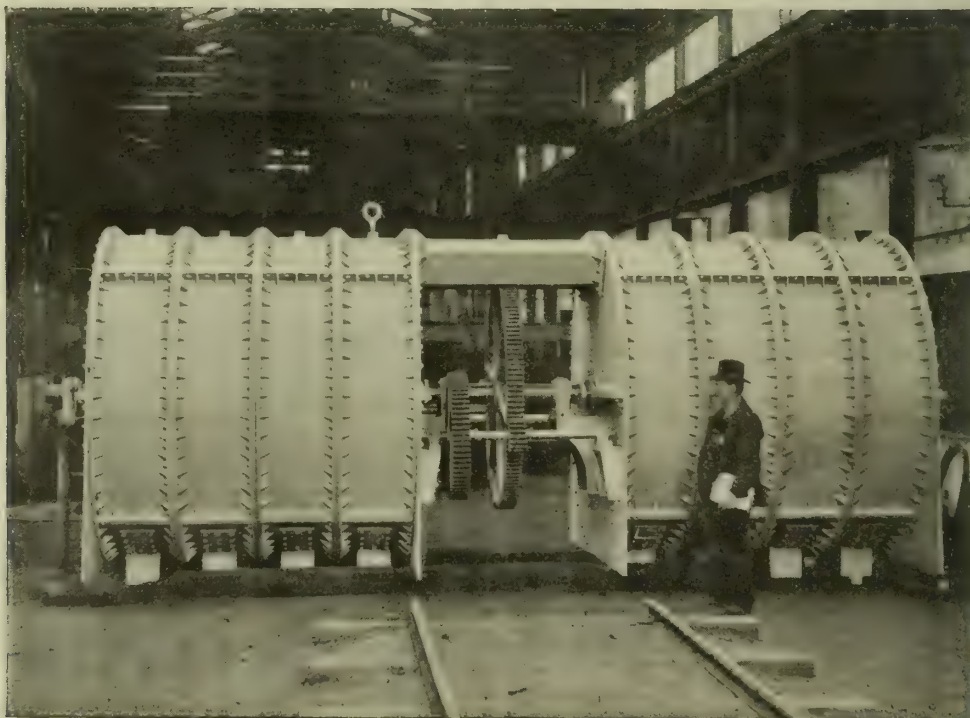
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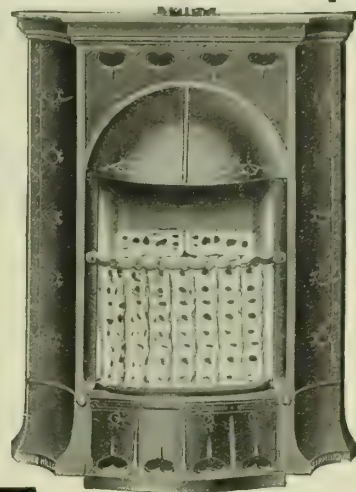
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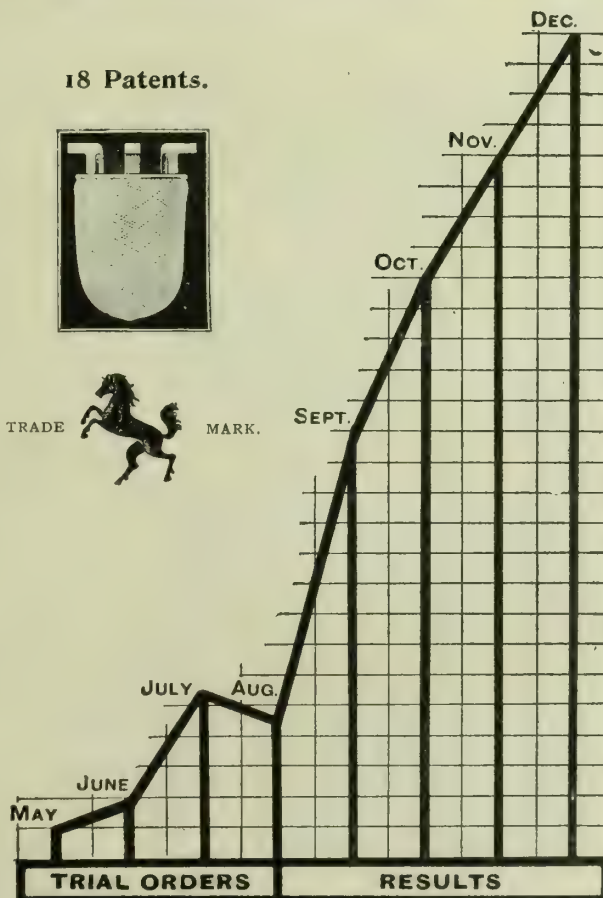
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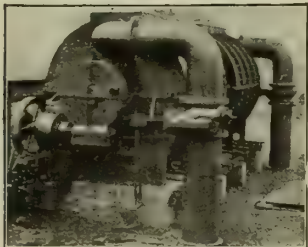
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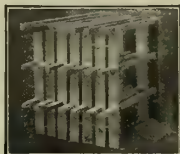


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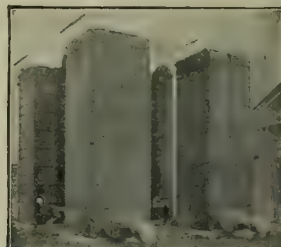
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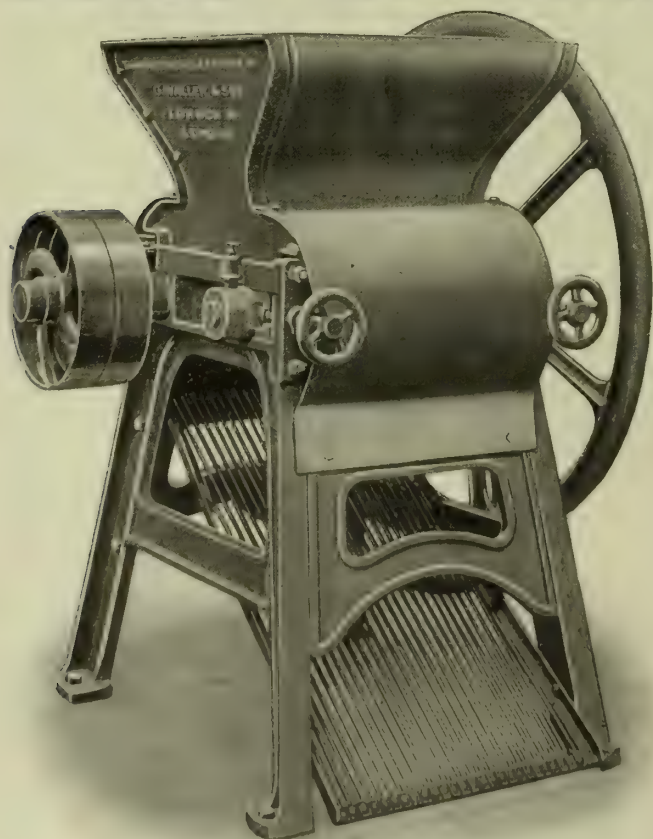
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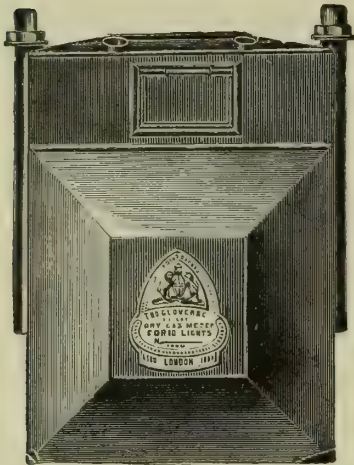
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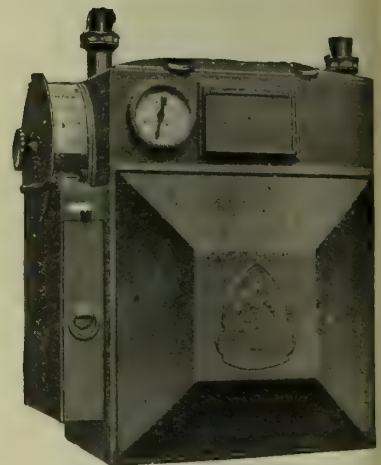


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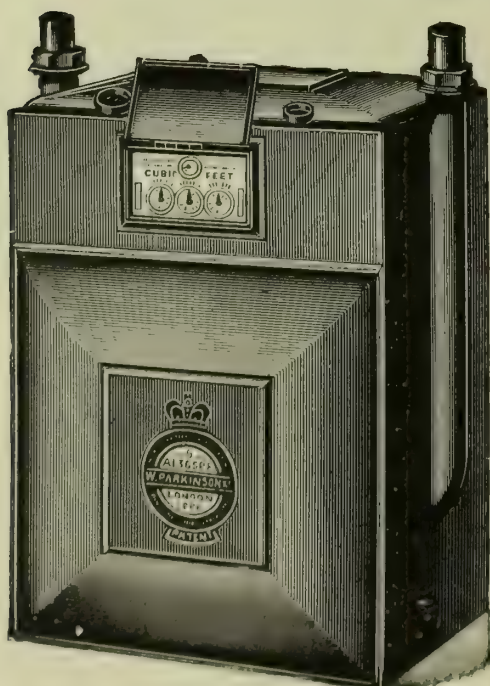
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2435.—TUESDAY, JANUARY 11, 1910.

## EDITORIAL NOTES—GAS, &c.

### Viewing the Vertical Retort Position.

WHEN Herr E. Körting, the General Manager of the Berlin works of the Imperial Continental Gas Association, speaks or writes on the subject of carbonization, he is assured of extensive attention. His communication to the "Journal für Gasbeleuchtung," of which a translation appears in this and last week's issue of the "JOURNAL," is fully up to the high standard of critical examination to which we have become accustomed when Herr Körting is the examiner. With him we fully agree that it is most difficult to keep oneself fully *au courant* with the ever-swelling mass of detail regarding carbonization that issues from the structural improvement and working of the newer rival systems and the operation of the older ones on latter-day lines; and without minute study, it is impossible to give the different claims their proper value. Fresh advantages or gains may have certain disadvantages or losses set against them; and, unless a comprehensive and critical survey is made, one may be misled by something that appears to be the absolute determining factor, and then ultimately receive a rude awakening to the truth that other factors combine to deprive of its gilt that which has persuaded on first blush into acceptance. The prudent course is to take nothing for granted without complete personal investigation. The more is this needed when, if it be true, the gas industry has grown so degenerate that it is possible for "a well-known" gas engineer to express his views in the drastic statement "that there have never before in the gas industry been so many lies told as at the present time." Although Herr Körting does not wholly endorse this statement, he does so partially in the remark that "to a certain extent this expression of opinion may have some justification," and in the palliation that "it is in accordance with human nature" that, for the sake of business interest or personal advantage, glowing statements should be made and failings suppressed. It is regrettable that it should have been felt that, in connection with such a purely technical matter as carbonization, there was occasion for the introduction of this protest; but, having been introduced, it is hoped by us that it is directed to German quarters and not to British ones. We entirely fail to see where any lasting benefit is to come in from false representations in such a matter as carbonizing plant and its performances, as such representations are bound "to come home to roost," to the detriment and discomfiture of those who make them.

The progress of vertical retorts has experienced a no small amount of resistance from horizontal retorts worked under the heavier charge and the longer carbonization period. Herr Körting calls attention to the result claims in this connection of British engineers; and he discusses the theoretical causes of success, and the reason why in Germany, working in similar manner with horizontal retorts, the same result attainment cannot be realized, though using the same coal. The reason is simply this, that the greater proportion of coal used in England is gasified while fresh, and is not stored for a long period as in Germany. There is no doubt something in this, and particularly in those places—such as Berlin—where the whole of the winter coal requirements have to be placed in store during the summer. But leaving out this factor, all the conditions that contribute to the greater production per ton, by the use in horizontal retorts of heavier charges and the adoption of longer carbonization periods—conditions comprising the avoidance to a great extent of the decomposition of the gas, the working at higher temperatures, the better utilization of the heat, the better distribution of the heavier charges in the retorts, the less frequent opening of the mouthpiece lids—all apply equally in Germany as in this country. The coal from store, whether used in vertical or horizontal retorts, is the same. And having regard to the figures that have been published for Dessau vertical retort working, and to what Herr Körting now says as to his trial experiences with

heavier charges in inclined retorts, it would seem there is nothing much, looking to gas production *per se*, to choose between intermittent vertical and horizontal working under the latest approved methods, using the same coal from stock, and without the introduction of steam into the retorts. But, of course, gas make is not the only consideration.

There are in the article a few structural and working criticisms of the continuous systems of carbonization. The structural ones may be left to those interested, with the necessary experience to (if that be possible) controvert the criticism. Among the disadvantages of the continuous system as seen by Herr Körting is that separate charging and discharging mechanism is required for each retort. In saying this, it is, of course, within the knowledge of Herr Körting that the point as to charging mechanism has not general application. The second criticism, as to the continuous movement of the contents of the retort not being advantageous to the coke, requires qualification. The descent is so gradual, the discharge so smooth and in such small quantities, that the amount of breeze formed, we should imagine, is no greater than is the case in the single evacuation of the heavy charge from an intermittently operated vertical retort. It is true, the coke of the intermittently charged vertical retort is denser than that from a continuously charged one, and consequently less friable; but, from observation, we should be inclined to believe that the proportion of breeze in the case of continuous vertical retorts is less than in horizontal working. As to the third criticism, regarding the impossibility of inspecting the inside of continuously operated vertical retorts, to ascertain whether they need repair, and whether the coal is properly disposed in them, this is not a matter to which actual experience gives much weight. Confessedly, there is a drawback here; but with the provision made, it is not of the magnitude that may be pictured when preferential feelings lie in some other direction. To but slightly alter Herr Körting's remark, *On préfère toujours son premier amour*.

Carbonizing chambers in which heavy weights of coal are used also come under Herr Körting's criticism. In his opinion, a big price is paid in connection with them for any small saving in labour costs in comparison with other modern methods of carbonization for gas production. At the low point to which carbonization wages have been brought to-day in well-conducted works, under moderate-charge carbonization, further economy is hardly worth consideration; but economy of fuel consumption is altogether a different matter. Wages at Berlin rates amount at the present time to about 0·3d. per 1000 cubic feet; whereas the fuel consumption in heating and settings entails a cost of about 3d. per 1000 cubic feet. Hence, Herr Körting points out, a reduction of 10 per cent. in the fuel consumption amounts to as much as the whole expenditure on wages. Experiments in increasing the girth of vertical retorts in Berlin in order to take heavier charges, have proved that there is no advantage, but distinctly otherwise; and the results have there led to the conclusion that the direction of progress is in increasing the heating surface relatively to the weight of the charge. To give effect to this idea, Herr Körting has put into settings of like dimensions eighteen vertical retorts where only twelve existed before. This has enabled 25 per cent. more coal to be charged into the retorts of a single setting, while the radiating surfaces of the latter remain unchanged; the increased output has been attained without making any change in the disposition of the producer and recuperator; there is an economy in the capital expenditure of 25 per cent., and in fuel consumption of 3 per cent.; as well as a saving of labour. These are among the advantages presented for the new arrangement of Dessau setting as developed at Berlin. Working trial results were published last week; and their import is accentuated in the instalment of Herr Körting's article published this week. Altogether the contribution to the question of carbonization is one that commands interest; and it indicates that vertical retort working is subject, as many other things, to improvement and progressively higher value in result.



### Shop Lighting and the Public Safety.

THE inquiry into the cause of the lamentable fire at Clapham Junction just before Christmas has ended in a verdict from which there was no escape, and which all intelligent people expected, but which naturally is most distasteful to the electrical industry. The loss of human life and of property, of course, moves our sympathetic feelings; but this is not an occasion on which the appalling results call upon us to avoid attendant considerations. Rather do the appalling results urge the necessity of safeguarding the future by the practical lessons of the catastrophe. The practical lessons both the electrical industry and traders are bound to observe unless they desire to be charged with wilful and culpable negligence on a repetition of such a disaster, small or great, having similar origin. It really required something that was absolutely sensational (we regret the awful measure) to awaken electricians to a proper sense of their responsibility in this matter of electrical risks, and to stay the persistent misrepresentation as to the absolute safety of electricity, in which misrepresentation they have indulged freely for purely commercial purposes. A mass of demonstrating negation has accumulated; but of it all, the latest addition is the most dire, and let us hope at the same time it will prove the most salutary.

From the evidence given at the inquest, it is patent that there exists a large amount of ignorance among shopkeepers as to the danger of electric lighting. We have the manager of one trading establishment in the neighbourhood of the ruins and heaped-up *débris* of the great Clapham emporium stating that shopkeepers do not seem to consider the danger of electric lighting with reference to fire, and that shop windows all over London—not only at Christmas time when the display is profuse, but at others—are dressed with combustible materials with electric lamps in close proximity. The installation may be carried out in the most technically approved manner; but no one can guarantee (as this lugubrious illustration proves) that something will not occur, such as a lamp breaking, that will be the incipient of a terrible catastrophe. In the main installation at Messrs. Arding and Hobbs, Mr. Sidney G. Russell, the Chief Electrical Engineer of the Phoenix Fire Office, bears witness to everything conceivable having been done for protective purposes in fitting up this so-called safest of illuminating agents. The wires were all run in iron tubes, the apparatus was enclosed in cast-iron boxes, and no expense was spared to ensure security from fire. The shop window lighting was most carefully considered, and all possibilities were met by every safeguard. Nevertheless, eight human lives have been lost, and the noble pile of buildings is but a heap of ruins! The greatest precautions may be taken—those that are essential are many—but one unsuspected small thing may produce, as here, most deplorable destruction. The Fire Offices provide conditions that would appear to be ample in detail; and yet, according to two of the witnesses, Messrs. Arding and Hobbs had general permission from the Phoenix Office to increase, on occasion, the number of lights installed. Where such general permission now exists, it may be taken the Fire Offices will promptly see that it is removed. For there is danger in the freedom. In this case, although Mr. Russell did not inspect the extension installation, he believes it was properly carried out, excepting in the one particular that the Phoenix rules provide that flexible cord conductors not furnished with an efficient flame-proof covering must not be used in shop windows containing inflammable goods. This rule was not observed in this instance. But it seems abundantly clear that, fruitful as flexible wires have been in originating conflagrations, the wire was not at fault on this occasion. All the evidence pointed to the fire being—and the Jury found that it was—started by the bursting of one of the electric lamps.

Here, then, is a risk of which many shopkeepers are perfectly ignorant. The electrical contractor who supervised the additional Christmas installation at Messrs. Arding and Hobbs' was well acquainted before the disaster with the fire-raising potentialities of electric lamps; and he appears to have taken every precaution in keeping the extra lamps that were put in as far as possible from the goods with which the windows were to be stocked. But that was not sufficient as events proved. There are several ways in which lamps may be a danger without being in actual contact with, or contiguous to, the displayed goods. In this case, the lamps were of the Tantalum type; and

they were run in series. A lamp may become broken, and produce a short-circuit to the leads in the lamp itself; and the result of this might be to put the whole pressure on the other lamp, probably blowing out its internal parts, or completely shattering the lamp. There is little or no doubt on the part of Mr. Russell as to the fire having really originated in the bursting of one of the electric lamp globes. One fairly frequent cause of such burstings is outward atmospheric pressure. Another cause is short-circuiting of the filament; or if a filament sags and touches a globe that will often produce a breakage. Mr. Russell described in his evidence some interesting experiments that he had made, which showed how easy it is to set fire to cotton wool with incandescent electric lamps. And it indicates how ignorant many shopkeepers are, or how prone to accept the electrical advocate's assertion that the electric light is incapable of fire-raising, when Mr. Russell, from his experience, states that the practice of placing electric lamps in proximity to inflammable goods in shop windows in London is so great that he has "frequently" recommended the Phoenix Office to throw up business rather than retain the risk. We should like to know whether or not information that has reached us is true, that since the advent of the metallic filament lamp fire insurance companies have had to deal with more claims for damage from broken lamps than they had to do in the days when the carbon filament lamp held undisputed sway as the electrical means of interior lighting.

The inquiry has made clear the facts (which should be widely known for the public protection) that in the window where the fire originated, and the same thing obtains in many other shops in which there are inflammable goods, there were two sources of fire risk—the lamps and the flexible wiring, and that it was one of the small lamps that burst, and produced the tragic havoc pictured in the daily press. We have also other clear points, that though the Fire Offices make such stringent regulations in regard to installation, fires of electrical origin still occur; also that, although there exist such stringent regulations, the Fire Offices grant general permission to make additions to the electric lighting of shops at Christmas and other times. In the public interest, this liberty ought not to be allowed, though any amount of inspection would not have prevented the bursting of the lamp that was, the Jury find on clear evidence, the cause of the disaster. One other revelation has been the vast amount of ignorance that exists among shopkeepers as to the risks they are running with electric lighting for display purposes. But the Coroner (Mr. John Troutbeck) has pointed out that, now that such prominence has been given to the peril, if anyone continues to use electric lamps in the manner in which they were employed in the shop window where the fire started, and a fire results, he will find himself in a serious position. Electricity undertakings ought to give this warning the greatest possible prominence; but will they do so? If they do not, and continue to advertise electricity as the safest illuminant, the short reply will be—"Remember Clapham!"

### The Northern Coal Dispute.

THE trouble that has arisen in the coal-fields of Durham and Northumberland over the coming into operation of the Coal Mines (Eight Hours) Act, naturally causes those who are large purchasers of coal to reflect upon the various new phases that have developed. Owing to the events in connection with the coal industry during the past twelve months, confidence of buyers in any durability of conditions has been greatly shattered; and what has occurred in Durham and Northumberland will make the feeling still more unsettled. In these two counties, the coal owners and miners had six months longer than any other coal-producing part of the country to arrange matters for the bringing into operation of the Act; and at the same time they had the experiences of the remaining coal-fields from which to draw guidance, though in every field there were, of course, differences to settle. Authorities behind the scenes quietly warned us, in the later summer months, that it would be strange if the Act was brought into operation on Jan. 1 without trouble in the two Northern Counties; and on the strength of that, on more than one occasion it was suggested in these columns that gas undertakings dealing with these counties should take the precaution of getting in good stocks to tide over any disturbance in deliveries during the busy gas-making season. Many undertakings, it is within our knowledge, did that; and not only so, but placed orders in



other districts, so as to have more than one string to their bow. The preparedness for trouble has been of advantage; for trouble there has been, and transport has been interrupted. Fortunately, however, the trouble is not so extensive as it was feared it would be; and there are signs, or at any rate hopes, that—notwithstanding that at many collieries work has ceased, and the indications are that some of the men would like to force the position by a strike—negotiation will finally bring about agreement. It is a point of honour with the men's leaders—the Executives of the Unions—that a peaceful solution should be effected if possible, seeing that they had before the outburst of disaffection entered into an agreement with the coal owners.

Here is a disconcerting feature of the trouble—a feature which shows that the rank-and-file of the Unions will rebel, though they give their leaders plenary powers to act for them, if the agreements to which their leaders are parties do not meet with their approval. After the great strike at the South Metropolitan Gas-Works, Sir George Livesey always said he would never again have anything to do, in the way of negotiating, with Union representatives, but would only deal with his men direct. And he never did again (perhaps it may be said he had no occasion to) acknowledge the Union leaders. What certainty now, after recent experiences, will the coal owners of the North feel in any future *pourparlers* and agreements with the Union leaders? The "leaders" can only claim to be so in name, not in actuality. In the case of Northumberland, the terms arrived at between the owners and the miners' leaders were submitted to the men, and approved—true, by only a small majority. In Durham, the Union leaders were clothed with power to arrange matters; and they used, as it appeared to outsiders, their authority effectively. Yet at one part of last week, it was estimated there were a total of 80,000 miners out on strike in the two counties—three-fourths of the number being in Durham, in which county there are about 149,000 miners. The Durham men have severely condemned their leaders for putting their signatures to an agreement without first submitting the terms to them. It is all very unsettling. Notwithstanding that many of the miners resumed work yesterday, this does not imply satisfaction with the new system; and the matters still outstanding at the time of writing are so complicated that it cannot be said the northern coal industry is yet "out of the wood." With men working in discontented spirit there may be a rupture of producing continuity at any time.

The chief point of resentment is the three-shift system. The Act, however, gives the men no power over the duration of mining, beyond the limitation as to the hours of the individual. But the miners want to control everything, no matter what effect their desires have upon the coal requirements of the country. In certain collieries where the two-shift system was in operation last week, there was dissatisfaction; the "putters" declaring that there was a serious reduction of their wages. This shows the difficulty of conciliating interests. What is wished is that in the first place the night shift shall be abolished altogether. There seems, however, a disposition now on the part of a majority of the men to give the new system a practical trial. And then in the event of continued dissatisfaction—well, that is a matter that may be left to the future. Apart from general issues, the additional uncertainties that have been introduced into coal dealings by the new Act cannot fail to have the effect of inducing large buyers of coal—such as are gas undertakings—in self-protection to distribute, more than of old they were wont to do, their patronage.

### Coalite Gas and Electricity Generation.

The British Coalite Company are still trying to get rid of their gas at Barking. The schemes for doing this have been many. They tried the Gas Companies; but the Gas Companies preferred relying upon their own plant for meeting their statutory obligations. The Company then proposed the promotion of a Bill in Parliament for distributing the gas in East London for power purposes; but they had not considered the scheme in all its bearings—had not considered the opposition of established gas suppliers; had not considered the fact that Parliament long since put an end to gas competition, with all its inconveniences and wastefulness, in London; and had not considered the question of the capital cost of distribution in relation to the prices manufacturers are prepared to pay for gas for power purposes. That

scheme no sooner saw the light of day, than these things were forced upon the notice of those responsible for its birth, and they promptly strangled their offspring by withdrawing the Bill. Another attempt was made to get the Gas Companies to take the gas; but they again declined with thanks. Then the Directors drew a pretty picture, in order to buoy up the hopes of the shareholders, of large factories being built by manufacturers round the Barking coalite plant, with the express object of using the gas for power purposes. Manufacturers have shown no particular desire to relieve the Directors from their difficulty by erecting factories. Now there is another project on the carpet. Sir William Preece, of electrical fame, is the Chairman of the British Coalite Board; and it may be presumed that his hand has been the guiding one in the new scheme. It is that the gas shall be used for the generation of electricity, and that it shall be supplied in bulk to the Barking District Council. Terms have been submitted by the Company to the Council; and the Electrical Engineer has been directed to report upon them. The point to which the costs of electricity generation have descended in quite ordinary central stations will not, taking into consideration capital expenditure on the electrical machinery and running costs, leave much profit on coalite gas to build up the profits of the ill-starred Company.

### Seeking Business Further Afield.

It will be seen from the foregoing that the British Coalite Company are making a desperate struggle for life. They are in fact losing no opportunity now. Last week it was seen from our columns that the Glasgow Corporation are considering the question of the use of gas-fires in relation to the abatement of the smoke nuisance. The British Coalite Company have apparently seized the opportunity for advertising in the "Glasgow Herald" that they are prepared to enter into contracts for the erection of coalite plant in any part of the United Kingdom for existing gas undertakings and companies requiring cheap power. The baits thrown are these: "Illuminating power of gas from 14 to 20 candle, according to requirements, supplied at 25 per cent. lower than gas companies' present cost of manufacture. . . . Gas for gas-engines can be supplied at a price which will lower the present cost of electric current by over 25 per cent." The Glasgow Gas Department are in the position to supply all the smokeless fuel required by the citizens, without the intervention of the British Coalite Company; but possibly the latter think a little pressure will be brought to bear on the Corporation by non-technical readers of the advertisement on learning that, "in districts where these plants are installed, a considerable supply of coalite—the economical smokeless fuel—will be obtainable, and will assist in mitigating the great smoke nuisance." The Glasgow Corporation have a Chief Gas Engineer on whose advice they rely in matters appertaining to the manufacture of gas and coke, both of which are smokeless fuels; the former being free of the labour, dirt, and inconvenience associated with all solid fuel fires—coalite not excepted.

### Last Year's Coal Exports.

The foreign trade returns have now been completed for the past year; and what is described by one commentator as a most unsatisfactory feature is the increasing cheapness at which buyers abroad can secure our coal, while there has been no general corresponding reduction for the home consumer. Last year 65,694,267 tons of coal were exported, compared with 65,180,649 tons in 1908. But the amount received was only £37,129,978, against £41,615,923 in the preceding year—a decline of £4,485,945, though 513,618 tons more were exported. If the figures are averaged, it will be remarked that the price paid last year was within a fraction of 1s. 6d. per ton lower than in 1908. A shilling per ton export duty last year would have produced £3,284,713; and foreign buyers would still have been nearly 6d. per ton better off than in 1908, or in the total £1,201,232.

A copy of the "Eastern Province Herald" of Port Elizabeth for the 20th ult., just to hand, records that the previous Friday night the officials connected with the South African Lighting Association assembled at the office to bid farewell to the Assistant-Manager, Mr. R. E. Taylor, who was leaving for England on the completion of his engagement; and they took the opportunity of presenting him with a silver jackal Kaross as a small memento of his stay in Port Elizabeth. Mr. W. Arnott, the Manager, in making the presentation, voiced the feeling of the staff in saying how sorry they all were to part with Mr. Taylor.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 121.)

THE week just concluded on the Stock Exchange was only moderately good. There was no enthusiasm, and business was rather humdrum. Then the inevitable reactionary swing of the pendulum after the rise set in early, and started realizations; and a factor unwelcome in the Consols market was the large new Indian issue. The new year opened fairly well though quietly, but markets were not uniformly strong. On Tuesday, selling was the order of the day; and most of the best markets were down. Consols fell  $\frac{1}{4}$ ; and Railways were dull. So were the speculative departments as well. Movements were unsettled and irregular on Wednesday; and (with the exception of the Foreign Market, which was firm all the week) prices were mostly lower. Consols were depressed on Thursday by the cause already mentioned, and fell  $\frac{5}{16}$ ; and the gilt-edged division in general were rather poor. Friday was a dull and inactive day; the general tone of most markets being lifeless and irregular. But on Saturday things mended; and there was a gratifying recovery in several good lines. Consols rose  $\frac{1}{8}$ ; and other choice descriptions and Railways were firm. In the Money Market the supply was abundant at easy rates, but discount was pretty firm. The Bank rate was lowered on Thursday, according to expectation, from  $4\frac{1}{2}$  to 4 per cent. Business in the Gas Market was more active than of late, and the tendency was quite firm. Several issues made moderate advances in value; while none receded. A change will be noted in the Stock and Share List; Alliance and Dublin 10 per cent. and 7 per cent. shares being consolidated into one stock. In Gas-light issues, the ordinary was active and strong—the opening price of  $103\frac{1}{4}$  being soon left behind. The stock afterwards changed hands repeatedly up to  $104\frac{1}{4}$ —a rise of  $\frac{1}{4}$ . In the secured issues, the maximum marked  $88\frac{1}{2}$  and  $88\frac{3}{8}$ , the preference  $104\frac{3}{4}$ , and the debenture  $81\frac{1}{2}$  and  $82\frac{1}{2}$ . South Metropolitan was only moderately busy, but very firm; transactions ranging from  $120\frac{1}{2}$  to  $121\frac{1}{2}$ . Commercially were quiet. The 4 per cent. made  $109\frac{1}{2}$  and  $110\frac{1}{4}$ ; and the  $3\frac{1}{2}$  per cent., from  $103\frac{1}{2}$  to  $104\frac{3}{4}$ . Among the Suburban and Provincial group, Alliance and Dublin changed hands at 86, Brighton original at 219 $\frac{1}{2}$  and 220, British at from  $42\frac{3}{4}$  to  $43\frac{1}{4}$ , and Wandsworth and Putney "B" at  $139\frac{1}{2}$  free. In the Continental companies, Imperial was unchanged at from  $105\frac{1}{2}$  to  $106\frac{1}{2}$ , ditto debenture at  $94\frac{1}{2}$ , Union at 97, ditto preference at 138 and  $138\frac{3}{4}$ , and European fully-paid at  $24\frac{1}{2}$ . Among the undertakings of the remoter world, Bombay part-paid realized  $4\frac{3}{4}$ , Buenos Ayres from  $14\frac{1}{4}$  to  $14\frac{1}{2}$ , ditto debenture  $98\frac{1}{2}$ , Melbourne  $4\frac{1}{2}$  per cent.  $100\frac{1}{2}$ , Primitiva  $7\frac{1}{2}$  and  $7\frac{1}{4}$ , ditto preference from  $5\frac{1}{2}$  to  $5\frac{5}{8}$ , ditto debenture  $97\frac{1}{4}$ , River Plate  $17\frac{1}{8}$  and  $17\frac{1}{4}$ , and ditto debenture  $98\frac{3}{8}$ .

## ELECTRICITY SUPPLY MEMORANDA.

**False Pretences—Increased Prices for Electric Current at Dublin—In Bad Case—Educating Warrnambool—Choice Surpluses and Otherwise—Rash Statements.**

THE result of the inquiry into the Clapham fire is noticed in our editorial columns; there is therefore little comment it is desired to make here. The origin of the fire has now been, beyond any question, traced to the bursting of an incandescent electric lamp. Both the electrical contractor who carried out before Christmas the installation of extra lamps at Messrs. Arding and Hobbs' shop and Mr. Sidney G. Russell, the Electrical Expert of the Phoenix Fire Office, knew quite well, previous to the fire, that in the best of regulated installations there is this ever-present risk of lamps bursting. If the inquiry over the melancholy occurrence has done nothing else, it has nailed this particular spurious coin—the absolute safety of electric lighting—fast to the counter. Obtaining custom under false pretences is one of the things to which the electrical industry has long accustomed us; but such proceedings cannot be for ever hidden. We may take it that the Edison and Swan United Electric Light Company, Limited, do not use gas on their premises in Queen Street, City, nor would there be any occasion to have matches in the basement. But there was a fire in the basement of the establishment early last Monday morning—a fire that was at first regarded as a perilous one by the Fire Brigade. Says one report, "As soon as the basement windows were broken in, volumes of dense, acrid, suffocating smoke (due probably to the material with which electrical apparatus is insulated) poured out." However, the fire was soon got under.

The Dublin Corporation have at length had to come to an increase in the charges for electricity. Their financial advisers have told them the step is imperative, and that the financial position of the undertaking is unsound, which unsoundness has been accentuated by the consumption reducing power of the metallic filament lamp, which is good for the consumer, but which makes it more difficult for electricity undertakings to earn a living. There was—this is customary—some plain speaking at the meeting of the City Council yesterday week, when the motion was brought forward for an increase of the charges by 10 per cent. Some members thought the management of the undertaking was at fault; and another member did not seem at all surprised that consumers had not confidence in the electric light when it failed

three times in as many months. But, in regard to financial unsoundness, the truth of the matter is that it is not so much the management as the fact that the electrical industry has not applied commercial discretion to the charges made for services rendered. The increase at Dublin will do something to put things in better condition, and to relieve the ratepayers from ever-recurring deficits. It was a pertinent question that was put by one member during the discussion: Were the general body of ratepayers to put their hands in their pockets to pay for the privileges and advantages of the comparatively few who use the electric light? The answer was found in the voting. That the Dublin City Council are regarding the position very seriously is shown by the fact that a year ago the proposal for an increase was rejected, while on this occasion 47 members voted in favour and 8 against it. There is no doubt the Corporation will be told they have taken a retrograde step; but when things are going from bad to worse on deficit-producing prices, how far is this to be allowed to proceed to please those who look with horror upon this so-called playing into the hands of the enemy. The fearful fuss that is made by the electrical people over increasing the price of current is humorous in view of the glorious advantages set forth for electricity. Despite all the disadvantages of gas (as drawn and imagined by our electrical competitors), the administrators of gas undertakings do not make any trouble, when need commands, about raising the price they charge for it. Why the difference? We know, and so do our electrical friends. But we have only just been through the period of peace and goodwill; so the point may be passed.

The charge is occasionally preferred that, in portraying matters electrical, we choose our pigments for the express purpose of imparting a high tone. To this, we do not assent. What is submitted is open to the inspection and judgment of all our readers; and we are content to leave it there. There is present satisfaction in learning that in reviewing last week the past year's affairs of the electrical industry, so far as they interest our readers, we did not exhibit the general position in too drab colours. Dealing with some of the electrical events of the year, the "Electrician" remarks that most of its readers will be glad that 1909 is over. A year earlier our contemporary expressed the opinion that things electrical could not be much worse during 1909 than they had been during the year preceding; and it even looked forward optimistically to better conditions. Ruefully it is now written: "Our optimism has been shattered. No examination of the bright side of things, no extended study of trade returns, no involved mathematical calculations based on peculiar units, can obscure the fact that the electrical industry has, during the past year, been in just about as bad case as it is possible for any industry to be. Whether during 1910 it will be even more unsuccessful, or whether it has at last touched bottom, we prefer not to prognosticate. Our attempted prescience of 1909 gives no encouragement to prophesy upon the events of 1910." This want of electrical success appears to be only on the commercial side. Admittedly, the industry has done very well technically, excepting in the matter of producing really practicable appliances for domestic heating, cooking, and water-heating. In regard to the last-named domestic operation, it was not long since the "Therol" water-heater was extolled in the columns of the technical press in a remarkable manner. Now we read that, in the class of apparatus "possessing the properties of interesting design and great possibilities, but just at the moment having no great practical application, may also be placed the 'Therol' water-heater. To use this apparatus satisfactorily, a revision of the existing tariffs for electricity supply is necessary, and a closer combination between manufacturers and station engineers essential." The present writer finds in connection with one electrical undertaking in a residential district, that the "Therol" heater has proved a distinct failure in attracting householders. Speaking of the recognition of the need for greater publicity, our contemporary says that this is "undoubtedly due to the present depression." A few sentences follow, the meaning of one or two of which is somewhat doubtful: "Great efforts have been made in most directions to secure an increase in the number of consumers, and while these efforts have been sometimes misdirected, initial errors are being gradually eliminated." We pause over the "misdirected efforts" and "initial errors," and wonder whether the writer had in mind the slanders and the mendacity directed by electricians against the use of gas, which "misdirected efforts" and "initial errors" have not relieved the industry from the judgment passed by our contemporary upon its affairs in the past year. That judgment is that the industry has been "in just about as bad a case as it is possible for any industry to be."

We may reiterate the satisfaction that it always gives us to learn how gas and electricity affairs wag in distant parts. Though Warrnambool in Australia is not a place on which the eyes of the whole civilized world are constantly fixed, there is pleasure in reading the contributions to a little gas and electricity controversy that is going on in the papers, copies of which have been forwarded to us by the Town Clerk. The controversy (which enables us to make a few comments that will have general interest) had its origin in a proposal to extend the gas-works; a shop-keeper following this up by asking consideration for the electric light. In an effort to make hay while there was a ray or two of sunshine about, an associate member of the Institution of Electrical Engineers, residing in Melbourne, and rejoicing in the name of Lascelles Parrington, wrote to the "Warrnambool Standard" pointing out that figures and statements quoted from the



"JOURNAL," "and other papers full of 'gas,' " were "most extraordinary and unreliable." Then this gentleman proceeds to try to make the mouths of the inhabitants of Warrnambool water by quoting the profits of electric lighting from such places as Glasgow, Manchester, Oldham, Sheffield, Liverpool, and Halifax. Now let us suggest to Mr. Lascelles Parrington, that it would have accorded better with the general fitness of things had he quoted the results from towns at home on an equality with Warrnambool, and not from towns representing the choicest industrial and trading centres of Great Britain. But we will meet him on his own ground. The electrical surpluses of these specially favoured towns are for the year 1907-8. When Mr. Parrington has had an opportunity of studying the figures for a year later, he will find that the surpluses have shown a fairly considerable decline. He says that Glasgow had a surplus in 1907-8 of £51,062; but for 1908-9, it had dropped to £49,175. He gives the total receipts for electric lighting and power as £249,569. Against this we quote, from the last Board of Trade returns, Glasgow's gas receipts of £1,006,152. Manchester, Mr. Parrington next mentions, exhibited in 1907-8 a surplus of £59,543; in 1908-9, the figure had descended to £33,495. He next states that Sheffield obtained from public electric lighting alone in 1907-8 no less than £48,111. But, in the "Electrician" tables issued last January, we see that there were only 50 flame arc lamps in the streets; so that they were, if Mr. Parrington is correct, charged out at the rate of nearly £1000 each! On the other hand, the Board of Trade gas returns state there were in 1908-9 11,102 gas-lamps in the streets of Sheffield. But, in 1907-8, he proudly adds, Sheffield made a surplus of £4796; the department, in 1908-9, only had half that surplus (£2423). Then Liverpool's surplus of £51,532 in 1907-8 dropped in 1908-9 to £42,854. Halifax, with a surplus of £3161 in 1907-8, only shows £768 for 1908-9. So much for Mr. Parrington's "extraordinary" and somewhat "unreliable" figures.

Instead of picking out the choicest areas for the guidance of Warrnambool or any other place, let us take the tables published in the "Electrical Times" on Dec. 30 last, and see what tale they unfold. It is not a pleasing one for electricians. The accounts of some 199 local authority electricity undertakings are analyzed; and we find this: 59 of them did not make a profit at all, but a deficit; 43 made under £500; 31 between £500 and £1000; and 66 above £1000. Now what on these figures comes of Mr. Parrington's argument, based on exceptionally well-placed concerns, with districts that are luxuriant in opportunities for both gas and electricity business? Many local authorities in other districts in this country have regretted the day they launched out into electricity supply; many of the towns have suffered year after year the provision of the money from the rates to make good deficits; many of the undertakings showing surpluses of less than and over £1000 have not put by a penny piece to reserve or depreciation; and the Local Government Board have shown time and again the financial unsoundness of several of these undertakings.

One or two other points from Mr. Parrington's most misleading letter. He states that in London thousands of gas-lamps have latterly been replaced by flame arc lamps. We should like to know where those thousands are to be found. Where there has been conversion to any extent of gas-lamps to electricity, it has invariably been in districts where the electricity supply is a municipal affair, and has been done entirely to give the electricity concerns the business, at the expense of the ratepayers. In such cases, local government has turned topsy-turvy. The interests of the electricity undertaking is of primary importance; those of the ratepayers of secondary moment. The Local Government Board have refused loans for the conversion of public lamps, on the ground that, with modern incandescent gas lighting, there is no justification to be found for change to electricity either in cost or in efficiency. The London County Council declined a loan to Marylebone on the same ground; but the Marylebone Council have been making the ratepayers pay the heavy costs of conversion so far as it has gone. But about this lamp conversion that is proceeding by the thousand, the Board of Trade returns show that ten years ago the number of gas-lamps in the districts of statutory gas undertakings in the United Kingdom numbered 581,206; in 1908-9 the total was 700,696. We will not traverse all the veracious Mr. Parrington's statements, but respecting a quotation from "a noted authority"—one Maurice Solomon—we should much like to know something more about it. The quotation reads: "According to figures published by the Imperial Continental Gas Association the least efficient of the electric lamps was about twice, and the most efficient about twenty times as good, as a lighting source, as the best of the gas lamps." The tests of Professor Drehschmidt, the Chief Chemist at Berlin, tell a different story. When were the figures referred to published by the Imperial Continental Gas Association, and where? We think there is some error about the quotation. Evidently it will be news to Mr. Parrington that the metallic filament lamp will give 800-candle-hours for one unit of electricity; while approximately 35 cubic feet of gas will, with modern inverted gas-burners and ordinary pressure, also give 800 candle-hours. Now we ask whether any of the figures or statements made here are "extraordinary and unreliable." They are all to be verified from electrical papers or official returns, excepting the one as to efficiency. That can be proved in a photometer room. It is no use trying to get electrical business under false pretences, misleading statements, and incomparable conditions. That game has been played in this country for many years; may Australia succeed in keeping free from it!

## PERSONAL.

Mr. FRED SMITH has been appointed Secretary and Manager of the Church Stretton Gas Company, Limited, in place of Mr. E. Wilkinson, resigned.

Mr. HUGH WILSON, son of Mr. David Doull Wilson, whose recent death is noticed elsewhere, succeeds his father as General Manager of the Tees Valley Water Board.

Mr. WILLIAM COLLINS, the Manager of the Porthcawl Gas-Works, has been appointed Manager of the Coquimbo (Chili) Gas-Works. Mr. Collins will sail early next month for his new sphere of labour.

The completion by Mr. JOHN PHILLIPS, the Secretary of the Bristol Gas Company, of fifty years' service, was signalized by a banquet held last Wednesday evening in the large hall at the Company's offices. Alderman Dix, the Chairman, presided; and he was supported by all the Directors, with one exception.

Mr. A. FRANCIS, who (as was briefly recorded in last week's "JOURNAL") retired at the end of the past year from the position of Secretary of the Tavistock Lighting, Coal, and Coke Company, has been presented by the employees of the Company with his portrait. The presentation was made on behalf of the subscribers by Mr. H. T. Doble, the Chairman of the Directors, who said that all connected with the Company regretted the retirement of Mr. Francis, who had for many years served the Company faithfully, and to whose clever and careful management, to a large extent, they owed their present favourable position. It was not the shareholders and employees only who felt regret; for if any difficulties or disputes had arisen with customers, they were soon smoothed over by Mr. Francis's genial and gentle disposition. By the Directors, with whom he had been associated for so many years, and who most thoroughly appreciated his advice and valuable services, the loss was felt very deeply. All employed on the gas-works, from the oldest man to the youngest boy, admired and respected Mr. Francis. He had endeared himself to them, not only as a master, but as a true friend. He had studied their interests, and by doing his best for the men had served the Company as well. Mr. Francis, in accepting the presentation, spoke of his long connection with the Company, extending over a period of 35 years—first as a Director, then as Auditor, and for nearly twenty years as Manager and Secretary, and latterly as Secretary. He cordially thanked them for the good feeling which prompted the presentation.

## OBITUARY.

By the recent death, at his residence in Middlesbrough, of Mr. DAVID DOULL WILSON, the Tees Valley Water Board have lost the services of their General Manager—a position he had held for more than a quarter-of-a-century. Deceased was born in Aberdeen, and went to Middlesbrough at the age of 16. In 1868 he entered the Town Council, and was for ten years Chairman of the Finance Committee. He had also been Mayor. He was in his 75th year.

The death occurred recently of Mr. WILLIAM THOMPSON, an old official of the Blackburn Corporation. Deceased, who was 70 years of age a few days before his death, was seized with influenza. He at first made favourable progress; but pneumonia supervened. Mr. Thompson was a native of Blackburn, and had been connected with the Gas Department, of which he was Chief Clerk, for the long period of 52 years—serving first under the Gas Company and subsequently under the Corporation. The funeral, which took place amid many manifestations of sympathy and regret, was attended by a large deputation from the staff of the Gas Department.

The death occurred last Wednesday morning, at his residence at Wallsend, in his eightieth year, of Alderman GEORGE AWBURN ALLAN, one of the best-known public men in the district. He was one of the first members of the old Local Board, formed in 1866; and he subsequently became Chairman of the Urban District Council. He was one of the most prominent Freemasons in the county of Northumberland. At one time he was Manager at the cement works of the late Colonel Addison Potter, at Willington Quay; but until only a short while ago, when he retired, he had occupied an official position under the Newcastle and Gateshead Water Company. On the death of Mr. Thomas Crawford, Alderman Allan was unanimously elected by his co-Directors as Chairman of the Walker and Wallsend Union Gas Company.

We regret to record the sudden death, early last Tuesday morning, at the age of 51, of Mr. JAMES DEAS, the Water Engineer to the Warrington Corporation. On the previous evening he was attending to his duties at the Town Hall, and was subsequently present at an entertainment. During the night, however, he was taken seriously ill, and succumbed. Mr. Deas entered the service of the Corporation in 1891, when he was appointed Manager of the Longford depôt; and on the resignation of Mr. Ross, the Water Engineer, in 1895, he was also appointed to that position, holding both offices until the beginning of 1904. During the time Mr. Deas held the position of Water Engineer, several large undertakings were carried out under his supervision; and at the time of his death he was actively engaged on other water-works improvements. He leaves a widow and four children.



## GAS BILLS FOR 1910.

## [SECOND ARTICLE.]

RESUMING the review of the group of Bills in which Companies are seeking incorporation under parliamentary powers, there are six additional measures to be noticed.

From the preamble of the Bill promoted by the Havant Gas Company, Limited, it is gathered that the share capital authorized by the Company's Order of 1879 consists of £3000 original capital entitled to a standard dividend of 10 per cent., and £10,000 additional capital entitled to a dividend of 7 per cent. With the exception of £4500 of additional capital, the authorized capital has been subscribed and fully paid up, and the Company have borrowed on mortgage of the gas undertaking, £2500. In applying for statutory powers, it is proposed to extend the area of supply so as to include so much of the parish of Idsworth as lies within a mile of the northern boundary of the limits of supply defined by the Company's Provisional Order of 1879. The capital authorization contemplated is £23,500, in 4700 shares of £5 each. This capital it is intended to class as follows: £3000 "A" ordinary shares; £5500 "B" ordinary shares (the "A" and "B" shares representing the original capital); and £15,000 additional capital, or "C" shares, not more than half of which is to be raised as preference capital. The standard dividend on the "A" shares is 10 per cent., and on the "B" and "C" shares 7 per cent., excepting so much as is raised as preference capital, and on that a dividend of 5 per cent. may be paid. The carry-forward is limited to the equivalent of a year's dividend. The new auction clauses are to apply to the new capital. Special purposes and reserve funds are provided for. Inclusive of £2500 already borrowed, the Company are to be allowed to borrow one-third part of the amount of the issued capital. The standard price of gas is proposed at 4s. 3d. per 1000 cubic feet, with the sliding-scale operating on the ordinary terms. The usual prepayment meter clause appears; and a discounts clause is included providing for not exceeding 10 per cent. for prompt payment, and up to 20 per cent. for large consumption, although (according to an earlier clause in the Bill) section 13 of the Gas-Works Clauses Act, 1847, is to be altered in manner that eliminates the necessity for the express limitation of discounts. The illuminating quality of the gas is proposed at 14 candles, tested by the "Metropolitan" No. 2 burner. There are sundry references to electricity in the Bill; but we do not see in it where the Company take powers for either generation or distribution. [Parliamentary Agents: Messrs. Baker and Co.]

In 1889, the Mallow (Cork) Gas Company, Limited, was formed, for the purpose (*inter alia*) of manufacturing and selling coal gas, oil gas, electricity, and any other form of artificial light. Gas is being supplied by them in the town. Under the Memorandum of Association, the share capital was fixed at £2000, divided into 400 shares of £5 each. In 1905, the nominal capital was increased by the addition thereto of the sum of £3000, also divided into £5 shares. Five per cent. mortgage debenture bonds have been issued to the extent of £1500. The Company now seek to come under parliamentary powers. We will not attempt to reproduce the townlands representing, in addition to the urban district of Mallow, the proposed limits of supply. The share capital asked for is not to exceed £11,000, consisting of the £5000 share capital already raised (to be known as the original capital), and £6000 of additional capital. The new auction clauses apply to the issue of further capital. Dividends are proposed to be limited to 10 per cent. on the original capital, 6 per cent. on the original preference capital, 7 per cent. on the additional ordinary capital, and 6 per cent. on as much of the additional capital as may be issued as preference capital. The borrowing powers are limited to one-third. Provision is made for special purposes and reserve funds. The standard price for gas is named at 5s. 3d., with the sliding-scale operating half-yearly on the usual conditions. The prepayment meter clause is in the ordinary form. The prescribed illuminating power is 14 candles, tested by the "Metropolitan" No. 2 burner. The Company ask for authority to apply, if they think fit, for a Provisional Order for electric lighting powers. [Parliamentary Agents: Messrs. R. W. Cooper and Sons.]

In the excellent belief that a proper and sufficient supply of gas to Maltby and certain surrounding places in the West Riding of the County of York would be of public and local advantage, the Maltby Gas Company has been formed, and statutory powers are being sought. The scheme contemplates a capital of £24,000 in 4800 shares of £5 each, with one-third borrowing power. Authorization is asked for the formation of a special purposes fund. Power for the compulsory purchase of gas-works lands is sought. The maximum price of gas is placed at 5s. 3d. per 1000 cubic feet; and the prescribed illuminating power of the gas at 14 candles, tested by the "Metropolitan" No. 2 burner. It is proposed to enact that the maximum price to be charged by the Company for gas supplied for public lighting shall not exceed a rate equal to the price charged to private consumers, less 10 per cent. The Company ask to be empowered to purchase, by agreement but not otherwise, the undertaking of the Dinnington and District Gas Company, Limited, upon such terms and conditions as may be agreed upon between the parties concerned. [Parliamentary Agents: Messrs. Baker and Co.]

The Tipperary Gas Company, Limited, was formed in 1882 for the purpose of supplying gas or any other illuminating or heating agent in the town or elsewhere within a radius of 4 miles from

the then boundary of the township. The land on which the gas-works stand is held on lease for a term of years, having 68 years to run. The share capital of the concern was fixed by the Memorandum of Association at £10,000. The Company have created 5 per cent. mortgage debenture bonds to the extent of £3330, of which £2280 has been issued. The Company now seek to be established under statutory powers. An enlarged area of supply is defined; and the share capital asked for is £17,000, representing £10,000 original capital, and £7000 additional, to be issued under the new auction clauses. The dividends are limited to 10 per cent. on the original ordinary capital, 5 per cent. on the original preference capital, 7 per cent. on the additional ordinary capital, and 6 per cent. on such part as may be issued as preference capital. There are the usual clauses for special purposes and reserve funds. The standard price suggested is 5s. per 1000 cubic feet, with the sliding-scale operating half yearly on the ordinary lines. Clauses referring to prepayment meter supply, prescribing 14-candle gas, and the "Metropolitan" No. 2 burner for testing, are all in the common form. The Company are also asking for sanction to apply, if thought fit, for a Provisional Order to enable them to supply electrical energy. [Parliamentary Agents: Messrs. R. W. Cooper and Sons.]

The Whitland Water and Gas Company are up seeking for incorporation and statutory powers to enable them to supply water and gas in certain parishes in the counties of Carmarthen and Pembroke. The Company was formed under the title of the Whitland and District Gas and Water Company, Limited; and by it gas is being supplied in Whitland, but no water-works have been constructed. The preamble of the Bill mentions that by an order, dated March 26, 1909, made in an action in the High Court of Justice, wherein Messrs. R. & A. Main, Limited, were the plaintiffs, and the Limited Company the defendants, Alexander Constantine Hutchins was appointed receiver of all the property and assets of the Limited Company. An agreement has been entered into on behalf of the Company for the purchase of the undertaking of the Limited Company. The agreement appears as a schedule to the Bill. It recites that the nominal capital of the Limited Company was £25,000, divided into 2500 ordinary shares of £5 each and 2500 preference shares of £5 each; but only about £4025 of such capital has been subscribed. The Limited Company also raised a sum of £4900 by the issue of a series of 490 first mortgage debentures of £10 each. The erection of gas and water works was commenced by the Company; but the share capital subscribed and the money raised by debentures were insufficient to enable them to complete the scheme. The Company have been unable to raise any further capital, and have made default in payment of the interest upon the debentures. Then follows the information as to the appointment of a receiver and manager. The agreement is made between the receiver and manager and Mr. Joseph Lewis Hampton; and, subject to the approval of the High Court, it provides for the purchase of the undertaking on arbitration terms. The promotion of the present Bill stands as part of the agreement. Turning to the clauses, the capital proposed by the Company is £15,000, in 3000 shares of £5 each; together with borrowing powers to the amount of one-third. Provisions are embodied in the Bill for reserve and special purposes funds; and another clause provides for the confirmation of the agreement for the purchase of the undertaking of the Limited Company. The water section of the Bill can be left for notice with the measures specially dealing with water. As to the section referring to gas supply, the area is defined; and all the necessary powers are included relative to manufacture and distribution. The maximum price of gas is not to exceed 4s. 6d. per 1000 cubic feet. The standard illuminating power is proposed at 14 candles, tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Baker and Co.]

The Wicklow District Gas Company, Limited, were incorporated in 1907 under the Companies Acts; and they have gas-works on lands held on lease for a term of years having 97 years to run. The share capital of the Company was fixed by their Memorandum of Association at £12,000; and they have issued ordinary shares to the extent of £9000, cumulative preference shares to the extent of £1100, and mortgage debenture bonds to the extent of £2400. The proposed share capital of the Company is £16,100, consisting of the share capital already raised of £10,100, and of £6000 additional share capital, to be issued under the new auction clauses. The limits of dividend are 7 per cent. on the original ordinary capital, and 6 per cent. on the original preference capital, with similar dividends for the respective classes on the additional capital. The customary one-third borrowing power is asked for; and then follow provisions as to special purposes and reserve funds. The standard price of gas is placed at 5s. 3d. per 1000 cubic feet, with the sliding-scale operating half yearly, by 1s. 9d. variations in dividend for penny changes in price. The standard illuminating power is proposed at 14 candles, using in testing the "Metropolitan" No. 2 burner. The prepayment and other clauses are in ordinary form. Power is taken by the Company to apply for a Provisional Order for electricity supply should it be deemed advisable. [Parliamentary Agents: Messrs. R. W. Cooper and Sons.]

**London and Southern District Junior Gas Association.**—Arrangements have been made for the members of the Association to visit, in two parties, on Wednesday and Thursday of this week, the meter works of Messrs. Parkinson and W. & B. Cowan, Limited, in Cottage Lane, City Road, E.C.



## THE HAMBURG GASHOLDER DISASTER.

THE "Zeitschrift" of the Association of Gas and Water Engineers of Austria-Hungary, after complaining of the difficulty of getting information officially from the works as to the disaster which took place at the Hamburg Gas-Works on Dec. 7, reproduces from the "Installateur" (which is a technical paper published at Ludwigshafen) a report which Herr Stellkens, an architect and chief officer of the Duisburg-Ruhrort Wharves, has communicated to a local Rhenish paper. The report is interesting chiefly because it discloses some special acquaintance on the part of its author with the gas affairs of Hamburg.

Herr Stellkens, after pointing out that the tank of the new gas-holder at Hamburg was the largest of its type in the world, states that the technical members of the Gas Committee of Hamburg at the time when the erection of a new gasholder was under consideration were unanimously in favour of a different construction. On the other hand, the commercial members of the Committee were in a majority, and took the view that the type of construction was of no moment, as the guarantee of the constructing firms would be sufficient. The construction followed was adopted contrary to the views of the technical members, and in spite of the warnings of authorities such as Professor E. Häsel, of Brunswick, who declared that it was statically unsound. This warning remains, he says, on record. Herr Stellkens next points out that an explosion in a gasholder which has been in use for some time is an impossibility, and that reports of explosions in coal-gas holders in which no air was present are exercises of the imagination. He then proceeds to say that in a new gasholder there is the possibility of an explosion when it is first being brought into action. The gas entering the holder forms with the air contained in the crown an explosive mixture, which must be carefully exhausted from it. The mixture of air is, he mentions, withdrawn through a pipe which extends through the crown of the holder down nearly to the surface of the water in the tank. At Hamburg, only one such pipe was, he states, used, whereas at least four should have been inserted in different parts of the crown. The first precaution to be observed in bringing such a large gasholder into use, should be that all lights, lamps, or furnaces should be removed for a distance from the holder of at least 22 yards, and in the direction of the wind at least 55 yards. At Hamburg there was a canteen underneath the gasholder, whereas no light should have been used there in December. In conclusion, Herr Stellkens remarks that he has an intimate knowledge of the site of the Grasbrook Works, and also of the particular private relations which prevailed in placing the construction of this gasholder, which relations exist in very many towns in Germany and adjacent countries. He takes upon himself the sole responsibility, under the Press laws, for his statements.

The Hamburg "Fremdenblatt" observes in regard to Herr Stellkens's statements that they are based on erroneous suppositions and faulty judgment. It is, it argues, quite a proper course in giving out the order for the gasholder to examine scientifically different projects. There was not in this case only one firm concerned; the construction was entrusted to two firms who are of good repute in the construction of gasholders, and have already erected a very large number. The causes of the catastrophe will not be definitely disclosed until the official investigation has been completed.

The "Zeitschrift" of the Austrian Gas and Water Association next proceeds to quote a report from the "Hamburger Nachrichten," of Dec. 16, as to the proceedings at a meeting of the City Council. One of the questions before the meeting was a recommendation of the Council that a sum should be voted for the reconstruction of the smaller burnt-out gasholder at the Grasbrook Works. It was proposed that the Finance Committee of the City should be empowered to transfer to the Lighting Committee for this purpose a sum of £10,000 from the Fire Insurance Fund. In the discussion which ensued on this recommendation, Herr Kümpel said that he thought that the works should be removed from the present position, on the ground that immediately adjacent to the gasholder were the passengers' waiting-rooms, in which often there were as many as 2000 emigrants. Happily at the time of the catastrophe only 80 emigrants were there; but there was a panic among these, and they were taken off on a steamer. Also some of the offices of the dock authorities were close to the site of the holder. Herr J. Rohde pointed out that the old gasholder was not the initial cause of the catastrophe. He commented also on the fact that the newspapers obtained earlier information of this proposition than members of the Council were able to do.

Reference was next made to the report of Herr Stellkens published in one of the Rhenish newspapers, and the attack which it made on the Council. It was stated that the authorities were anxious that the truth in regard to the catastrophe should be disclosed as quickly as possible, and that the investigation was being hastened forward. Herr Beit explained that originally it had been intended to erect a fourth gas-works at a cost of £1,400,000; but the purchase of a site for it had not been approved by the authorities. Herr Krause, the former Manager of the gas-works, had then brought forward a scheme for enlarging the Grasbrook Works, and it could not be said the reconstruction and enlargement of the works had been undertaken without due consideration.

The scheme had been submitted to Herr Körting, the General Manager of the works of the Imperial Continental Gas Association at Berlin; and he made an exhaustive investigation of it and suggested a number of changes. This was of importance, as the authorities had been reproached with having erected too large a gas-works on such a very small area. In regard to Herr Stellkens's charges, it might be pointed out that eight firms had tendered for the construction of the gasholder; and as a result of the consideration of the tenders, the contract had been given to the Berlin Anhalt Engineering Company. There was no question of the commercial interests being opposed to the technical opinions, because the construction of telescopic gasholders was approved by all technical men. Senator Strack considered Herr Stellkens's article was the outcome of insufficient knowledge. Dr. M. Albrecht thought that, while the gas-works themselves might not be dangerous, it appeared inadvisable to store so large a quantity of gas as 7 million cubic feet close to the retort-settings. It was obvious that the leakage from the gasholder was due to a fault of construction. Such a large gasholder ought to be removed from that position. In regard to the small gasholder, he thought that the roof, which had previously been of wood, should certainly be constructed of fire-proof material. Herr Stolten remarked that the cause of the catastrophe could only be traced to a fault of working, or of design, or of material, while such a large gasholder should not have been erected near the furnaces. Gasholder explosions were comparatively rare; but in cases such as the present where an accident occurred, the cause must certainly be ascertained. It must in any case be determined how the leakage arose, and the responsibility must be brought home to the person at fault. Herr Gutknecht pointed out that if water had been available at the proper place and time, the catastrophe to the old gasholder would not have happened. This gasholder was not so lofty; and he wished to know why the Fire Brigade had not been able to save the roof. Dr. Wolfson thought that it was the duty of the Lighting Committee to institute proceedings for slander against the author (Herr Stellkens) of the article in the Rhenish paper. Herr Kümpel in a second speech said that the gas-works constituted a great danger to the adjacent docks and wharves, and the question should be thoroughly discussed whether they should not be removed to another site. Herr Paevelow said the real question was whether a concrete roof was not dangerous. Herr Hennicke remarked that every effort had been made by the admirable City Fire Brigade to get water on to the roof of the gasholder, but it was a very difficult matter, and they had been unsuccessful. Herr J. Rohde interposed to observe that it had been clearly shown that the Fire Brigade ought to be better equipped. After a few further remarks, the discussion was closed, and votes were taken first on a motion by Herr Kümpel objecting to the reconstruction of the old gasholder, on the ground of the danger it presented to the emigrants' accommodation. This motion was lost. A motion by Dr. Albrecht, to the effect that the roof of the gasholder house should be constructed of incombustible material, was also lost, and the original recommendation of the Council was finally carried.

The December number of "Het Gas" contains a short notice of the Hamburg catastrophe, based chiefly on the report given of it in the "JOURNAL" for Dec. 14. It points out, however, that tanks of somewhat similar construction exist in Holland at the Rotterdam and the Hague Gas-Works. The one at Rotterdam is for a holder of 30,000 cubic metres (= 1,060,000 cubic feet) capacity; but the interior of the annular tank is closed up and inaccessible. But the tank of the holder of 70,000 cubic metres (= 2,472,000 cubic feet) capacity at the modern Trekvljet works at the Hague is of the raised annular type, and the interior chamber or vault is roofed over, and is used as a store. The roof, however, is of iron sheets, covered with water to a depth of 6 or 7 inches; whereas the roof of the chamber of the large holder tank which collapsed at Hamburg appears to have been mainly constructed in cement concrete. The gasholder at the Hague was described, with a view of the holder and a section of the annular tank, in the account of the Trekvljet works which was given in the "JOURNAL" in February, 1908 (Vol. CI., pp. 290, 291). The holder, however, rises to a height above the ground level of only 174 feet, as against 246 feet for the Hamburg holder; while the diameter of its tank outside is only 174 feet, as compared with about 243 feet for the Hamburg tank. Notwithstanding the smaller dimensions of the gasholder at the Hague, the similarity of its construction with that of the holder which has failed at Hamburg must recall attention to it. A second similar gasholder is at the present time being erected at the Trekvljet works at the Hague.

**Manchester and District Junior Gas Association.**—At the next meeting of this Association, which will be held in the Victoria University, Manchester, on Saturday afternoon, two papers will be read—one by Mr. A. L. Holton, entitled "Notes on the Manufacture of Sulphate of Ammonia;" the other by Mr. S. Carter, on "Some Experiences with Carburetted Water-Gas Manufacture." We learn from the Hon. Secretary (Mr. J. Alsop) that the return debate between the members of the Association and those of the Manchester Students' Section of the Institution of Electrical Engineers, on the subject of Gas v. Electricity for the Production of Heat and Power, will take place at the Municipal School of Technology, Manchester, on the evening of Tuesday, the 15th prox.



## PRECAUTIONARY MEASURES WITH GASHOLDERS.

THE "Zeitschrift" of the Association of Gas and Water Engineers of Austria-Hungary of the 1st inst. contains an article by Herr Walter Licht, of Vienna, on the precautionary measures which, according to his experience, should be followed in bringing new or repaired gasholders into action, and in making ready gasholders which have been in use for repair. The article is prompted by the reports of the gasholder catastrophe at Hamburg; and its object is to suggest precautions which the author's wide experience with starting new and letting down old gasholders leads him to believe will be of benefit to those of his colleagues in the industry who may occasionally be called upon to superintend such operations.

When a holder is about to be brought into use, it is necessary that the contained air should be displaced by gas. The first step, however, with a new holder is to raise it repeatedly with air, in order to see that the guide-rollers act properly, easily, and silently. With telescopic holders, the cupping and uncupping should take place without a hitch; and it must be ascertained that the cups are absolutely sound. It has been known, for instance, that a rivet has been omitted from one of the cups, and the hole merely lightly filled in with red lead and paint, so that it was only after the lapse of a little time that unsoundness was disclosed. If there is a steam-pipe for warming or stirring the water in the cups in winter time, care must be taken that the water cannot be syphoned out of the cups by this pipe. The tank and cups should be closely examined, to see that pieces of wood or tools or other working appliances have not been forgotten or dropped in, as they might cause serious interference with the rising and falling of the gasholder or the cupping and uncupping of the lifts.

In order to test the soundness of the valves, the inlet and outlet connections to the holder should be filled up with water before the holder is raised with air. Water is more readily and rapidly applied than blank flanges. After the bell is raised its soundness must be tested by a thorough application of soapy water. The pipe by which the holder is blown off should pass through the highest point of the crown, and extend nearly down to the surface of the water in the tank. A small outlet-pipe with pet-cock may be provided on the pipe by which the holder is blown off, in order that samples of the mixture of gas and air may be taken in a small bladder and tested in the laboratory. The men engaged on the holder at the time should wear india-rubber shoes, in order to avoid striking a spark. Watchmen should, if the local conditions necessitate the precaution, be placed round the holder, so as to prevent people who are smoking approaching it. A day should, if possible, be chosen for blowing out the holder when the wind is not blowing towards the retort-house or the boiler-house. All flames in the neighbourhood of the holder should be first extinguished. The day also should be free from thunderstorms. The blowing-off should be started early enough in the day to admit of finishing off the whole operation before dusk. In blowing out the holder, the valves should only be opened sufficiently to raise it gradually.

When it is necessary to let down a holder which has been in use, for repairs or cleaning, the gas remaining in the bell must be expelled by air. The blowing-off pipe must in that case not be prolonged inside the holder. The outlet-pipe must be filled with water, and remain filled with it till the holder is again put to work. It must be ascertained with certainty that the valve on the inlet-pipe is perfectly tight; and, in order to ensure that air does not find its way through this valve into the system of mains, it is safer to cut off the inlet-pipe from the works main by a blank flange. The air is then blown through the inlet-pipe by means of a pump or an exhaustor, so as to raise the bell gradually. As soon as the blowing out of the holder is finished, the inlet-pipe should be filled with water. In some cases, the author has had the free end of the blowing-off pipe made to dip into a vessel of water. The walls of the vessel must be of sufficient depth to prevent the water being splashed over them. The dip, or depth to which the pipe passes into the water, must naturally be settled for each particular case according to the prevailing pressure. The blow-off pipe must not be of too small size; otherwise the operation takes too long, and the chances of an explosion are thereby considerably increased. Where the gasholder happens to be enclosed in a building, the blow-off pipe must, of course, pass outside the building.

The method of blowing off through a water-seal obviously can be applied also to the blowing out of large new distributing mains, if they are not blown out with chimney gases according to Dr. Strache's system. When the Imperial Continental Gas Association some years ago were bringing a new stretch of 36-inch main into action in Vienna, the outlet-pipe was made to dip into a stream of water, in order to avoid risk of accident. It is easy to arrange apparatus for the blowing out of mains and apparatus in a portable form with a water-seal.

The foregoing are general precautions, which may need to be supplemented according to local conditions. It would be useful, the author considers, if his colleagues in the industry also would put on record the precautions which they have been accustomed to adopt in blowing out gasholders, &c.

## LOCAL ADMINISTRATION AND TAXATION.

THE annual reports of the Local Government Board have grown so bulky of late years, that it has been necessary to issue in two parts the one dealing with the general work of the Board; a separate volume being devoted entirely to the proceedings of the Medical Department. Part II. of the thirty-eighth report, covering the year 1908-9, has lately been published; and, as on previous occasions, we shall reproduce from it some of the statistics relating to local administration and taxation. The various subjects are arranged in three groups: (1) The work of County Councils under the Local Government Act, 1888; (2) public health and local administration; (3) local taxation and valuation. It is with statistics contained in the last two groups that our readers are specially concerned.

Since the constitution of the Board in 1871, they have sanctioned loans by urban and rural authorities amounting to £184,262,578, of which £6,531,401 was authorized in the year ended Dec. 31, 1908. This sum was divided between the two classes of authorities as follows: Urban councils, £6,009,741; rural councils, £521,660. Under the Public Health Act and Local and Confirmation Acts, the Board sanctioned loans to the amount of £4,552,673, of which £1,592,890 was to be spent on street improvements, &c., £1,026,857 in connection with the sewerage of towns and villages, £325,795 on gas-works, £369,524 on water-works, and £290,015 on the provision of public walks and pleasure-grounds. The amount sanctioned for water-works was divided thus: Urban councils, £248,058; rural councils, £121,466. The borrowings by local authorities for electricity supply purposes under the Act of 1882 continue to be heavy. In 1891 they amounted to £115; in 1901, to £3,995,459; and in 1908, £1,377,268. The total amount borrowed between 1890 and 1908 (both inclusive) was £25,550,546, the whole of which was required by town and urban district councils, with the exception of two loans of £20,000 and £7000 authorized to be raised by the Rural District Council of Neath in 1905 and 1908. The loans for water supply sanctioned to joint boards during the past ten years amount to £2,530,285, of which £745,643 stands for the year 1908. This includes £722,393 for the Metropolitan Water Board.

Most of the local inquiries held by the engineering staff of the Board are in connection with applications by local authorities for sanction to loans; but many other matters engage their attention. For example, they have to consider appeals against the apportionment of the cost of sewerage or water works between rural parishes, and objections to the construction of these works beyond the limits of the district for which they are required, and also to the construction of reservoirs which will hold more than 100,000 gallons of water. In connection with this work, 1181 inquiries were held during 1908. In addition, a large number of visits were paid with reference to complaints in regard to the sanitary conditions of towns and villages, and appeals by owners against the demands of local authorities for the repayment of the cost of making-up private streets, and the inspection of sewage-disposal and other sanitary works in respect of which the Board had sanctioned loans. Under section 243 of the Public Health Act, 1875, the Board are empowered to recommend the Public Works Loan Commissioners to advance moneys to local authorities for the purposes of that Act; but, by virtue of the Public Works Loans Act, 1898, their recommendation is no longer necessary in the case of such loans, unless the period within which a loan is proposed to be repaid exceeds thirty years. During the year 1908, the Board's District Auditors investigated the accounts of twenty special non-Metropolitan gas and water authorities; and the Board determined eight appeals against disallowances.

In pursuance of the Board's powers under the Public Health Act, 1875, they issued 21 Provisional Orders for the repeal, alteration, and amendment of Local Acts and Provisional Orders Confirmation Acts. Among them were the following: The Aspatia, Silloth, and District Order legalized works which had already been executed by the Water Board, and provided that certain other works to be executed should be carried out in accordance with plans to be approved by the Local Government Board. The Barry Order authorized the purchase by agreement of lands for protecting from pollution or contamination the sources of water. The Bethesda Order abolished the existing gas-rate, substituted the district fund and general district rate for the gas-rate as security for moneys borrowed for the purposes of the gas undertaking, made further provision for the repayment of such moneys, and empowered the Council to charge to the district fund any deficiency in the revenue of the undertaking. The Fulwood Order empowered the Board, on the application of the Council, to fix the rates and charges for a supply of water for domestic purposes, including additional charges for fixed baths and for each water-closet beyond the second in a house. In the foregoing and other cases, further powers were conferred on local authorities in regard to the gas and water undertakings, including the use of lands for the manufacture and storage of gas and residual products, the supply of gas, and of apparatus, &c., used in its consumption for lighting and heating or other purposes, the extension of the limits for the supply of gas, and other matters.

Among the financial, statistical, and other statements in the report is a table showing the loans sanctioned to county borough, town, and urban district councils in respect of their gas and water undertakings during the twelve months ended Dec. 31, 1908. The following were among the loans sanctioned for the first-named



purpose: Ammanford, £1000; Bangor, £2000; Barnoldswick, £2000; Brighouse, £6420; Burnley, £9500; Chorley, £10,317; Clacton, £5310; Congleton, £3000; Gainsborough, £2000; Glastonbury, £2271; Glyncorrwg, £1300; Hereford, £4160; Huthwaite, £1000; Ilkeston, £15,746; Leeds, £55,000; Liverpool in respect of the Fazakerley Gas Order, 1906, £21,006; Llandudno, £3880; Mansfield, £1100; Marple, £1000; Maryport, £1160; Milford Haven, £1914; Neath, £9925; Newark, £1400; Newbury, £1592; New Mills, £2000; Newland, £4000; Oswaldtwistle, £1955; Rhyl, £1100; Richmond (Yorks), £2000; Shipley, £6890; Sowerby Bridge, £1100; Stockport, £35,567; Stourbridge, £6000; Swadlincote, £4000; Teignmouth, £1000; Tipton, £1340; Tiverton, £4000; Torquay, £4150; Wallasey, £64,821; Wigan, £22,250. A number of loans were also granted in respect of water supply, the following being the principal ones: Bridlington, £11,000; Burnley, £5675; Colne, £2500; Coventry, £8306; Cowes, £6100; Croydon, £5000; Dawley, £14,000; Exeter, £9000; Harrogate, £3735; Hinckley, £14,000; Hyde, £11,000; Llandudno, £3350; Maesteg, £17,802; Portland, £4622; St. Ives (Cornwall), £11,205; Scunthorpe, £3200; Silsden, £3000; Wellingborough, £3800.

The section of the report dealing with local taxation and valuation sets forth that the Board prepared and presented to Parliament returns showing, for the financial year 1906-7, particulars of the receipts, expenditure, and outstanding loans of each county council, town council, urban district council, rural district council, and board of guardians, together with information as to the financial transactions and outstanding loans of all other local authorities exercising jurisdiction in England and Wales. According to these returns, the total amount of public rates collected in England and Wales during the year 1906-7 was £59,545,948; comprising £27,388,974 from poor rates, £13,652,749 from general rates in Metropolitan boroughs, £12,990,331 from general district rates, and £5,513,894 from other rates. The amount of public rates received for all purposes exceeded by £1,301,655 the corresponding amount for 1905-6; and £414,366, or 32 per cent., was due to additional rates received for the purposes of elementary education. From statistics given in one of the appendices, we find that the revenue of gas undertakings was £7,150,028; and from water-works, £4,615,664—against £7,073,249 and £4,429,778 in 1905-6. The expenditure of gas undertakings out of loans was 424,749, and of water undertakings £2,771,799; compared with £523,394 and £3,178,722 before. The sums expended out of moneys other than loans were approximately £114,134,274. This total comprised the following sums: Maintenance and other expenses, gas-works, £5,066,646; water-works £1,742,579; loan charges, apportioned as far as practicable, gas-works £1,457,000, water-works (exclusive of the expenditure of the Metropolitan Water Board), £3,371,685—total gas, £6,523,646; water, £5,114,264. Further particulars as to the amounts expended otherwise than out of loans are given in an appendix to the report. The outstanding loans at the close of the year 1906-7 were: Gas-works, £23,550,765; water-works, £120,559,297, including £47,407,029 in respect of loans taken over or raised by the Metropolitan Water Board, whose work in the year 1908 is dealt with at some length by Mr. Charles Perrin, M.Inst.C.E., the Water Examiner under the Metropolitan Water Act, 1871.

## A STEEL-FRAMED COKE-STORE.

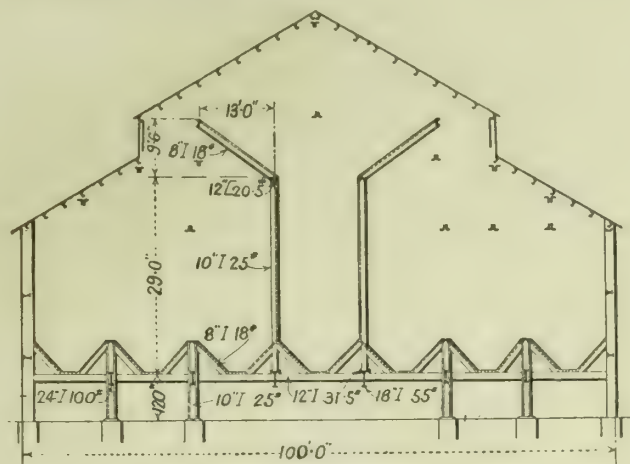
A RECENT number of "Engineering Record" contained the following particulars of a steel-framed coke-store designed for the Toronto Gas Company by their Engineer, Mr. W. H. Pearson, jun., and erected by the Dominion Bridge Company, of Lachine, Quebec.

The building, 100 ft. by 170 ft., and 70 feet high, is constructed with steel framework, roof, and hoppers, and with brick walls; and its capacity is 147,000 bushels. It is divided, by two rows of tall intermediate columns, into three longitudinal aisles, each of which contains a full-length hopper-bottom bin supported on horizontal steel floor beams 12 feet above the surface of the ground. The centre bin is comparatively deep and narrow in cross section, with a wide flaring top, vertical sides, and inclined bottom, all covered with  $\frac{1}{4}$ -inch flat steel plates. The side bins are three times as wide as the centre one, and have vertical side walls, one of which is common with the centre bin, and the other is composed of a solid brick exterior wall 18 inches thick. The bin bottoms are divided into 36 cone-shaped sections, with one, three, and five bushel rotary measuring chambers, through which their contents can be delivered into cars on the surface of the ground.

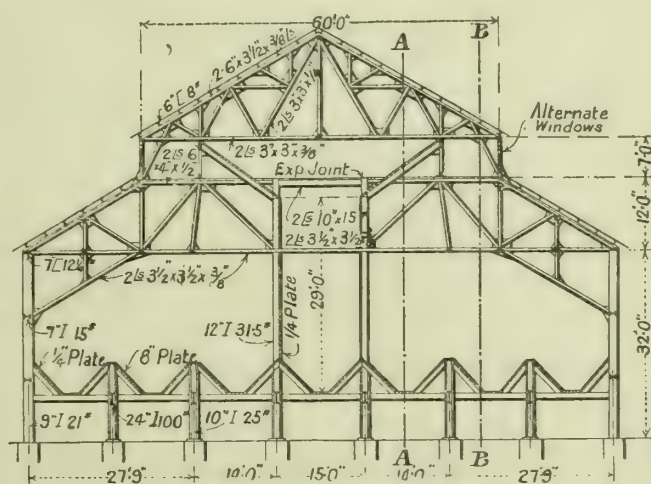
The hot coke, which is not larger than 8 inches in any dimension, and weighs only 31 lbs. per cubic foot, is broken and delivered to gravity bucket conveyors supported by the roof trusses, and is automatically graded into the three sizes by rotary screens, and dumped into the bins, which are proportioned for maximum loads of about 260 lbs. per square foot at their floor area when filled to the tops of the side walls.

The framework has 13 longitudinal panels 13 ft. 9 in. long at the end, 9 ft. 8 in. long for the three centre panels, and eight intermediate panels of 14 feet. The transverse bents at the panel points are each made with four main vertical columns supporting the roof trusses and four short intermediate columns supporting

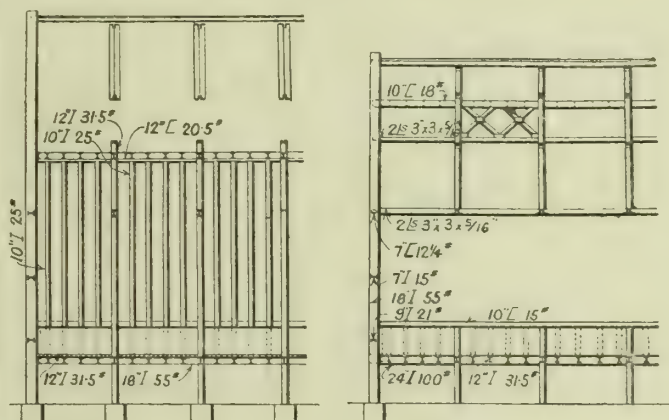
the floors of the side bins. The centre main columns, 7 ft. 6 in. from the axis of the building, are 12-inch, the side wall columns 18-inch, and the intermediate short columns 10-inch I-beams, with their flanges reinforced (like those at the lower end of the centre column) with 9 in. by  $\frac{3}{8}$  in. cover-plates. The tops of the centre and wall columns are connected by simple side roof trusses of 41 ft. 9 in. span, with their top and bottom chords continuous between the centre columns, to provide transverse rigidity, but not designed for the transfer of vertical loads from one side of the building to the other.



Intermediate Cross Section.



Cross Section at Panel Points.



Longitudinal Section at AA.

Longitudinal Section at BB.

General Structural Features of the Toronto New Coal Store.

The side trusses are knee-braced to the wall columns with long angle struts, and near the centre points of their top chords they carry very wide monitor frames, supporting the upper centre roof trusses of 60-foot span. Vertical and inclined members in the monitor bracing connect the upper and lower trusses, and provide for the support of the distributing conveyors and screens, &c., and of the flaring upper part of the centre bin. The roof trusses are connected longitudinally by 34 lines of 6-inch channel purlins, all covered with corrugated iron sheathing and by cross-bracing of single 3 in. by 3 in. angles in the horizontal planes of the bottom chords of both upper and lower trusses. They are also connected by one-panel and two-panel frames of vertical cross-bracing in the four panels, having bottom chord braces in three longitudinal lines of the upper trusses and in four longitudinal lines of the lower ones. The wall columns are built solid into buttresses formed in the brickwork of the sides and ends of the building, and are not braced.







## STRASBURG GAS-WORKS AND SUPPLY.

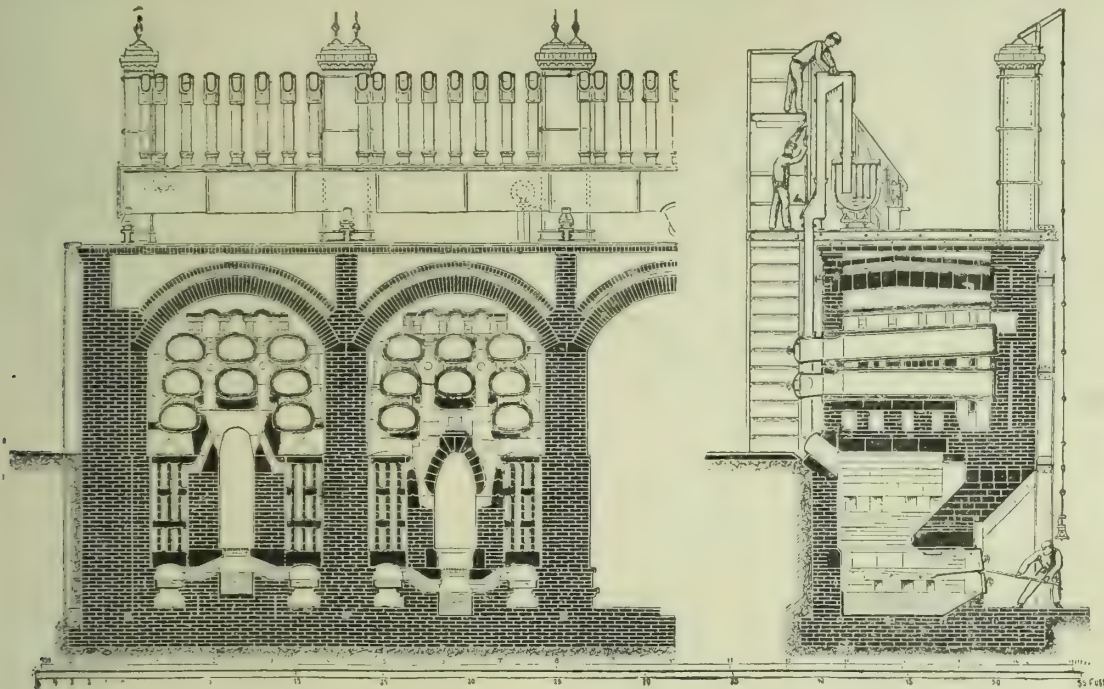
## [SECOND ARTICLE.]

IN the previous article (*ante*, p. 26), we gave a general account of the progress made by the Union des Gaz Company in the first half-century of their responsibility for the supply of gas in Strasburg. We now give a few particulars of the works and plant as they stand at the present time.

The situation of the works in the fortified portion of the centre of the northern quarter of the city gave rise to difficulties which called for some special solutions, having regard to the public health and to prefectorial requirements and the rules of the Syndical Association of German Gas-Works. The authority granted to the Company in 1897 to enlarge their works to a daily capacity

of 2 million cubic feet was accompanied by the condition that the smoke from the retort-houses and the steam produced by the quenching of the coke should be carried away at a height of nearly 100 feet. The retort-house and boiler chimneys had therefore to be built about 145 feet high. The numerous stacks give the works a rather strange appearance, such as one would expect to meet with in a metallurgical or mining district. They, however, keep the neighbourhood fairly free from dust.

When, in 1908, the Company obtained sanction for the enlargement of the works so as to bring them up to a capacity of  $3\frac{1}{2}$  millions per day, they were required by the authorities to introduce some method of rapidly charging and drawing retorts; and various systems were considered. The retort-house intended to receive the new installation was already in existence, and contained a bench of horizontal retorts set back to back. It was therefore decided to retain this arrangement, and to introduce a machine which a journey to England had brought under notice,

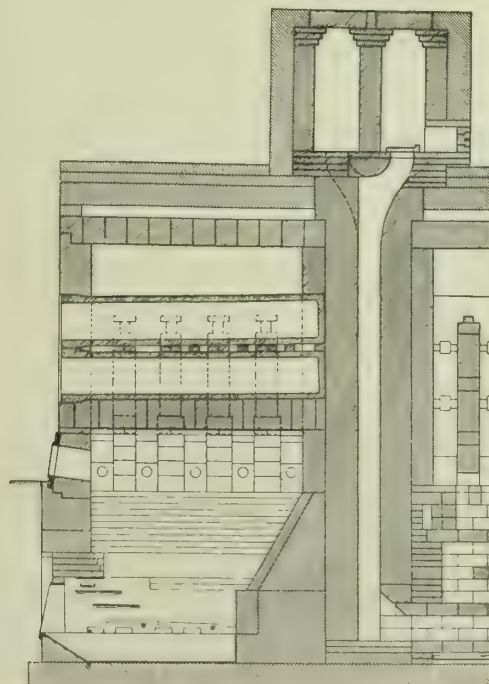
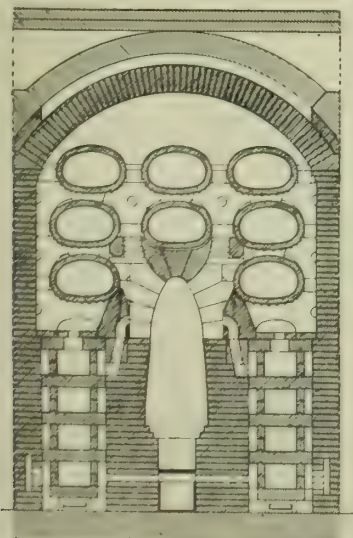


Cross Section of the First Recuperative Settings.

and which was considered to be superior to everything of the kind then upon the Continent. It was the Fiddes-Aldridge machine, of which a detailed description is given by the author of the book from which these particulars are taken (M. Gaston Kern). According to experience at Strasburg, thirty retorts, 21 feet long, each supplied with  $8\frac{1}{2}$  cwt. of coal, can be drawn and re-charged in 45 minutes. The accompanying illustrations show the old settings at the works, the first settings on the recuperative system, and the discharging side of the new retort-house. The machine serves a bench of thirteen double settings of nine 21-feet retorts, placed back to back. Each double furnace has only one generator, which is fed with the incandescent coke direct from the retorts, and consumes only 12 per cent. of the coal carbonized. The coke intended for sale falls into a chain conveyor on the Klönne system, by which it is carried out of the retort-house, where it is quenched and is then sent through a shoot into the coke-pit.

The transport of the coke to the stores is a new feature of the

installation. The arrangement of the works is such that the coke has to be conveyed to the two yards by means of an overhead railway, located at a height of 55 feet, which connects them with the retort-houses. This portion of the plant is shown in the accompanying illustrations. The skip which receives the coke can convey it either to the shed from which it is sent away by cart, or to the railway shed by passing over the retort-houses. In this way the cart roads in the works are saved wear and tear, and the coke is moved with as little shaking as possible, assuming that the skip conveys it to its destination without any other manipulation. The coal is also dealt with by means of mechanical appliances. A horizontal conveyor, 82 feet in length, running



Cross Section of the Old Settings.





The New Retort-House—Discharging Side.



The Coke-Sorting Shed.

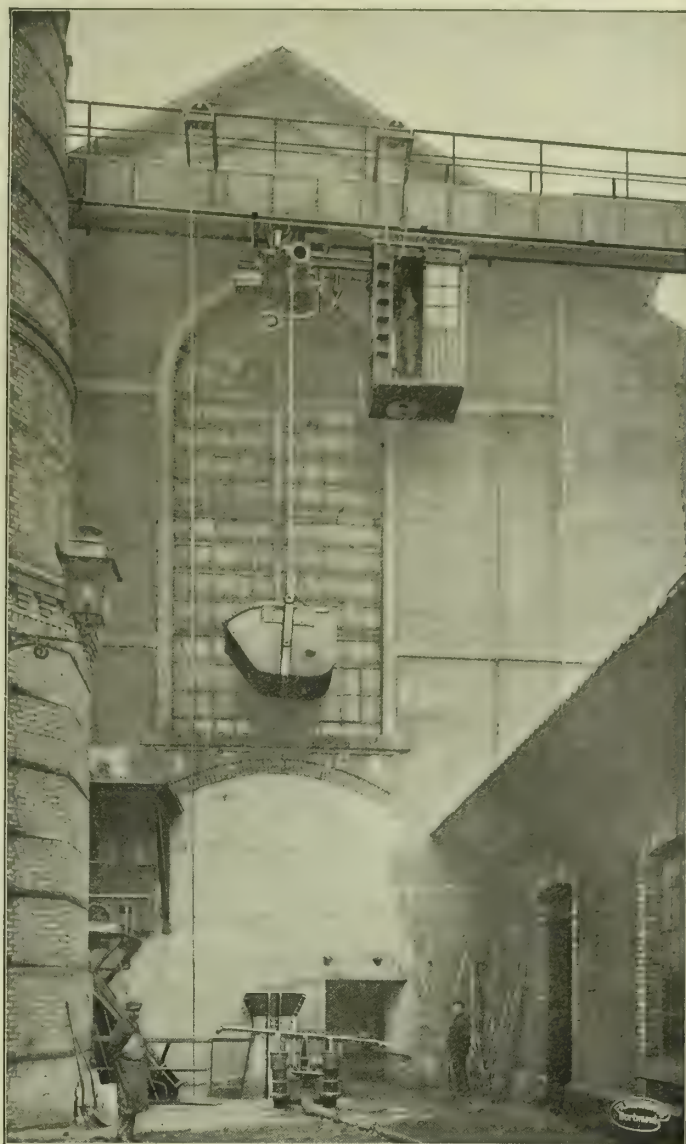


parallel to the railway lines, allows of the discharge and transport simultaneously of four trucks per hour. The coal is shovelled into the conveyor, which is worked by a three-phase electric motor hermetically closed so as to exclude dust. The coal-conveying plant, which will lift about 25 tons per hour, is sufficiently powerful to deal, in less than ten hours, with the whole of the coal required for a maximum day's production of gas in winter. Night work is consequently unnecessary. The consumption of electric current, at 125 volts, is 180 amperes per hour. The motive power required to convey a ton of coal from the truck to the store is about 1 kilowatt.

We pass now to the purifying plant, a conspicuous feature of which is a Klönne condensing tower of sheet iron, about 100 feet high and 13 feet in diameter, into which the gases of different compositions from the retort-settings pass at a comparatively high temperature. They enter at the bottom, rise slowly, mix with each other, and remain a long time in contact with the tar-fog that they contain. As the gases rise in the tower, they become cool by contact with the walls, and encounter the rain of condensation products, more especially the tar, which carries down a large quantity of the naphthalene in suspension. The efficiency of the apparatus is increased by means of a spray of weak ammoniacal liquor from the top, as well as by a series of perforated metal discs fixed at different heights inside the cylinder, so as to make the mixing as thorough as possible. The hot products of condensation, which leave the tower at the base, consist of ammoniacal liquor and tar, with a large proportion of naphthalene. The tar condensed in the Klönne apparatus is very fluid, and never causes obstructions. This condenser is not employed to the exclusion of other types of coolers, such as the Pelouze and Audouin and the "Standard;" on the contrary, their operations are facilitated by it. The arrangement of plant for the mechanical purification of the gas is shown below.

A certain amount of interest attaches to the chemical purification of the gas produced at Strasburg, in consequence of the efforts which have been made to reduce to a minimum the handling of the purifying material and its revivification in the boxes. Though the purifiers are located in a spacious shed enclosed in high walls, and situated about 500 feet from a dwelling-house, it may happen that when a box is opened, the odour arising is carried by certain winds into the neighbouring street. In order to minimize this trouble as far as possible, the number of purifiers has been doubled, the area of material trebled, and the latter rendered more efficient by the substitution of bog iron ore for sawdust. In this way it has been possible to effect the automatic revivification of the material in the boxes until it is quite spent. When in this condition, it is revived generally in a well-ventilated building, where it is spread upon the ground in thin layers, so that a large surface may be exposed to the action of the oxygen in the air. A great improvement has been made of late years in the purifying plant by the introduction of the Klönne three-tray boxes. As in many other gas-works, the operation of purification is improved by the admission of a small quantity of air to the gas before it enters the purifiers. This, however, necessitates careful regulation of the temperature and of the degree of humidity in the boxes, owing to the over-heating that may arise there. The Klönne purifier is a practical application of the principle laid down by Herr Kunath, that the speed of gas when passing through the purifiers should not exceed 12 inches per minute with old Lux material, but may be three times this rate with new.

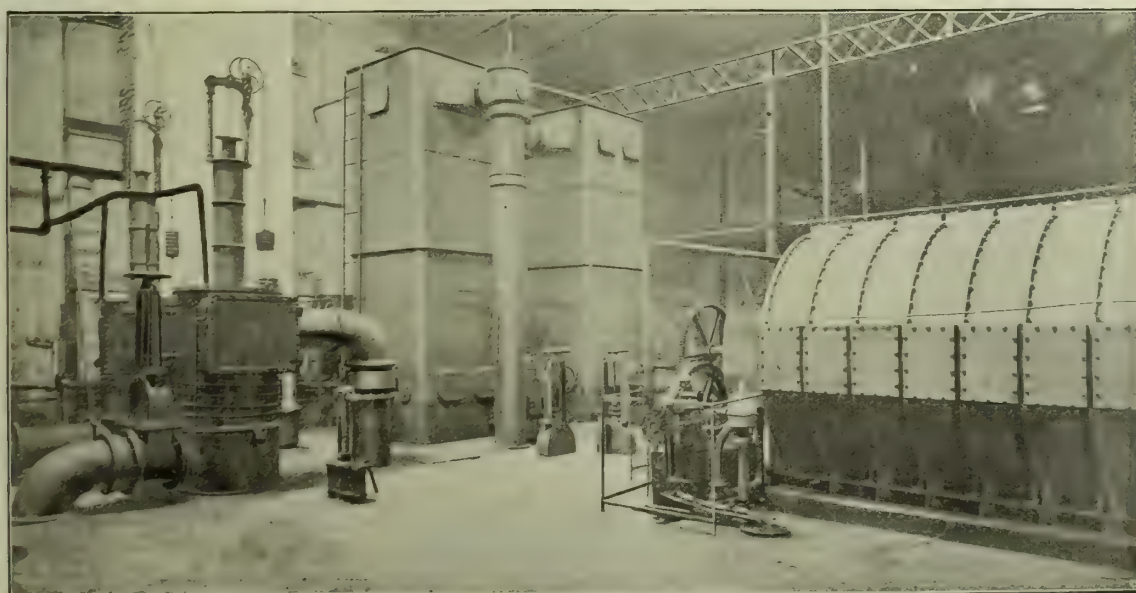
The next chapter in M. Gaston Kern's interesting book deals with the arrangements made to connect the works with the line of the Eastern of France Railway, and to move the coal-waggons from place to place. The extent of the traffic may be gathered from the following figures of arrival and departure: 3836 coal-trucks of 10 to 20 tons; 1966 coke-trucks of 10 to 15 tons; 54 coke



The Overhead Railway for Transporting Coke.

tipping-waggons of 15 tons; 224 tank-waggons of 10 to 20 tons for tar; 36 do. for ammonia; 25 trucks for purifying materials; and 285 trucks for merchandise and materials for construction. In the course of 300 working days, there are about 20 loaded trucks and as many empty ones to manipulate in the ten-hour day. A few years ago, this required a squad of twenty men, and was attended by considerable danger. But there is in operation a system of mechanical traction which has rendered signal service since its installation.

It now only remains to give a few particulars as to the public lighting of Strasburg; and these are reserved for the concluding article.



General View of the Purifying Plant.



## MODERN METHODS OF CARBONIZATION.

By E. KÖRTING, of Berlin.

Reference was made in the report given in the "JOURNAL" last week (p. 27) of an efficiency trial of a setting of eighteen vertical retorts at Mariendorf, to a communication to the "Journal für Gasbeleuchtung" on "Modern Methods of Carbonization," by Mr. E. Körtling, the General Manager of the works of the Imperial Continental Gas Association in Berlin, to which communication the report in question formed an appendix. The following is an abstract translation of Mr. Körtling's paper.

The dry distillation of coal constitutes the fundamental principle of gas manufacture; and, consequently, general attention has become riveted on types of settings and the various trials made and the experimental results obtained with them. The mass of material and data relating to the same is now so great that it is difficult to study it in detail and to give the different items their proper value. A well-known gas engineer recently expressed his views in the drastic statement that "there have never before in the gas industry been so many lies told as at the present time." To a certain extent, this expression of opinion may have some justification. It is in accordance with human nature that, for the sake of business interest or personal advantage, glowing statements should be made and failings suppressed. Hence it is eminently essential to sift thoroughly the value of all fresh information, whatever its source, and, if necessary, to revise our own position in regard to the matter in question. For instance, British gas engineers have told the author recently: "We have considerably increased our make of gas per ton of coal in horizontal retorts by charging them as full as possible, and we can now secure a make of gas of over 11,840 cubic feet per ton."

At first glance, this statement appears startling and almost inconceivable. To begin with, the figures are remarkably high; but it should not be forgotten that in England coal is not stored for a long time, as the surplus production of the summer is rapidly disposed of for export. Moreover, the distances in Great Britain are small; and the coal, consequently, is generally gasified while quite fresh. This accounts for much, as it is an established fact that many varieties of coal suffer great loss in their gas-making quality in the first few days and weeks after they are raised from the pit. On the other hand, the English coal which reaches Berlin has undergone a railway and sea journey, extending over at least 14 days, in the course of which it has been exposed in thin layers to all opportunities of weathering. Further, the whole of the winter requirements of English coal must be brought into store in Berlin in the summer. It may therefore be at once assumed that the make of gas in the gas-works of German ports which obtain fresh coal all the year round must be appreciably higher than that of inland works. The author's own information confirms this assumption. Still better results may therefore be expected in England.

How can the make of gas, however, be increased by charging the retorts full? We know that when small charges are put into quite hot retorts a portion of the heavy hydrocarbons and tarry vapours are decomposed, and, consequently, a considerably increased volume of gas is obtained. This is theoretically correct; but in practice it does not apply to many English coals. With small charges, the separation of the carbon occurs so energetically that the ascension pipes are constantly becoming blocked; and it is necessary, in order to facilitate working, to draw the coke before it is completely burnt off. Also it is much easier to distribute a large charge evenly in the retort than a small one; and, owing to the greater time required for working it off, the retorts are not opened so frequently. Finally, since the decomposition of the gas is to a great extent avoided when the retorts are filled, it is possible to work at higher temperatures.

All these points in conjunction afford an explanation for the seemingly paradoxical experience that large charges of English coal give a better make of gas per ton than small ones. Large charges worked off in six hours in the inclined-retort settings at Berlin have, for similar reasons, given the same result—viz., the make of gas per ton has been increased. But, owing to the unfavourable condition of the coal, the make has only been about 11,480 cubic feet per ton. Much more gas, however—viz., 12,200 cubic feet per ton—is produced with small charges in horizontal retorts if an addition of Silesian coal is made to the English coal, so that high temperatures may be employed without the risk of much thick tar being formed. But there is a loss of ammonia, and the tar contains much free carbon and is less valuable, while the gas has a calorific power of only about 573 B.Th.U.; whereas the good gas from inclined retorts, of 584 to 595½ B.Th.U. per cubic foot, can receive a considerable addition of blue or simple water gas, while the ammonia and tar are preserved. We are thus also able (although only by the aid of water gas) to produce more gas per ton of coal in completely filled retorts. This fact is in complete agreement with the experiences obtained with the admission of steam in vertical retorts.

Speaking broadly, the dry distillation of coal only proceeds very smoothly when as many points as possible are offered at which the heat can act—that is to say, it proceeds best of all in vessels of minimum capacity and of maximum heating surface. The limits are determined by the friction on the fire-brick walls and the dependence thereon of the possibility of discharging the

retorts, by the resistance offered to external influences by the cross section, and by the labour that is required for the service of the retorts. Vertical retorts are subject to a special limitation. In order to ensure the proper discharging of the coke, notwithstanding small inequalities in the surface of the retort, it is necessary that they should diminish in diameter upwards, and hence, with the Dessau retorts, for instance, the temperature of the setting must fall off from the bottom upwards in correspondence with the reduction in the cross section of the retorts. The author considers that continuous carbonization has its chief advantage in the fact that it is not subject to this last limitation, and that the heats in the upper parts of the settings can be as high as in the lower, or even higher. In this way a thin layer of coal is exposed to a high temperature, and favourable conditions of carbonization, which afford a high productive capacity per retort, are secured. The cross section of the upper part of the Woodall-Duckham retort shown in fig. 1 illustrates this statement. This form of retort, however, offers very small resistance to pressures in the direction of the arrows. It is clearly very difficult to give the requisite support to the retorts in the upper heating zone, as they must there be so far distant from one another that slabs inserted between them will sag. The author has therefore little confidence in the durability of the upper ends of these retorts. On the other hand, the Dessau setting, a cross section of the lower part of which is shown in fig. 2, is hottest where the cross-section of the retorts is strongest, and the props between adjacent retorts are the shortest and most solid. Hence the Dessau retorts have the greatest durability in the zone of highest heats; while the upper ends of the retort, being only exposed to the lower temperatures, can be made of less valuable material and yet possess a very long life.

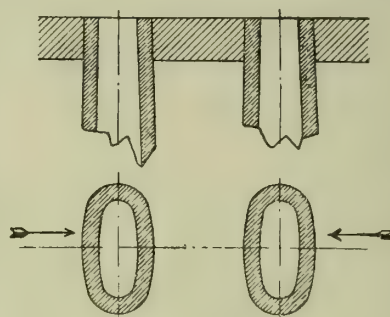


Fig. 1.—Woodall-Duckham Setting.

Upper Part.

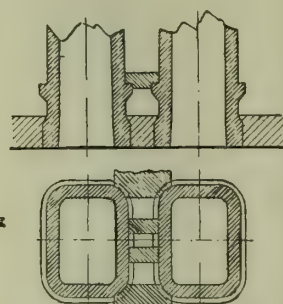


Fig. 2.—Dessau Vertical Retort-Setting.

Lower Part.

An important question is the comparative effect on the consumption of fuel in heating the settings of (1) a high temperature throughout the whole setting with a corresponding increase in the quantity of coal carbonized in a given time, as accomplished in the continuous systems of carbonization, and of (2) the great falling off of heat from the bottom to the top of the Dessau retorts, which implies a good utilization of the heat in the setting itself. The results of the Glover-West retorts appear to be good in this respect; but they are surpassed by the latest form of the Dessau retort-setting. An advantage of continuous carbonization is the complete absence of smoke; but it presents the following disadvantages: (1) Separate charging and discharging mechanism is required for each retort. (2) The continuous movement of the whole contents of the retort cannot possibly be advantageous to the coke. The economy of the system would be thoroughly dubious if the reduced durability of the coke increased the quantity of coke breeze by only a small percentage of the weight of coal carbonized. (3) It is impossible to inspect the inside of the retorts because they are always quite full, and to ascertain whether they need repair and whether the coal is properly disposed to them.

The patent specification of Messrs. Robert Dempster and Sons, Limited [see "JOURNAL," Vol. CVIII., p. 411, cf. also pp. 27 and 125, and pp. 179 and 326], is also of interest. Its object is to heat vertical retorts worked intermittently, as in the Dessau system, uniformly throughout their whole length, but without any extremely high temperature. To judge from the drawing, the retorts narrow but little, if at all, towards the top. The patentees would thus utilize the whole heating surface as far as possible, as in the case of continuously worked retorts. But it is to be feared, according to our experience, that vertical retorts will not work properly unless they are considerably tapered towards the top, as quite small inequalities interfere with the discharge of the coke. If, however, the tapering is necessary, it is impossible to avoid, with intermittent working, heating in the same way as with the Dessau settings. In that case, experience shows that, as soon as the heat in the upper part of the retort is greater than corresponds to the coal contained in that part, superheating of the gas takes place, and pitch and naphthalene are formed.

The large carbonizing chambers or ovens so far produced are clearly designed primarily not with the object of providing the most favourable conditions for carbonization, but rather with a view to reducing to a minimum the labour required by the adoption of the largest possible charges and the longest periods of working-off the charge. If the conditions of carbonization—i.e., the ratio of the capacity of the chamber to its heating surface—



are not favourable, it follows that the consumption of refractory material and of fuel will be disproportionately high. One point in favour of large chambers or ovens as compared with Dessau vertical retorts is that the chambers are at nearly the same uniformly high heats throughout their length. Inclined retorts and through horizontal retorts have likewise the same advantage. The author is therefore of opinion that the latter—especially when worked with nearly full charges, as in a setting experimentally tried at the Dessau Gas-Works, or as in the Glover half-chambers, 3 feet deep [see "JOURNAL," Vol. CVI. p. 701] at Norwich (fig. 6),

cent. in the fuel consumed amounts to as much as the whole expenditure on wages.

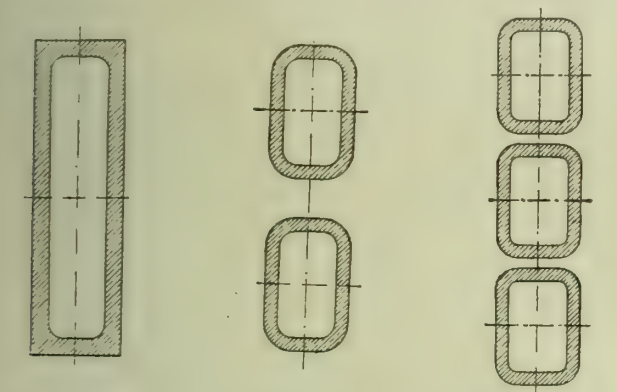
The author does not understand the need for large carbonizing units which has suddenly arisen, or been artificially promoted, in Germany. Large units cost small gas-works more, both in capital expenditure and in working charges. In order to put a large unit out of action, the reserve must be correspondingly greater than with small units. The consumption of fuel and loss through irregular working render smaller units far better adapted for actual requirements. It is of no avail to have one small setting of the earlier type to be put in and out of working, while the installation consists chiefly of a number of large units. Ordinarily, a single setting works in very unfavourable conditions, and probably will not be kept at a sufficiently high heat. The best plan is to have alongside the large units a couple of smaller units of the same system—as, for instance, to have alongside settings of twelve vertical retorts one of six and one of four retorts. The working conditions are still more unfavourable for small works if, in addition to large settings, the retorts or chambers are also large. There is then the greatest difficulty in producing uniform gas, and great inconvenience is thereby caused to the consumers and indirectly to the works itself.

It must, however, be recognized that large units present some advantages for quite large works. In certain conditions they are so much cheaper in installation and in working per 1000 cubic feet of gas made, that, notwithstanding the faults indicated above, they may even be advantageous for gas-works of moderate size. Having regard to all these circumstances, the following settings are recommended for the Dessau vertical retort system—viz., for productive capacities of 130,610 to 148,260 cubic feet (? per diem), settings of ten retorts 4 metres (13 ft. 1½ in.) in length; and for productive capacities of 176,500 to 201,210 cubic feet, settings of twelve retorts 5 metres (16 ft. 5 in.) in length. According to the fashion of the day, experiments were made with retorts of large size at the Dessau and the Mariendorf Gas-Works. Two retorts placed one behind the other were united so as to form one large chamber; while no appreciable change was made in the width or heating of the retorts. The result was entirely unsatisfactory. The durability of the chambers was lower than that of the retorts. The time required for carbonization was increased very considerably, as well as the consumption of fuel; so that the chamber system proved thoroughly uneconomical. This result might have been foreseen from the proportion of the weight of the charge to the heating surface. The result was instructive, as it suggested an attempt to work in the opposite direction, and to increase the heating surface relatively to the weight of the charge.

This question was tackled in a very simple manner by arranging three rows of retorts behind one another, in place of two, and somewhat curtailing the cross section of the retorts by shortening their longer axis. The development from the large chamber retort to the three retorts is shown in fig. 3. It will be seen therefrom that the heating surface of the chamber is much smaller than that of the two retorts, whereas that of the three retorts is considerably greater than that of the two. At the same time, the shape of the retort is improved, as the heat from the narrower sides of the retorts can supplement to a considerable extent that from the wider sides. Thus 1½ tons of coal is much more favourably disposed in the three retorts, and affords much greater accessibility to the heat than the 1½ tons of coal which constitutes the total charge with the two retorts. It is instructive to compare a horizontal section of the new setting with a vertical section of a setting of nine horizontal retorts and one of six Glover half-chamber retorts. These sections are shown in figs. 4 to 6. It will be seen that the vertical settings nearly revert as to the form and arrangement of the retorts, to the old producer fired setting of nines. "*On revient toujours à son premier amour.*" But there is a difference in that the space is better utilized through the heating gases playing on the long sides of the retort and not on their narrow sides. The Norwich settings, on the other hand, appear to present a happy compromise between chamber and retort settings. The retorts are much more suitable so far as sagging is concerned than the old horizontal retorts. They expose their long walls fully to the heat, while their width is sufficient for the time of working off to be extended to twelve hours. In comparison with ordinary horizontal retorts, they introduce both economy in working and advantages as to make of gas and fuel consumption.

Reverting, after this digression, to the new Dessau settings of 18 retorts, it should be observed that this number is placed in a setting of the same external dimensions as the former setting of 12 retorts; so that there is an increase of 25 per cent. in the coal charged into the retorts of the setting, while the radiating surface of the latter remains unchanged. It is thus obvious that if the heating of the retorts presents no difficulties, the efficiency of the setting must be considerably improved. The working results obtained with the new setting in the trial which was made of it by the Instructional and Experimental Gas-Works of the German Association of Gas and Water Engineers [of which a report was given in last week's "JOURNAL"], show that the heating of the setting was quite satisfactory. The output of gas per setting of retorts is now amply sufficient for the requirements of quite large gas-works. The increased output has been attained without making any change in the disposition of the producer and recuperator, or in the position of the De Brouwer conveyor.

Since the retort-house and the area which it covers remain also unaltered, there is an economy effected in the capital expen-



Large Chamber Retort.	Setting of Twelve Retorts.	Setting of Eighteen Retorts.
207'75 sq. ft.	106'56 sq. ft.	99'67 sq. ft.
3968'3 lbs.	1322'8 lbs.	1102'3 lbs.
117 sq. ft.	180'4 sq. ft.	202'3 sq. ft.
	Heating surface per ton of coal.	

Fig. 3.

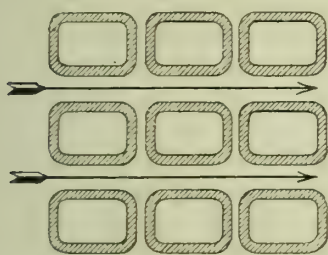


Fig. 4.—Half of a Vertical Retort-Setting seen from Below.

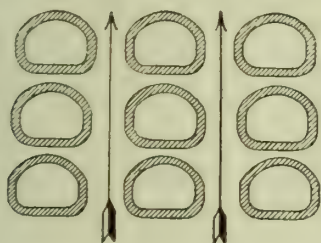


Fig. 5.—Vertical Section of a Horizontal Retort-Setting with Producer Firing.

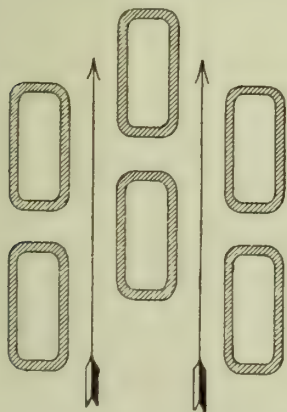


Fig. 6.—Vertical Section of a Setting of Glover Horizontals.

or, to a less extent, in all modern through horizontals with push stoking machinery—are, from the heating standpoint, technically superior to the large carbonizing chambers in which the charge is worked off in twenty-four hours. The economy of wages by means of further improvements is scarcely worth consideration at the present day. On the other hand, the fuel consumption clearly is very important. The wages at Berlin rates amount at the present time to about 0.3d. per 1000 cubic feet, whereas the fuel consumption in heating the settings entails a cost of about 3d. per 1000 cubic feet. Hence it will be seen that a reduction of 10 per



diture of 25 per cent. Incidentally it may be pointed out that it has been found possible to make the iron construction of the "Oberspre" type of retort-house more than 30 per cent. lighter. The fuel consumption with admission of steam to the retorts is now the same as that of the best producer settings. The high make of gas per ton of coal is thus secured free of cost. If there is a saving in the fuel consumption of 3 per cent. of the weight of the coal carbonized, there is an economy per setting per annum of about 219 metric tons of coke, which, at £1 per ton, represents a saving of £219, which, capitalized at 4 per cent., is equivalent to a capital value of £5475. This, however, is not the only improvement in the conditions of carbonization. The second problem attacked was the diminution of labour. This was simply and appropriately solved by regarding three retorts as one and working them together. The three bottom doors of the retorts are mounted on a common axle shaft; so that they are opened together and the whole contents of the three retorts are discharged at once. The three doors are then closed again by a single handle; and the three retorts receive their charge of coke and of coal at the same time. The labour saved is as 6:15. Assuming that ten beds of 18 retorts can be attended to by two men, it follows that four men will, in 24 hours, suffice for an output of 65,000 to 75,000 cubic metres (2,294,500 to 2,647,500 cubic feet), or that the make of gas per man will be 16,000 to 19,000 cubic metres (564,800 to 670,700 cubic feet).

The upper mouthpieces of the retorts are connected together, so that they require only one short pipe for taking off the gas. Thus the new construction, in addition to saving labour, has the advantage of considerably greater simplicity. It is interesting also to note in the last annual report of the Cologne gas undertaking that the vertical retort gas required the use of only half as much purifying material as the gas from inclined retorts. Thus, in addition to the reduction in the amount of sulphur in the purified gas, which has been well known for a long time, there is also the prospect of smaller purifiers being required, and of a saving in purifying material and wages. A third great advantage is that no appreciable formation of pitch or thick tar occurs in the take-off or the dip pipes. The horizontal take-off pipes are cleared only once in eight days, and the pans beneath the dip-pipes only once in four to six weeks.

The construction of the new type of Dessau vertical retorts can also be applied substantially to smaller settings; and experiments in this direction are well advanced. It will therefore be seen that the constructors of the Dessau vertical retort settings are remaining true to the principles which have gained for them the confidence of many gas undertakings. Careful practical trials had shown the vitality of one set of ideas and the impracticability of others which were tried in good faith. Thus, slowly and step by step, having regard also to the experience gained, improvements have been introduced in many directions. Any other course of procedure is precluded, as the first attempt throughout has rarely or never had any good result. In the present transition stage from one type of setting to another, there is naturally considerable trouble in making a proper choice.

The communication concludes with a reprint of the report of the Instructional and Experimental Gas-Works at Carlsruhe, on the efficiency trials carried out by it at the Mariendorf Gas-Works upon the new setting of eighteen vertical retorts. This is the report of which a summary was given in the "JOURNAL" last week (p. 27).

## PROFESSOR DIXON ON FLAME.

At the Royal Society of Arts last Wednesday afternoon, Professor Harold B. Dixon, M.A., F.R.S., delivered his first lecture to a juvenile audience, on "The Chemistry of Flame." We learn from the Society's "Journal" that the lecture was devoted to an account of the researches of the early chemists, from Boyle to Cavendish, on whose work is founded the knowledge that we now possess of the composition of the air and the nature of combustion. A number of the experiments of the early investigators were repeated, and the means were shown by which Boyle proved that air has weight and that metal gains instead of loses weight when burnt, by which Priestley separated what he called "dephlogisticated air," and we call "oxygen," and by which Scheele showed, without knowing it, that hydrogen, when burnt in a closed vessel, removes the oxygen from the air.

What we knew about the chemistry of flame was, he said, due to the work of a number of men, chief of whom were some of our own countrymen, who made experiments, beginning some 250 years ago. Up to this time, fire had been regarded as being an "element;" and indeed for long afterwards many people thought there was an element or principle of fire. The experiments of Boyle, Hooke, and Mayow first showed that a body when burning uses up part of the air; and they gave this air the name "nitre air," because it was also found to be in nitre. Hooke and Mayow proved the true nature of flame, and also showed that the breathing of animals was of the same nature as combustion. But these great discoveries were forgotten; and it was only after the discovery of oxygen by Priestley and by Scheele, and the discovery of hydrogen and the compound nature of water by Cavendish, that Lavoisier was able to put forward the modern theory of combustion.

## MODERN DEVELOPMENT OF THE GAS INDUSTRY

In the "JOURNAL" for the 26th of October last, we gave an abstract of a paper on the above-named subject read by Dr. W. B. DAVIDSON, F.I.C., the Chief Chemist of the Birmingham Corporation Gas Department, before the Birmingham Section of the Society of Chemical Industry. The full text of the paper appears in the current number of the Society's "Journal," and we extract therefrom the portions to which only passing reference was made on the previous occasion.

In the introductory portion of the paper, the author gives a table showing that about 16 million tons of coal, valued at £10,000,000, and 60 million gallons of oil, valued at £700,000, are used annually in the production of gas, coke, and residuals in the gas-works of the United Kingdom; the make of gas being about 190,000 million cubic feet, of which approximately 11 per cent. is carburetted water gas. He then goes on to show that on the Continent, the magnitude of the gas industry, relative to the population, is much smaller than it is in this country. The total quantity of coal carbonized for gas in Germany is only 5½ million tons per annum, 25 per cent. of which comes from England. Coal in Germany costs on an average about 20s. a ton; while coke is sold at 25s. a ton. In the United States, carburetted water gas bulks more largely in the public supply than coal gas.

During the eighties and nineties, the rate of increase in the output of gas in this country was seven or eight times the rate of increase in population. Dr. Davidson points out that naturally this extraordinary development could not be maintained for very many years; and so it is not surprising that the last decade has witnessed a considerable slackening in the demand for town gas. He shows this by the following table compiled by him from "Field's Analysis," giving the outputs for 24 of the largest gas undertakings in the United Kingdom for the years 1888, 1898, and 1908, together with the decennial percentage increments for the two intervals in question:

Name.	Millions of Cubic Feet.			Decennial Percentage Increase.	
	1888.	1898.	1908.	1888-1898.	1898-1908.
Gaslight and Coke Company.	18,610	22,400	23,740	20'4	6'0
South Metropolitan Company.	5,890	9,825	12,790	66'8	30'2
Birmingham Corporation.	3,722	5,531	7,328	48'6	32'5
Glasgow Corporation.	2,705	5,355	7,034	98'0	31'3
Manchester Corporation.	3,046	4,158	5,779	36'5	39'0
Commercial Company.	1,989	2,614	3,369	31'4	28'9
Sheffield Company.	1,649	2,424	3,474	47'0	43'3
Newcastle-on-Tyne Company.	1,668	2,519	3,350	51'0	33'0
Brentford Company.	1,031	1,658	2,866	60'8	72'9
Bristol Company.	1,348	1,798	2,684	33'4	49'2
Nottingham Corporation.	1,405	1,697	2,109	20'8	24'2
Leicester Corporation.	900	1,451	2,062	61'2	42'1
West Ham Company.	579	1,009	1,903	74'2	88'6
Salford Corporation.	843	1,346	1,716	59'7	27'5
Dublin Corporation.	1,233	1,447	1,555	17'4	7'5
Tottenham Company.	279	525	1,495	87'5	185'9
Oldham Corporation.	810	1,094	1,471	35'0	34'5
South Suburban Company.	747	1,121	1,293	50'0	15'3
Portsea Company.	565	764	1,384	35'2	81'2
Croydon Company.	389	673	1,293	73'0	92'1
Brighton Company.	821	1,027	1,261	25'1	22'8
Wandsworth Company.	311	631	1,105	102'9	75'1
Plymouth Company.	508	836	1,096	64'6	31'1
Bolton Corporation.	629	885	1,022	40'7	15'5
Totals.	51,677	72,786	93,179	40'8 average	28'0 average

The author directs attention to the fact that the Metropolitan Companies are making less rapid progress than the Provincial undertakings; while the London Suburban Companies show an abnormally high rate of increase. This, he says, is only what might have been expected. He adds that it is gratifying from the manufacturers' point of view that, in spite of economies in the consumption of gas for lighting purposes, the ever-growing competition of electricity for the supply of light and power, and the introduction of producer-gas plants in large factories, the average rate of increase in the output of gas is still more than double the rate of increase of the population. Analyzing the figures for individual years, it is found that the weather is the most important factor to be considered as affecting gas consumption. In particular, the presence or absence of fog has a marked effect. Now that a very considerable proportion of town gas is used for industrial purposes, a reflection of the state of trade is found in the annual records of gas-works.

Passing the next sections of the paper, which have already been noticed, we come to the author's remarks on the progress made in the production of residuals and in methods of purification. These we give in full.

### RESIDUALS.

*Coke, Breeze, and Dust.*—The sale of coke has been encouraged by paying strict attention to the sizing. It is now the usual practice to screen the coke so as to produce large and small coke, 1-inch breeze, breeze, pea breeze, and dust, to suit the require-



ments of different classes of customers. There is a steady sale of considerable quantities of "small coke" for household use. Coke-dust, formerly sent to the tip, is now sold for use in boiler furnaces where there are special fire-bars and forced draught. At some works, particularly in Germany, coke dust is mixed with tar and converted into briquettes, which find a ready sale. In 1907, patents were taken out for the manufacture of what was described as a new smokeless fuel called "Coalite." The material is now produced on a fairly large scale by the British Coalite Company at Wednesfield and at Plymouth. This fuel is the product of coal carbonized at a temperature of 1000° Fahr. as against 1800° Fahr. for ordinary gas coke. In the process of manufacture, the gas made per ton of coal is only about 5000 cubic feet; half of the total volatile matter of the coal remaining in the coke. The tar obtained is about 20 gallons. It is of a light nature and particularly rich in paraffins. The yield of ammonia is 70 per cent. of that produced at high temperature. Coalite ignites more readily than ordinary gas coke, and burns with more flame; but it is only slightly better in heating efficiency. In view of its greater efficiency and smokelessness, as compared with coal, coke merits a much larger sale for household purposes than it at present enjoys.

**Ammoniacal Liquor.**—There is little to be said regarding this residual. Synthetic nitrogenous manures, such as nitrolime, have hitherto failed to prejudicially affect the sale of ammonium sulphate. A considerable quantity of gas liquor is now converted into strong ammonia, both in this country and on the Continent. This is found to be much more remunerative at present prices. Quite a large number of gas-works possess sulphate plant, which in its improved modern construction is easily controlled. The extraction of ammonia from the crude coal gas, in these days of perfected mechanical appliances, is very complete. In the final washing with a rotary washer of up-to-date construction, one may confidently expect an efficiency of 99 per cent.

**Tar.**—Since the discovery and development of the aniline dyes, coal tar has had an attraction for the young research chemist. The unfortunate fact remains that thirty years ago tar fetched nearly double the price that it does to-day. The cause of the fall in price is the usual one—the supply is greater than the demand. Quotations depend largely on the market for pitch. As a dressing for roads, a new use has been found for gas-works tar. It is said to preserve the surface of the road from disintegration, and thus suppress the dust nuisance. Its use is accompanied by diminution in the expenditure on road cleansing, on watering, and on maintenance. Carburetted water-gas tar is of slightly less value than coal tar. Special use has been found for it in the manufacture of naphthalene solvent. It yields a good kind of pitch, which finds a use in the manufacture of special varnishes.

**Spent Oxide.**—One of the troubles in purifying gas by means of oxide of iron has been back-pressure, caused by the oxide settling down in a compact mass, and thus offering excessive resistance to the passage of the stream. This has been remedied in a large measure by alterations in the design of the grids supporting the material. Various kinds of oxide ore are employed; but they are being displaced to quite a large extent by artificial oxide prepared from the burnt spent oxide. This material is inactive towards sulphuretted hydrogen immediately after coming from the kilns; but after exposure to the action of air and water for a prolonged period, and after treatment with a little lime and copperas, it is able to do its work satisfactorily, especially when lightened by the addition of sawdust or similar material. Nearly all the spent oxide of the gas-works is used for the manufacture of sulphuric acid. A small proportion is bought by a few chemical works for the extraction of prussian blue and sulphocyanide. This is said to be a profitable business only when the oxide contains at least 5 per cent. of the former ingredient. Lime for purification has been largely discarded, especially in the South of England.

**Cyanogen Extraction.**—Ten or twelve years ago, and occasionally since then, prussiate of soda crystals were quoted at 4½d. and 5d. per pound. The price has been dwindling for some time, and during the present year [1909] it has stood at 3d. At the former figure, a handsome profit could be made if the plant was sufficiently large to treat at least 2 million cubic feet of crude gas per day. At the present time, few are bold enough to erect expensive appliances for the sake of cyanogen recovery. In the absence of a recovery plant, the impurity (only 0.2 per cent. by volume of hydrocyanic acid) is removed to the extent of about 80 per cent. by the oxide through which it has to pass. Prussiate processes, on the Foulis, Davis-Neill, or similar systems, are now operated at seven or eight gas-works in England.

A description of the various processes would carry us too far. Suffice it to say that ferrous hydrate, sulphide, or carbonate mud is the essential ingredient; the base being ammonia, soda, or lime, or a combination of these. One of the great difficulties experienced has been to find a suitable washer to deal with a heavy sludge. The Holmes brush rotary washer is employed with success when the mud is thin; but troubles ensue when the sludge is inclined to be gritty or thick. The highly ingenious washer patented by Feld in 1906, though not so high in efficiency as one would like, gets over this difficulty very satisfactorily.

It is more profitable to treat the gas before removing the ammonia. On the Continent, the Bueb prussiate process is very generally employed in the larger works. The method consists simply in running a strong solution of copperas from time to time

into a rotary washer. The sludge containing soluble and insoluble prussiate is sold to chemical works.

The British Cyanides Company's patented process of extraction has been in operation at a number of moderate-sized works for some years. In this process sulphur is added to strong ammoniacal liquor in a suitable washer to form polysulphide, which takes up the hydrocyanic acid to give sulphocyanide. The resultant product is sold in the form of liquor to the chemical works.

#### DEVELOPMENTS IN PURIFICATION.

**Carbon Bisulphide.**—Under the old restrictions of the sulphur clauses, lime had to be employed on a large scale. This was sulphided so as to remove the carbon bisulphide as thiocarbonate. At the same time a large proportion of the carbon dioxide present was eliminated. With the repeal of the clauses, the use of lime became no longer necessary, except where no better means could be found of maintaining the illuminating power of the gas. It is possible to gain one candle by removing all the carbon dioxide; but, all things considered, it has generally been found unprofitable to do so. When the sulphur clauses were enacted, the incandescent burner was not known. The diminution in the consumption of gas for a given candle power with the incandescent burner was thought to be good cause for the removal of the sulphur restrictions. Nevertheless, the elimination of organic sulphur, as it is called, would be a welcome gain to the gas industry; for there is no gainsaying that the formation of even minute quantities of sulphuric acid in a room cannot but be harmful to furniture as it is to metallic fittings.

It is not likely that lime purification will again be resorted to, on account of its tediousness, high cost, uncertainty, and the difficulty of removing the malodorous product. Some hope of success is held out by the large-scale experiments of Mr. Hall, of Portland, Oregon, the results of which have been recently published. Mr. Hall has adopted the expedient recommended by Mr. Vernon Harcourt fifty years ago, of simply heating the gas, leaving the purifiers to a temperature of 700° to 900° C. The probable reaction that occurs is represented by the equation  $CS_2 + 2H_2O = 2H_2S + CO_2$ . The heating takes place in brickchambers, and the gas is afterwards purified a second time with iron oxide. The great bulk of the organic sulphur is said to be removed in this way; but nothing is known as to costs.

**Liquid Purification.**—Seeing that a purifier-box must be opened more or less frequently, with attendant dangers of firing of the oxide by rapid revivification, the loss of gas, and the subsequent admixture of a large quantity of air when the box is again put to work, a process of liquid purification in closed vessels has been much sought after by gas manufacturers. Partially successful attempts to solve the problem were made in the eighties by Hills, Claus, and Holgate. The processes then experimented with depended on the action of purified ammonia, obtained by the distillation of the gas liquor, in absorbing hydrogen sulphide and carbon dioxide. The experimental plants that were erected were discarded one by one. Their failure was due to the following causes: (1) The loss of ammonia; (2) the incompleteness of the reactions; and (3) the costly nature of the plant and the supervision necessary.

Two or three years ago, Dr. Feld launched a scheme for condensing and purifying coal or coke-oven gas. The gas was to be taken as hot as possible—say, at 200° C.—from the retorts, and treated in a series of centrifugal washers. The tar was to be fractionated (by hot washing) into pitch, dry heavy tar, and dry light tar. It was intended to extract ammonia in two washers and sulphuretted hydrogen in another set of two. One washer was to be used as a cooler. Thus it was proposed to perform the whole process of condensation and purification in a small building under the supervision of one man. Attempts have since been made to work the process in Germany; but, so far as I can gather, without complete success. There have been naphthalene and other troubles. The idea is brilliant, and, I think, it is well worthy of a sustained effort to put into execution.

[The author described the Feld process as in use at the East Hull Gas-Works, and the later proposal of Herr Feld to ensure the complete extraction of ammonia to form sulphate simultaneously with the removal of sulphuretted hydrogen.]

The paper concludes with some references to the new appliances which have been introduced in connection with the manufacture of gas.

**The Mineral and Chemical Industries.**—At the meeting of the London Section of the Society of Chemical Industry on Monday last week, a paper on "The Relation between the Mineral and Chemical Industries" was submitted by Mr. G. T. Holloway. In the course of it, the author remarked that the evidence deduced from the association of minerals in Nature was shown to be of the greatest value, not only to the prospector, but also to the chemist and metallurgist. The manner in which the demand had created a supply, even in the case of rare metals, was well brought out in relation to the exploitation of monazite sand and the production of tantalum. The thorium obtained in the monazite industry and employed in the annual production of more than 200 million incandescent mantles amounted to only about 5 per cent. of the total amount of rare earths thus handled; and the ceria, zirconia, didymia, and other oxides which were thus accumulated as by-products furnished an important field for the researches of the industrial chemist.



## MIDLAND JUNIOR GAS ASSOCIATION.

### Visit to Messrs. Hardman's Tar Works.

There was a large muster of members of the Midland Junior Gas Engineering Association on Saturday afternoon, to take part in a visit which had, by permission of the Directors, been arranged to the Nechells tar works belonging to Messrs. Josiah Hardman, Limited.

The headquarters of the firm are, of course, at Milton, near Stoke; the Nechells works having been put up only a few years ago, on the securing of the Birmingham Corporation tar contract—although tar from other places is also dealt with there. The quantity of tar being treated at the Nechells branch is about  $6\frac{1}{2}$  million gallons a year; but the plant is of sufficient capacity to accommodate another 2 million gallons, or so. The works are connected with both the Saltley and Nechells Gas-Works of the Birmingham Corporation by a 9-inch main having two 6-inch branches. At the Saltley works, there is a special pump for the purpose of boosting the tar along, as the main has to pass over two bridges. From the Nechells gas-works the main is on the level. On one side of Messrs. Hardman's works there is a canal, and on the other the railway; so that there is ample facility for tar from other places than Saltley and Nechells being brought in by boat and railway tank-waggon. On arrival, the tar is pumped into storage tanks by a large Evans pump.

When the members of the Association assembled at the gate of the works, they were received by Messrs. Hardman's Manager (Mr. Warnes), who escorted them round, and fully explained everything of interest. In acting the part of guide, he was, it may be mentioned, assisted by Mr. Davey (Chemist) and Mr. Mason (Foreman). Starting right at the beginning, it was explained that from the storage tanks the tar is, as required, pumped by another Evans pump into special preheaters; and by the adoption of this method, a good deal of fuel economy is effected. The preheaters take up a certain amount of the heat of the distillate, and this heats the tar in the apparatus before it is run into the still; and therefore when the tar is passed into the still, it is just about the point of commencing distillation. There is a battery of ten 15-ton capacity stills, each with its accompanying preheater. Producer gas is being employed for heating the stills; there being provided for the purpose a Wilson's patent power gas plant. It is found that by the use of producer gas the fuel consumption is not increased; it being possible to keep well within the amount generally consumed under stills which are not worked in this fashion. With the help of a piece of chalk, Mr. Warnes gave his visitors a very full explanation of the construction of the stills.

The distillate from the stills passes through the preheaters, by means of a water-jacketed coil, so that when necessary the coil may be kept hot by circulating hot water. The distillate then drops into collecting boxes, and from there into divider boxes, so long as crude naphtha and ammoniacal liquor come over. After these distillates have stopped, the divider boxes are cut out, and the oil which next distils over is allowed to run through another main fitted to the collecting boxes, to the various reservoirs provided for collecting the different fractions. The worm ends and collecting boxes are connected with foul gas mains, in order to minimize foul odours; the foul gases being burned under the boilers. As regards the provision of foul gas mains, it may be mentioned that one is also furnished in connection with the pitch coolers. This method, it is pleasing to note, operates so satisfactorily that the Alkali Works Inspector invariably makes a good report upon it. There are a series of boilers provided with steam coils inside to warm up the distillates if it should be necessary, as sometimes happens in the winter time.

After the distillation is completed, the pitch is allowed to stand in the still for a few hours, and is then run into the cooler, where it remains for a number of hours longer. It is then run off into the bay (which is previously whitewashed) to solidify. After solidification, it is dug out, by the aid of wedges and sledge-hammers, and loaded into railway trucks.

The various distillates are passed through the carbolic plant. This plant is of the modern type, using carbonic acid gas to recover the phenols. By this process, which is continuous, the carbonate of soda obtained is recausticized and used over again. Therefore there is no great waste of caustic soda. The lighter distillates from the tar are washed first of all to remove the phenols, then re-distilled in stills something like tar stills, after which they are re-distilled in special steam stills. They are then washed with acid and water. After washing, they are run into special stills provided with fractionating columns, and there separated into benzol and naphtha, and so on.

One interesting little point to which attention was drawn was in connection with the cocks about the works. Trouble is always being experienced with leakages from the ordinary gland cocks, owing to the strain to which they are subjected by the blowing of steam through the mains to prevent solidifying. The loss of benzol and creosote in this way is, however, found to be obviated by the use of a special Butterfield type of cock. This costs about twice as much as the ordinary gland cock; but it lasts a great deal longer. In fact, the one on the works which the members inspected has been in use now for about nine months, without having developed any leakage. Another point of which note was made by his hearers was a general formula which Mr. Warnes

gave for ascertaining from the Twaddel the amount of free carbon in tars received in the Midland district. This was as follows:—

$$\text{Free carbon} = 0.8n - 10$$

where  $n$  = the degrees Twaddel of the tar.

When the party reached the laboratory, the various methods employed for testing the different products were explained as fully to them as had been the case in connection with the distilling processes carried on at the works.

One more matter may perhaps be picked out from the mass of valuable information which was furnished to the members during their inspection. It has been found at these works by investigation that corrosion of plates of the tar stills is due practically to the dissociation products of ammonium chloride. It is further thought that, at the high temperature obtaining in the stills towards the end of the process, when steam is being introduced, some of the steam is dissociated also, and that this assists materially in the general corrosion.

At the conclusion of the inspection, the party assembled in the offices connected with the works; and here expression was given to the feelings of the members with regard to the pleasant and instructive afternoon which they had spent.

The PRESIDENT (Mr. A. O. Jones, of West Bromwich) proposed a hearty vote of thanks to Messrs. Hardman for allowing the members of the Association to come and see their works, and to Mr. Warnes and his assistants for showing them round. Everything had been explained in great detail to them—in fact, they had had quite a treatise on the subject of tar distillation; and altogether the visit had proved most interesting.

Dr. W. B. DAVIDSON, who seconded the proposition, said he was very glad to have an opportunity of expressing how deeply they all appreciated the amount of instruction they had received that afternoon. They could not have had a better or more lucid statement of all that went on in a tar distillery. It was far better than listening to a dozen lectures, to come there and see the actual processes and actual apparatus, and have a practical explanation given by a man like Mr. Warnes, who had the subject at his fingers' ends.

The vote having been heartily accorded,

Mr. WARNES thanked the members, and said he would convey what had been said to the Directors, who would understand that he had done his best to entertain the party, and that the visitors had appreciated the manner in which he had done it. He thought he had made everything clear; but there were, of course, many things to learn in connection with a tar distillery.

### Presentation to Mr. William Ford.

At the annual "Smoker" in connection with the Stockton Gas-Works Social Club (presided over by Mr. Matt Dunn), a very pleasing item of the evening's enjoyment was the presentation of a silver salver, suitably engraved, by the staff and employees, to Mr. William Ford, the Manager, on the completion of his forty years' management. Mr. Dunn made the presentation, and conveyed to Mr. Ford the cordial wishes of himself and colleagues that he would have good health and happiness for many years to come. Mr. Ford feelingly replied, thanking all for the kindness conferred upon him. He spoke of the happy relationship which existed between himself, Mr. Dunn, and the whole of the gas-works employees. The programme consisted of musical and other items; and during the evening reference was made to the departure of Mr. Ford's son to Vancouver (B.C.), where he is now occupying the position of Chief Assistant to Mr. J. C. Moon, the Engineer and Manager to the Gas Company there.

### The New Holder for the Toronto Gas Company.

In the report of the Directors of the Toronto Gas Company which was presented at the annual general meeting on the 26th of October, it was stated that the Directors had decided, in view of the continued rapid increase in the consumption of gas, to erect another gasholder having a capacity of 5 million cubic feet, which would be by far the largest in Canada. It may be remembered that, in the report upon the condition of the Company's works made by Mr. Thomas Newbigging, he said the only marked deficiency he found when he inspected them was in the storage; the capacity of the existing holders being considerably short, instead of in excess, of the maximum day's production. At the time of the meeting, tenders for the new holder, submitted by the principal English and American firms, had been under consideration, with the result that the lowest was accepted. We are pleased to learn that it was obtained by an English firm—Messrs. C. & W. Walker, Limited. The holder will be contained in a steel tank 216 feet diameter and 39 ft. 9 in. deep—the largest of its kind, we believe, in the world. In order to withstand the stresses which will come upon the sides, very heavy plates (some of them being  $1\frac{1}{8}$  inch thick, and weighing  $4\frac{3}{4}$  tons each) will be used. The four lifts of the holder will be respectively 213 ft. 6 in., 211 ft., 208 ft. 6 in., and 206 ft. diameter and 38 feet deep. The framing will consist of 24 lattice-work standards and five tiers of lattice-work girders; and the height to the top of the standards from the bottom of the tank will be 196 feet. The superficial area of the holder, when fully inflated, will be upwards of 130,000 square feet. This is the third gasholder supplied by Messrs. C. & W. Walker to the Company—each larger than its predecessor.



## FERRO-CONCRETE CONSTRUCTION.

By HARRY W. TAYLOR, Assoc.M.Inst.C.E., of Newcastle.

[Extracts from a Paper read before the Association of Water Engineers.]

It will be generally conceded that suitable design and good construction are the two most essential conditions in ferro-concrete work. Should either of these requirements be absent, the result is almost certain to be unsatisfactory.

*Factors of Safety.*—The author suggests that before designs are prepared the following particulars should be definitely settled:—

- (1) The live (or applied or accidental) load per unit.
- (2) The factor of safety for the live load (usually about 4).
- (3) The factor of safety for the dead load (usually about 3).
- (4) The test load (which should be  $1\frac{1}{2}$  times the live load).

For the walls and floors of reservoirs, and especially for water towers, the author is of opinion that a higher factor of safety should be used; and in his experience a factor of 5 or even 6 is none too much. Water pressure is the most searching of all pressures, and though theoretically a higher factor is not needed, this is essentially a case where theory and practice differ.

The author is of opinion that the factor of safety should be based on the elastic limit of the steel. The live or working load should not exceed one-half of the elastic limit, while the test load should not exceed three-quarters of it. Factors of safety are, however, very generally stated in ratio of the breaking weight, and therefore the elastic limit of the steel should be doubled when this ratio is adopted. As an example, with steel whose elastic limit is about one-half of its ultimate strength, the factor of safety would be described as 4, for one-quarter of the breaking load. The author welcomes the recommendations made by the R.I.B.A. Joint Committee, and it seems fairly certain that these will be the standard regulations in the British Isles for some years to come.

*Design of Centering.*—The primary object in designing centering should be ease in removal and facility for quick re-erection, a point of the utmost importance where there is much repetition on a contract. A careful study of the most suitable arrangement of the centering is time well spent. It should never be forgotten that the cost of centering is nearly always a large percentage of the total cost of the structure, and economy on this item will frequently mean an appreciable sum of money. Where it is possible and the smaller spans permit, it is frequently desirable to arrange for the floor slab centering to be carried on the secondary beam troughing, and for this troughing to be carried in turn on the column boxing. With large beams of considerable span this, generally speaking, will not be possible, and arrangements must be made for the beam troughing to be carried by struts. The beam troughing should be so designed that the under or bottom board may remain in position after the side boards and the floor centering have been removed. All struts under beams, &c., should be wedged from below at the floor level, and not at the top of the struts.

It is also advisable to chamfer the arrises of the columns and beams, as giving a much more pleasing appearance to the work, also to give a camber to the beams of about  $\frac{1}{2}$  inch in 10 feet. If this is not done, the beam, though perfectly straight, will appear to the eye to sag at the centre. The ends of the beams should be haunched on to the supports where possible, and especially in continuous beams. Thick timber is better than thin, as it lasts much longer, and stands rough handling better, and, generally speaking, is more economical in the end. In the construction of walls it is generally advisable to fix the outer shuttering first, then place the steel in position, and add the inner shuttering and concrete as the work proceeds. To keep the inner and outer faces of the shuttering for walls the proper distance apart, perforated wood plugs or concrete separators are used; a bolt through the hole keeping the shuttering all tight and rigid. After the shuttering is removed the holes left in the concrete are, of course, filled.

Where a smooth surface to the work is required, the face of the timber touching the concrete should be wrought and coated either with mineral oil, boiled soap, or whitewash.

These also preserve the life of the timber by preventing the liquid cement soaking into the pores of the wood. If the surface of the work is to be afterwards rendered, boiled soap or whitewash may be preferable to oil; in any case no animal oil of any kind should be used, but only mineral oil, such as crude petroleum. After all the centering is fixed and coated with oil or soap, and the steel placed in position, it is advisable to thoroughly flush the centering and moulds with water before any concreting is commenced.

*Steelwork.*—It will save considerable time if the steel is delivered cut to the required lengths, as by this means a good deal of smith's work on the job will be avoided. A convenient way of bending the smaller bars is to use a long temporary bench, constructed of thick timber with strong pins or plugs in same to bend the bars upon. These pins should be arranged to form a template, and thus the work will be accurate and expeditious. Generally speaking bars up to  $\frac{5}{8}$ -inch diameter can be bent cold, but larger ones should be bent hot; and it is desirable that the heat at which they are bent should not exceed a cherry red. A white heat is not desirable. Smooth bars whether round, square, or hexagonal must be anchored at the ends, either by bending at right angles or by splitting open like a fish-tail or by means of a washer and nut—the latter being probably the most effective method. Steel bars in floors and walls must be crossed, and bars in the beams must be cranked-over the supports irrespective of the system used. Where openings occur, either in floors or in walls, it is always advisable to put additional steel round the openings. It is always preferable to have the inside of the steel work of a column as clear and free as possible from projections so that the ramming of the concrete may be thorough. It is in every way desirable that all, or nearly all, bars where they cross each other should be wired together with soft iron wire—thus guarding against displacement when the concrete is being rammed around them. This takes a little while, but is time well spent, and results in good homogeneous work.

*Concrete.*—Good concrete should be dense; that is to say, containing as few voids as possible. In this respect the selection of the gravel and sand is a matter deserving great care and attention. Hitherto it has been the custom to specify that concrete shall be composed of so many parts by measure of gravel, and so many parts of sand to one part of cement, regardless of voids in the two materials. This, in the author's opinion, is a mistake. The proportion of voids in the gravel and sand should be ascertained, so as to obtain as dense and homogeneous a mass as possible. It is much more satisfactory to test the voids in the aggregate on each contract, as it rarely happens that the aggregate comes from the same source on two consecutive works. Voids in clean, sharp sand vary from 30 to 50 per cent.; and this space must be filled or the resulting work will be porous.

Specifications very frequently call for coarse, sharp, clean, gritty sand; but the author believes a sand containing a proportion of fine particles is preferable in the majority of cases. Of course, a dense concrete is not always needed, such, for instance, as internal floors; but where work is required to be weather-tight, and especially water-tight, sand containing a considerable proportion of fine particles is in every way preferable. The dust or flour created by crushing stone is frequently removed; but if dense concrete is required the author is distinctly of opinion that this is a mistake. The presence of this dust certainly retards the setting of the concrete; but ultimately it becomes quite as strong as, and is certainly much denser than, concrete made without the dust. In depositing concrete in the moulds and centering, the chief object is for it to be homogeneous. If it is dropped from a height (even of 6 or 7 feet) the larger stones tend to separate from the mass and honeycombed work will result. Concrete should not be dropped more than a couple of feet. If it must descend from a greater height than this, it is better to slide it down a pipe or shoot. The author's experience is that wet concrete is preferable to plastic concrete, because it fills the moulds and spaces better, and flows between and around the steel bars more freely.

Whatever materials are used for rendering concrete waterproof, it is necessary that they be such as will not affect the strength and durability of the concrete. It has been clearly established by tests that the presence of a small percentage of fine clay does not necessarily injure the strength of the concrete, while it certainly assists very materially in securing a more waterproof concrete. This is, of course, altogether contrary to the former opinions of engineers,



and when judged by earlier teachings is a "heresy" of the most pronounced type. The use of soap and alum is fairly well known, both applied either as alternate washes on the concrete or as a solution in mixing the mortar for cement rendering. The addition of a soap and alum solution to cement rendering is undoubtedly beneficial where a watertight surface is required; but it must be remembered that if the sand itself is coarse and sharp, the resulting work will probably not be watertight—there being an insufficient percentage of small particles to thoroughly fill all the voids. A material which is largely used on the Continent for this purpose is powdered pumice stone or "trass." This is sometimes mixed with the concrete; more often with the rendering only. Two layers of rendering, the first composed of equal parts of sand, trass, and cement, and the second of equal parts of trass and cement, will usually give a perfectly watertight surface. The author has used it with eminently satisfactory results. The trass makes a fat fixture, and, to use a plasterer's expression, works smooth and "slick."

*Maturing of Concrete.*—It is often advisable to make test cubes from the same concrete that is being used on the works, so as to note the process of hardening. It is important that the moulds in which these test cubes are made should be thoroughly wet when the concrete is placed in them, or the dry wood will suck the moisture out of the concrete, and consequently the test will be of no real value. The author, however, prefers to place reliance upon the actual concrete work itself, and considers it better practice to test important beams with a chisel to ascertain their hardness. If this is done near the neutral axis, it will not affect the strength of the beam.

*Removal of Centering.*—Generally speaking, it will be safe to remove the centering from under floor slabs in from 7 to 14 days after the concrete has been deposited. The side-boards of the beams and the boxing of columns may also be removed in about the same time. The bottom boards under beams of spans, say, up to 20 or 25 feet, should not be removed for at least four weeks, while for longer beams an extra length of time for hardening should be allowed. It is a good practice to nail a date tag on the beam troughing when the concrete was deposited in same. Should frost occur shortly after concrete has been deposited, the duration of the frost must be added to the number of days given above for the removal of the centering. A rule should be made on all contracts never to touch the struts under the bottom boards of the beams until the concrete has set hard, or damage by shear is almost certain to result. Workmen have sometimes been known to temporarily remove these struts and replace them; but the risk of so doing is great with green concrete, and such action should be rigorously forbidden.

*Frost and Heat.*—It occasionally happens that work has to be finished within a given period irrespective of weather conditions; and if such work should be driven into the winter, risk of frosts will be incurred. Where it is feasible and time permits, the author thinks it better to stop work altogether, and protect the portion already done in the best manner possible. This can generally be accomplished by covering the concrete with hay or straw about 12 inches thick, with boards or matting on the top. Where, however, the work must be finished regardless of frost, special precautions must be taken. Probably the simplest way is to heat the gravel and sand to about 70° or 80° (Fahr.), and use warm water of about 100° temperature in mixing the concrete. Immediately the concrete has been placed in position, it must be protected by canvas tents connected with salamanders or fires by hot-air pipes. The pipes should be placed near the concrete, so that the hot air from the fire can pass inside the tent formed by the canvas, and thus raise the temperature sufficiently to protect the concrete from frost. During hot, dry weather, and especially where the sun can play directly upon it, the concrete will dry very rapidly. Provision must be made in such cases both for screening the concrete from the sun and also for keeping it moist. The surface of newly laid concrete should be kept in a moist state for not less than six or seven days during hot weather.

It is frequently contended that ferro-concrete is in its infancy, and that sufficient time has not yet elapsed to form a reliable opinion as to its lasting qualities. The fact that such a large number of structures have been built, especially during the last 15 years, and have answered their purpose perfectly, is in the author's opinion reliable evidence as to the strength and durability of properly designed structures. It should always be remembered that if a ferro-

concrete structure is inherently weak, it will fail when first loaded. As the concrete continues to harden for 10 or 15 years, its strength increases also; and the author has yet to learn of a case where a ferro-concrete structure having been erected, say, for five years has afterwards collapsed.

### Discussion.

Mr. EASTON DEVONSHIRE (London) said he had had some experience of ferro-concrete work; and he regarded a paper of this sort as a modest contribution to the knowledge of the subject, which, he was sorry to say, was still very limited in this country. Taking Mr. Taylor's communication so far as it went, and assuming the generalizations applied, no matter the local conditions, to the use of reinforced concrete, there were two or three points to which he should like to allude. In referring to the design of centering, the author said: "The primary object in designing centering should be ease in removal and facility for quick re-erection—a point which is of the utmost importance where there is much repetition on a contract. A careful study of the most suitable arrangement is time well spent." He (Mr. Devonshire) had had experience of failure; and they had been told in a previous discussion that the reason for failure was what they should all confess. In his opinion, the primary object in designing centering should be its rigidity for practical work, bearing in mind, secondarily, the facility for its removal. If anyone tried to save money by putting in thin boards where there should be thick ones, there would be failure. The author mentioned that steel bars should be crossed in walls, &c. It was, he (Mr. Devonshire) thought, difficult to generalize to that extent. The crossing of steel bars in floors and walls was essential in order to get what he might call a continuous steel structure to which they could work. But the method of their attachment, and whether they were calculating on the steel bars acting in two directions or one, were all-important in making such a general statement as to their cranking and crossing. He thought this remark might be applied, generally speaking, either to walls or floors or roofs in any construction. Then another practical factor they could get at was the weight of the steel reinforcement in relation to the thickness of the slab. It was only repeating, however, what had often been experimented on, and proved, over and over again. The question of the relative advantage of wet concrete over dry was one that had been threshed out, and thoroughly proved, in the construction of reinforced work. Where one had a steel core, it was necessary to have wet concrete; and experience showed that one could go up as high as 20 per cent. in weight of water in the mass of concrete without danger. Coming back a little to the construction of walls, the author stated that the shuttering must not be built up high on the one side. He (Mr. Devonshire) understood this to mean that the boarding might be put up to the full height on one side, and kept down on the other. In practice, however, he had found this to be very inconvenient. The matter of rendering was highly interesting. It was quite sufficient to make a good mortar of clean sharp sand and cement in the proportion of 1 to 1; and, properly rendering to the thickness of an inch on good concrete, any structure would be made water-tight. Structures so treated in connection with the Antwerp Water-Works many years ago had never leaked. In a recent construction of two storeys—that was, of filters superimposed—built of reinforced concrete a height of 15 feet from the ground, the columns and girders being reinforced with Kahn bars, and the walls with expanded metal, they had simply rendered it on the inside the thickness of an inch, and it did not leak.

Mr. H. PRESTON (Grantham) said he had never used reinforced concrete in the ordinary sense, but had often used hoop-iron in concrete; and some tests he had made about eighteen months ago were interesting from the fact that it brought out the great advantage that was gained by the use of a bit of metal. The bars, as before, were 6 feet long and 6 inches square. He made two of these test-bars from the same mixing—one of plain concrete; the other with four rods or bands of hoop-iron placed so that the bar could be tested with the hoop-iron either flat or on edge. After six weeks, he tested them. The one without reinforcing broke after 399 lbs. had been applied. The first test with the reinforced concrete was up to 952 lbs.; the second test, to 2754 lbs.; and the third test, when they weighted it up to breaking-point, to 3122 lbs.\* It was a simple and perhaps a somewhat crude test, but it satisfied one as to the advan-

\* Photographs of these various testings were exhibited.



tage of using reinforcement. But what was really of most interest to him was the manner in which the bar broke. It appeared from photographs he had taken to have fractured along the plane of the hoop-iron, and was due possibly to the final buckling of the iron bands. As time went on, one would be sufficiently alive to reinforced concrete to adopt it, because he believed there was great advantage in getting the steel strength into the concrete.

After some remarks with regard to the use of slag in connection with ferro-concrete work,

Mr. H. W. TAYLOR, replying to the discussion, said he quite agreed with Mr. Devonshire that, in fixing the centering, it must be quite rigid. He might perhaps amplify his paper by saying he was careful to specify a minimum thickness of timber for use in all centering. He rarely allowed anything under  $1\frac{1}{2}$  inches thick to be used for any part of the work; and for the bottom boards in beams, nothing less than 2 inches. If this was observed, and the work properly strutted, the structure did not sag at all under the weight of the concrete; and good construction would be obtained. As to the steel bars in walls and floors, what Mr. Devonshire had said was quite true. Perhaps in 50 per cent. of the cases the slabs were reinforced in one direction only; that was to say, the stresses were taken in one direction. But it was politic to have cross bars or bond bars running at right angles; and it was policy not to skimp these bars. With regard to the construction of walls, he quite agreed with Mr. Devonshire that walls should, where at all possible, be carried up evenly; but he did not agree with him that the outer boarding or shuttering should be carried up evenly with the inner one. He found that contractors much preferred to do it as he suggested in the paper; and his experience was that the fixing of the outer boards first, and the carrying up of the inner boards and concrete regularly, did not interfere with the construction at all, neither did it interfere with the homogeneity of the wall. He did not agree with Mr. Devonshire that, if one used a clean sharp sand mixed with cement in the proportion of 1 to 1, one always got a water-tight job. This was what made him (Mr. Taylor) think; and he had consequently made a good many experiments on the point, which showed that it was essential there must be a considerable proportion of fine particles in the sand to more than fill the voids; and he was glad to hear that Mr. Devonshire bore him out in this contention fully.

Mr. DEVONSHIRE: By clean sharp sand, I mean that I should take the sand in its natural state, and see that it was clean.

Mr. TAYLOR said he wanted to emphasize this point. It was necessary that the sand used for rendering should contain a large proportion of fine particles. As to the use of slag, there had been a great diversity of opinion. His experience was that slag should never be used where it could possibly be avoided. It was risky, dangerous stuff. They might get slag suitable in every way from one part of a heap, when the works were making a particular kind of iron; and from the other side of the same heap, they might get slag of quite a different sort, and containing considerable proportions of sulphur or phosphorus. He had, in consequence of this danger, rigidly excluded slag from all the work that he had carried out.

### "Transactions" of the Societe Technique.

We have received the volume of proceedings of the Société Technique du Gaz en France for the past year. It contains the report of the thirty-sixth annual congress, held in Lyons from the 22nd to the 25th of June last, under the presidency of M. Auguste Godinet, the General Manager of the group of gas undertakings in the hands of MM. P. de Lachomette, Villiers, et Cie. Most of the technical matter in the volume has already been noticed in the "JOURNAL." It is followed by a report of further meetings of the Committee on the Standardization of Screw-Threads for Gas Appliances, notices of the life-work of deceased members, particulars of the competitions for the current year, lists of prizes awarded by the Society, names and addresses of members, &c. A useful table is given of the contents of the volumes of "Transactions" for the thirty-six years from 1874 to 1909. In a supplement will be found a collection of the technical abstracts made by M. Payet, together with a tabulated synopsis of the subjects dealt with in this and the preceding volume. This is followed by a review of the legal business of the year 1907-8 by M. de la Taste; and the index to the cases as far back as 1884 is brought up to date. Though M. Payet has relinquished the secretaryship of the Society, it may be assumed that this volume of the "Transactions" has been produced under his supervision.

## SCOTTISH JUNIOR GAS ASSOCIATION.

### WESTERN DISTRICT.

A Meeting of the Western District Division of the Scottish Junior Gas Association was held in the Technical College, Glasgow, last Saturday evening—Mr. D. CURRIE, of Stirling, the President, in the chair.

The PRESIDENT intimated that Mr. V. M. Evans, a representative of the James Keith and Blackman Company, who was to have read a paper on "High-Pressure Gas Distribution," had found it inconvenient to be present, and he did not care to have his paper read by a deputy. They had been fortunate, however, in being able to get a paper on the same subject from Mr. Arthur Robinson, who was also connected with the Company.

Mr. ROBINSON then read the following paper:—

### HIGH-PRESSURE GAS DISTRIBUTION.

The title I have chosen for my paper is one which covers a vast field; but it is my intention to confine myself more particularly to that part of the subject which appertains to the "boosting" or supplying of gas to outlying districts. This is a question which in recent years has occupied a very large amount of attention among gas engineers, in this and in other countries, and one which is destined to revolutionize gas-works methods to a large extent.

Of recent years, as my audience are fully aware, very large demands for gas have arisen in connection with cooking, heating, and industrial purposes; and in many instances these demands are from districts or villages lying at some distance from the gas-works, and from which districts no great demand was anticipated when the mains were laid down. In consequence, these mains are found to be of too small a size to adequately deal with the largely increased consumption, more especially at times of peak load. Another difficulty met with is in cases where gas-works supply gas to distant holders, put up originally to relieve the works themselves—that is, the holders could be filled during the hours of least demand, and would store sufficient gas for a considerable period for supplying the outlying districts.

Matters have come to such a pass in many cases that the gas-works are unable at any time to supply even the holders. To put it another way, the carrying capacity of the mains to these local holders has been overtaken by the increased demand for gas from the district itself. The question therefore arises whether or not to put down new mains of larger size. The inconvenience of this method is well known to you all, to say nothing of the heavy capital expenditure required.

For any small additional quantity of gas required, it is possible, of course, if the holder would stand it, to increase the pressure given by it. The only other alternative is to put down what is now generally known as a "boosting" plant. The question I shall probably be asked is: What effect has this boosting, or increasing of the pressure, upon the illuminating power of the gas? I think I can dispose of this point in a few words. For all moderate pressures such as I wish to speak of, the loss in illuminating power is quite negligible. It has been found that the actual loss by compression, with pressures up to about 5 lbs. per square inch, is practically *nil*. Of course, when it comes to high-pressure distribution, with which the American gas engineers are more or less familiar, there is a distinct loss in illuminating power; but for our purposes this point can be disregarded.

Another question likely to be raised is: If the mains are not in good condition, what effect will the increased pressure have on leaks? The only answer that can be given is that the amount of the leakage will be directly proportional to the square root of the difference of pressures; and the thing to be done, if the pipe-line is in bad condition, is to see that the leakages are made good.

Another use for boosting plants that I might briefly touch upon is that in which low-pressure supplies might be boosted up, or reinforced, by carrying the high-pressure main along, and connecting it up, through suitable governors and at suitable points, to the low-pressure main—this having the effect of permitting a larger carrying capacity of the low-pressure main than would be otherwise obtainable. A case which I might cite, and of which members will doubtless have read, is that of the city of St. Louis, in the United States, which has a 24-inch cast-iron pipe laid completely round the city, and into which the gas is compressed by rotary blowers to a pressure of 5 lbs. per square inch. This circle is used during light loads as a high-pressure distributing main to fill the holders scattered throughout the city, so that at the time of peak load both the holders and the ordinary supply main could be depended upon to meet all requirements. At certain points where the pressure was particularly low in the low-pressure distribution system, connections were made to the high-pressure main, with suitable governors.

There are several types of plant used for the purpose mentioned above; but the more general method in this country is by means of rotary compressors or blowers, and, for lighter pressures, centrifugal fans. Either of these types of plant can be arranged for driving by any available power—by belt, by direct-coupled electric motor, or, in the case of the rotary blowers or exhausters, by a direct-coupled gas-engine; and where the cost of water is not a consideration, then by water-turbine drive. The class of apparatus most familiar to my hearers will be the rotary exhauster type; and I may perhaps be permitted to give a few particulars of the patent



compressor or blower manufactured by the firm with which I am connected.

The Keith patent rotary gas-compressor consists of a positive rotary blower of special design, fixed upon a box base containing the inlet and outlet connections, and the automatic pressure control and return valve. The blower proper is of the eccentric drum type, being fitted with four blades. Several novel features have been introduced into the design. The blades are now made hollow (so as to reduce as far as possible the centrifugal effect), and well stayed between the surfaces; and in order to still further lower the pressure of the blades on the outer casing and reduce the centrifugal effect, they are so arranged that the opposite blades almost completely balance each other. Segmental gun-metal blocks are fixed on the inner ends of each of the blades, working on steel pins. The outer edges of these blades bear on the inside edges of the rings, which are made stiff enough to prevent distortion; and in this way the blades are limited as to the extent to which they can fly out by centrifugal force, and practically balance each other. As the outer ring revolves with the blades, and receives the pressure due to centrifugal force, which is very considerable, the frictional loss usual with this type of blower is very greatly reduced. The blades proper are made so as to keep slightly clear of the outer cylinder in all positions, and the extra distance is made by sliding packing-pieces, which are kept out by centrifugal force. The end covers of the cylinder are jointed in a novel manner, which preserves the end measurement of the cylinder, and still permits the joint to be broken and re-made as often as desired without destroying the packing.

The common fault with rotary blowers of this type is the pulsating effect given by the blades on the discharge side, which is caused by the sudden compression of the gas between any given pair of blades as the space is brought round to the delivery opening, as practically no compression takes place up to this point. This difficulty is overcome by providing a special port which feeds the space gradually before it reaches the delivery port, and which action is carried out without any loss in efficiency. The box base is divided into two portions—one being connected with the low-pressure gas supply and the inlet to the blower, and the other to the outlet of the blower and the service-pipes leading to the burners. These spaces act as reservoirs, which still further reduce any pulsating effect of the blower on the supply or discharge. In the partition between the two spaces is fixed the automatic pressure regulating and return valve, consisting of a special design of safety-valve with an oil dash-pot fitted. This valve is loaded with disc weights on the top, so as to blow off at the exact pressure desired.

A continuous automatic lubricating device is fitted to all machines of this type when arranged for pressures of 1 lb. per square inch and upwards, which gives ample lubrication—considerably more than is possible with sight-feed lubricators—and is very economical of oil; a quantity being poured in at the filling-plug, passing through the oil-pot in which the valve works, and then overflowing into the base. A copper tube is fixed in the connection at the base, and carried up to the lubricator, which consists of a sight-feed tube with a regulating screw, having a small gauze filter to keep back any particles of grit. This lubricator is fitted to the back bearing of the machine, and as this bearing is always in connection with the low pressure, the high pressure in the base is able to force the oil up to the lubricator, and thence to the interior of the eccentric drum. This oil is then thrown out by centrifugal force to all parts, and is finally discharged back again to the back, whence it is again forced up to the lubricator. When sufficient oil is put in to start with, the machine will run several months without requiring any addition, providing the stuffing-box is kept reasonably tight and the lubricator is not allowed to pass too much oil into the blower. This new method of lubricating considerably increases the efficiency of the blower, causing it to run more quietly than the ordinary sight-feed lubricators. It is self starting and stopping, and when the regulating screw is once adjusted, it need not be touched.

For dealing with large volumes of gas at moderate pressures, the most suitable type of plant is that known as the centrifugal fan or blower. These machines, though not capable of giving pressures obtained by the use of positive rotary compressors, can be arranged to give up to about 24-inch water-gauge pressure, and at the same time deal with very large quantities—they having the great advantage of being much less in cost when compared with plant of the positive rotary type arranged to deal with the same quantity of gas. The pressures given by these fans or blowers is proportional to the speed at which they are run; and, following on this, the higher the speed the larger the quantity of gas delivered. As an instance, take a small Keith-Blackman No. 1 gas-blower. This, when run at a speed of 3100 revolutions per minute, will deliver 12,000 cubic feet of gas per hour at an increased pressure of 2 inches. To obtain an increase of 4 inches, it would need to be run at 4500 revolutions per minute, and would then deliver no less than 16,000 cubic feet per hour at the higher pressure. In a few cases, it has been found that the speed at which these fans should be run is a disadvantage. To overcome this, my firm have brought out what is known as their special narrow pattern fan, the chief features of which, when compared with the above-mentioned blowers, are the reduced speeds, and the possibility of increased pressures up to (say) 24 inches water column; the first-mentioned blowers only being capable of dealing with pressures of about half that of the narrow pattern.

In this connection, I should like to bring to your notice plant

which has just been installed for the Tynemouth Gas Company. Formerly the gas-works supplied a holder about a mile from the works at the east end of the town; the holder being filled during the periods of light consumption, while in the hours of heavy consumption it gradually emptied itself, thereby augmenting the works supply through an 18-inch main. The Company, however, decided to abandon the holder, and increase the delivering capacity of the 18-inch pipe by means of a pressure-raising plant, so as to bring up the pressure to the main necessary to maintain a constant delivery of gas of 200,000 cubic feet per hour. The plant now installed is duplicated throughout; each set consisting of one Keith-Blackman blower driven by a direct-coupled electric motor, and each blower being capable of dealing, while running at a minimum speed, with 200,000 cubic feet of gas per hour, at an outlet pressure of 13 to 14 inches—the inlet pressure to the fan being from 5 to 9 inches. The electric current for each set of motors is generated by efficient dynamos connected by belt for driving with suitable gas-engines; all the necessary switches, &c., being supplied with the plant.

This is an instance I have given simply to show the trend of opinion with regard to the use of blowers or fans in gas-works themselves. An installation nearer home, to which I may be permitted to refer, is that at the Lochgelly Gas-Works, where they have the positive rotary type of blowers in duplicate, connected through flexible couplings to suitable gas-engines. This plant is used for sending gas a distance of some two miles through a 4-inch main, tapped at intervals throughout its length to supply colliery districts and houses. An initial pressure of some 70 or 80 inches water-gauge is given by this compressing plant; and at each point where the main is tapped for the supply of small districts or clusters of houses, a Keith-Blackman type of diaphragm governor is used, to bring the pressure down again to whatever is required at the various points.

Another and a growing use for the centrifugal type of fans or blowers is the installation of one at the gas-works for the purpose of temporarily raising the pressure in order to actuate automatic lighting devices. This forms a particularly handy plant, for at certain pre-arranged times in the evening, when the street-lamps or others have to be lighted up, and when they are fitted with the automatic distance lighting arrangements, the blower can be started and run at such a speed as to increase the pressure temporarily to the extent necessary to actuate the apparatus on each lamp, and after a few minutes' run it can be stopped, leaving the lamps alight. Conversely, to shut off in the morning the blower is again started, and the increased pressure put into the mains again actuates the control, so extinguishing the lamps.

#### Discussion.

The PRESIDENT said Mr. Robinson had consented to throw his paper open for discussion, or to answer any questions put to him as to high-pressure lighting.

Mr. J. M'GHEE (Glasgow) said that most of the paper had been devoted to giving the members a very clear and comprehensive idea of the new blowers and fans introduced by Messrs. Keith and Blackman. He did not think Mr. Robinson was going out of his way when he stated that it was quite evident that the trend of gas engineering in the near future would be towards introducing the boosting system. It had become quite evident, if they took a city like Glasgow, with the enormous network of pipes of every description under the soil, and the great complication and expense there would be in introducing larger mains, that it had practically become prohibitive to do so; and when they were looking forward to a great expansion of their industry, by gas-fires and the like, it was obvious that the present mains would not carry the gas necessary to keep up the supply. There was only one way of meeting the difficulty, and there was a notable example of it in Birmingham, where they were laying a high-pressure gas-main. He did not think it was altogether a secret that in Glasgow they had it in contemplation to do likewise. They had had a great demand recently, and heavy work had been thrown upon the stations in meeting it. One of the main features of a high-pressure supply would, of course, be the provision of a suitable governor to reduce the pressure. This would be a very expensive arrangement. There were many places in Glasgow in which they could do with a high-pressure installation; but they were not prepared to face the expense of installing compressing plant themselves. It might be possible to light up a number of shops or factories in a range by fitting up a compressor in a central position; but unless a number could be got together, it was hardly worth while. If, however, a high-pressure gas supply were coming off the main, it would be quite an easy thing to accomplish. He thought it was evident to everyone that if gas could be delivered at high-pressure direct from the main, it would be a strong inducement to many firms who would not face the cost of providing plant themselves to take it at once. In America, they had certainly gone far ahead of what had been done in this country. Here high-pressure gas distribution had been carried out on only a small scale, and notably at Dunfermline and Lochgelly. He did not consider that in the matter of the loss of gas the mains need trouble anyone. The pipes were quite capable of standing very much heavier pressure than they had to bear at present. Oil gas which was used for lighting railway carriages was compressed up to 120 lbs. per square inch; and the pressure desired and necessary in most cities was about 2 lbs. per square inch. It was only a matter of jointing. If a joint were properly made at the beginning, there need be no doubt as to its standing the



requisite pressure. He might put to Mr. Robinson just one or two points as questions. There had been various little defects, of one kind or another, in installations; and he knew that Messrs. Keith and Blackman had taken great pains to overcome them. One of the drawbacks which had been felt was as to the position in which the installation would be in the event of the power failing. At present the result would be utter darkness. In their former installation, in which the pressure was from 8 to 10 inches, it was possible to switch on the low pressure, as he had done himself, and get a very good light until the motor was put in order. But under the new system, this could not be done. This meant the installation of a duplicate compressor, which would add to the expense. There was another point, which was put before him by the engineer of a large establishment in which plant had been installed. There were occasions on which it was necessary to have men working at night at one or two isolated spots. This meant that they had to keep their power running for one or two lights; and they found this to be expensive.

Mr. A. KELLOCH (Alloa) said the question of high-pressure gas supply was under consideration at Alloa two winters ago. They supplied an out-district by a 4-inch main, with a pressure of some 2 inches at the works. To put down a new main meant considerable outlay, as the maximum demand for gas was only about 1500 cubic feet per hour during the peak of the load. The scheme which seemed to them to be most feasible was the introduction of a compressor; and they installed one, driven by an electric motor. It was fitted in the town, about two miles from the village that was being supplied, and a mile from the works. The initial pressure was about 7 inches; and even at this they were not working the compressor at its full speed. The pressure at the end of the village was about 5 inches. They felt this was far too high at which to supply to consumers; and a service governor was put down to regulate to  $3\frac{1}{4}$  inches. They had been able by this means to stop all complaints as to want of gas. The cost of running the plant was about 1d. per hour for electric current; and they could supply 4000 cubic feet instead of the 1500 cubic feet required. The illuminating power of the gas had since in no way suffered by the introduction of the compressing plant. He had listened with interest to the previous speaker's remarks about defects in Messrs. Keith and Blackman's fittings. There was still another to which he would like to draw their attention—viz., the electric ignition apparatus. At Alloa they had introduced a high-pressure plant, similar to that which was in use in the Fleet Street installation; and the only difficulty they had had with it was that the electric ignition had failed to work. He understood that Messrs. Keith and Blackman had some new apparatus to put before them shortly. He hoped that this was so, and that there would be no further trouble with the lighting and extinguishing of the lamps. In their installation the gas consumption per lamp was about  $2\frac{1}{4}$  cubic feet per hour, which would show that a considerable saving was being made, as compared with the old plant, throughout the works.

Mr. J. WEBSTER (Provan) considered that boosting of some description should be in use in all works. They had a pressure of from  $8\frac{1}{2}$  to 9 inches, and with this they could send gas into Dalmarnock—360,000 cubic feet, with the holder erect. When they came down to the second lift, Dalmarnock could supply Provan with gas, instead of Provan supplying Dalmarnock. When they came down to the lower lift, the gas just ran back from Dalmarnock. During the last fog, they had 200,000 cubic feet of gas in one of their 8-million holders, and they sent it direct to Dalmarnock and put it into a smaller holder, where they got a pressure of 6 inches. If they had not had a turbine, they could not have done so, because they had a loss of an inch of pressure on the road. With a small holder on they could take it down to the ground, and still keep up the pressure. With a booster running about 8000 revolutions per minute, they could send down from 800 to 900 cubic feet of gas at a pressure of about 15 inches; and they would not get 1-10th of oscillation on their station. Anything below  $3\frac{1}{2}$  to 4 inches pressure was now useless. They ran about  $5\frac{1}{2}$  inches in their district, and even with this they had complaints.

Mr. A. SMITH (Tradeston) said he had not had the experience of any of the gentlemen who had spoken regarding boosting or high-pressure gas-lighting, but it was evident that with the increased number of incandescent burners pressure must be increased. Within the last five or six years, the initial pressure had gone up 100 per cent.—from about 15-10ths to 30-10ths. The district supplied by the Glasgow Gas-Works being so extensive necessitated the consideration of boosting plant, because with a pressure of 5 or 6 inches at the works, which was the pressure under the present arrangement, this was found to be required to allow consumers at the far end of the mains to have anything like an adequate supply. This was their experience during the last fog they had. The pipes were simply drained before they reached the outlying districts. The question of leakage and unaccounted-for gas used to be considered a drawback in the early days of high-pressure distribution; but he thought that the reverse had been found in practice, and that with higher pressure the unaccounted-for gas had gone down.

The President said he considered that Mr. Robinson's paper was full of interesting material. The subject dealt with was one which should appeal to all of them as juniors, because high-pressure lighting had undoubtedly come to stay; and great advances might be expected in this direction in the future. The point raised by Mr. McGhee about the compressor breaking

down, and there being no provision for lighting up temporarily, was one which, he thought, would appeal to most people in putting in plant for high-pressure lighting. He was talking about a fortnight ago to a gentleman about high-pressure lighting; and this was one of the points he had raised. In the event of high-pressure lighting breaking down in a factory where there were, perhaps, hundreds of employees, it would be very awkward—particularly if it were to happen at a busy time. On the screen Mr. Robinson showed them a flat-flame burner for high-pressure lighting. He took it that this flat-flame burner was for reducing the pressure to that of an ordinary flat-flame burner. He would like to ask how this burner was regulated—that was to say, if any burner could be regulated to suit a pressure of about 8 inches. There was another disadvantage, he thought, with high-pressure lighting, which was that, practically, a governor would be required at almost every service. The governors were very expensive; and they would be very apt to choke. He did not know whether there was a high-pressure governor on the market which was not liable to choke with naphthalene deposits and the like. It would be very awkward if they had the whole of the lights put out by the pipes choking up. He observed that Messrs. Keith and Blackman claimed to produce a light by the Fleet Street lamps of 60-candle power per cubic foot of gas. He asked at what pressure this gas was burned, and also what would be the illuminating power of the gas, tested according to the Referees' Instructions.

Mr. ROBINSON said he was much obliged to the members. Most of what had been said had been in corroboration of the paper; but there were one or two queries he should like to reply to. Mr. McGhee had anticipated a lot of the things they had been doing. For instance, taking the Fleet Street plant, they knew that they had the same plant in use in printing offices and the like in the neighbourhood. They had taken the gas into those works at high pressure, thereby giving a steadier light, and effecting economies. The same could be done in Glasgow, if a high-pressure system were put down. A great deal of interest had been taken in the question of boosting; and he wanted to restrict his paper that night to this question. The fact was that, so far back as four years ago, he was chatting with some gas managers about boosting, and they were contemplating at that time the first public installation that was to be in Scotland. They were thinking of linking-up small towns by this means, and he believed they would have gone on and done so, but they were a little cautious, and wanted, perhaps, to see someone else going forward before they did. He believed that if they had gone on they would not have regretted it. Of course, there was always the possibility of a stoppage of rotary compressors. The bulk of them were driven off the shaft; and if the shafting stopped, the compressor stopped too, or if the belt broke the place would be in darkness. This was a difficulty; and they met it in every case by recommending a duplicate plant, or a duplicate means of supplying power. If they had a gas-engine supplying the power, they might have an electric motor which could be switched on. Still, the compressors were very reliable. In fact, he did not know that they had had a breakdown yet with the rotary type. In the case of engineering works requiring a few lights at night, this was easily arranged, because on the compressor they had a pressure-valve, and they could allow the gas to go through at ordinary pressure; and by the fixing of a few flat-flame burners, or ordinary incandescent burners, they could get a light. Of course, care would have to be taken, in the morning, that the lights were switched off when the compressing plant was turned on. In the case of moving machinery, he admitted it was a difficult question. With regard to the point Mr. Kelloch raised about electric ignition, they were not troubled with this. It was a good idea; but it took some time to get these things perfect. He had word from his people that they had found out a new method of fixing the filaments, by which they would not be affected by the temperature. Regarding the adjustable burner, it was simply an ordinary Peebles governor. The intention of the burner was that in a high-pressure installation they might want a few flat-flame burners. The burner simply reduced the volume of the gas. They worked generally with a pressure of 4 inches of mercury, which was about 54 inches of water pressure. The result of 60 candles per cubic foot was obtained with London gas; but Mr. Herring had also tested the lamp, and he found over 80 candles per cubic foot.

The President proposed a vote of thanks to Mr. Robinson, which was heartily accorded.

#### INCANDESCENT GAS LIGHTING—SOME POINTS OF INTEREST.

The President intimated that Mr. L. Fletcher, the Chief Engineer to the Welsbach Incandescent Gaslight Company, Limited, had favoured them with a paper on this subject, which would be read by the Hon. Secretary. The paper was read, accordingly, by Mr. D. Fulton, as follows.

The revolution in gas lighting brought about by the introduction of the Welsbach mantle is fast becoming ancient history compared with the rapid changes being brought about in other spheres by the adoption of new scientific discoveries. But the marvellous efficiency, and the still somewhat mysterious cause of this wonderful light, render our subject always extremely interesting and fascinating. The old method of obtaining light by means of a luminous flame depending on the light emitted by the incandescent solid particles in the flame itself has, after all, much in common with the Welsbach light, in which the oxides of thorium



and ceria are raised to incandescence by means of a bunsen flame. The phenomena, however, of the old method are easily explained and understood; whereas the secret of the marvellous radio-activity of the 99 per cent. thorium mantle, containing the vitally important 1 per cent. of ceria, has yet to be explained in such a way that cause and effect can be as closely followed and understood. It is, therefore, first the extremely high efficiency, and, secondly, the somewhat mysterious origin, of the light, which make it so interesting from a scientific point of view; and this interest is only intensified by its simple and successful application in the practice of modern gas lighting.

We will briefly consider the principles underlying the successful application of the Welsbach mantle in conjunction with the bunsen burner, and discuss them under the following headings: (1) Suitability of gas supply as to both quality and pressure. (2) Burners, comprising low-pressure, self-intensified, and high-pressure. (3) Mantles.

In the early days of incandescent gas lighting, the vital importance of the quality and the pressure of the gas supply was not, of course, so fully recognized as it is now; and undoubtedly the new system of lighting was hampered exceedingly in consequence, as the gas then supplied was, in most cases, unsuitable for giving the best results with a bunsen burner for the two following reasons: (1) It was so rich in heavy hydrocarbons that it required a very large volume of air for its complete combustion; whereas the ideal gas for a bunsen burner is such a mixture as will only require (say)  $4\frac{1}{2}$  volumes to 1 of gas for complete combustion, instead of (say) 6 volumes with 16 or 17 candle-power coal gas. (2) The low pressure at which it was supplied, though necessary to enable the old luminous flame burner to give its best results, militated against the proper working of the bunsen burner, as the sluggish jet entering the bunsen tube had not the power to draw in its proper quantity of air.

This paper does not give us scope to discuss the constituents of the ideal 12 to 14 candle-power bunsen burner gas; but the subject will have had considerable thought and study from all of us. It will, however, be sufficient to say here that such a gas should not require more than  $4\frac{1}{2}$  volumes of air to 1 of gas for its complete combustion; and if it is delivered to the bunsen tube at any pressure over 2 inches, it would be an extremely poor burner indeed that would not yield a satisfactory bunsen flame under all working conditions. I do not mean to say that a successful bunsen burner cannot be made to give excellent results with a coal gas as rich as even 20-candle power; but we are putting a heavy load on the jet of sluggish gas as it issues to the bunsen tube, and unless our burner is kept in an ideal condition, the chances are that a sufficient volume of air will not be drawn in to produce a good bunsen flame. We then get a partial breakdown of the flame, a much lower flame temperature, and carbon deposited on the mantle. Undoubtedly, if we only consider our gas supply from a bunsen burner point of view, whether for lighting or heating, the reasons are all in favour of a gas of lower candle power, requiring the minimum of air for complete combustion while still being capable of producing flame temperatures of (say) approximately 1500° C. and upwards. There is, of course, something to be said on the other side for a medium quality gas (say, 15 to 16 candle power); and the writer hopes the matter will here be re-discussed. But he thinks all will agree that a minimum pressure of 2 inches of water at the inlet-nipple of the bunsen burner is necessary for general success.

We will now go on to heading No. 2, and briefly discuss the burners and the system at present in use. Though the upright burner is being displaced by the inverted type, we will discuss the former first; and we may roughly classify the upright burners into two sections—namely, the "C" type and the Welsbach Kern. The distinction between the two is clearly defined both from scientific and practical points of view, because in the "C" (chimney) burner about  $2\frac{1}{2}$  parts of air only to 1 of gas is drawn into the bunsen tube, and the flame temperature necessary to produce the excellent result given by the "C" burner is obtained by the secondary air supply conducted to the outer envelope of the flame by the glass chimney; whereas in the case of the Kern (chimneyless) burner nearly the whole of the air required for complete combustion—(say) at least 4 volumes of air to 1 of gas—is drawn in at the bunsen tube, and its increased efficiency is obtained without the aid of a chimney. The special double cone construction of the Kern tube induces a higher velocity of the mixture of air and gas flowing through the same; and, consequently, a much larger proportion of air is sucked in at the air-holes of the tube. And this results in a flame of very great intensity—the temperature of the hottest zone being from 1600° to 1700° C. In addition, the perforated mixing cone ensures the gas and air being intimately mixed, so that every molecule of gas is surrounded by sufficient air for its combustion, and there are no "streaks" of unmixed gas, as there are in a bunsen burner not provided with a mixing-device. Intimate mixing means highest possible temperature; and this in turn means highest possible candle power from the mantles. The increased efficiency of the Kern over the "C" burner is about 30 per cent. if both are working under best conditions.

It is not generally appreciated by users of incandescent burners that there is one zone in a bunsen flame which is very much hotter than the remainder of the flame; and this hyper-incandescent zone, as it is called, is situated just beneath the outer envelope of the flame, and is concentrated to a very great extent at the base of the flame.

Comparing the upright burners with inverted, it may at once be said the light yielded by an inverted burner is due largely to the secondary air supply, as in the case of the "C" burner; and it is doubtful whether an inverted burner has yet been produced which would yield a flame temperature as high as (say) the Kern upright burner. In other words, if the conditions obtaining in the best type of upright burner could be maintained when it was inverted, a higher efficiency would be yielded, as it is an undoubted fact that when you can take nearly the whole of the air into the bunsen tube you get a far more intimate mixture of air and gas, and therefore more complete combustion and higher flame temperature, as previously described, than can be obtained when you use a three to one mixture of air and gas and rely on the secondary air supply for external combustion in the envelope of the flame. This statement at first may seem contradictory; for we are all agreed on the apparently increased light given by the inverted burner. But I want to say that this is entirely due to the angle at which the light is reflected from the inverted mantle and the shape of the latter, and not to a flame of higher temperature, as, indeed, the inverted burner flame is of a lower temperature than the best form of upright burner (such as the Kern), and the combustion is not complete. It must not be assumed, however, that the advantage of the Kern inverted burner is being overlooked, and that I am advising a return to upright lighting; but rather I am endeavouring to point out that we should not be satisfied until the inverted burner has been improved so that it will yield a flame temperature as high as the best upright burner by the jet of gas drawing into the bunsen tube nearly the whole of the air required for complete combustion. To do this we must in some way prevent the overheating of the bunsen, as it is this, and this only, that at the moment prevents us from obtaining even far higher results than are at present yielded by inverted burners at ordinary pressures. I particularly mentioned "ordinary pressures," because if you employ high pressure the overheating effect, and consequent slowing of the flow of air and gas through the bunsen tube, is to a great extent overcome, and the burner is enabled to draw in a constant quantity of air, as the flow of gas and air is maintained at practically the same aspirating power; whereas in the low-pressure burner, although the jet remains constant, the expansion taking place immediately the gas issues into the overheated bunsen tube reduces the velocity through the latter to such an extent that it has no longer power to draw in the same quantity of air as when the bunsen tube was cold.

A very interesting and convincing experiment, illustrating the changes taking place in a bunsen flame during the rise in temperature of the burner itself, may be carried out by gradually heating the bunsen tube of an inverted burner. It will be seen that, although when the burner is quite cold and properly regulated the bunsen flame with an inner ring at the mouth of a whitish-blue colour and containing nearly all the air required for complete combustion is almost ideal, it rapidly changes to a "C" burner type of flame, with a large green inner cone, containing (say) 2 to  $2\frac{1}{2}$  volumes of air to 1 of gas, until, eventually, when the tube becomes nearly red hot, there is not sufficient air drawn in at the air-holes to render the flame non-luminous. Then take the same burner, or, at least, a burner with exactly the same nipple and construction, and surround the bunsen with an outer tube or casing, forming a water-jacket, and allow cold water from a vessel at higher level to flow through an inlet at the top of the jacket, permitting it to run away from an outlet at the bottom, thus surrounding the bunsen tube with cold water. You will see that your original conditions remain practically constant. If close observations are made during the above experiments, points of great interest will be noticed, and you will be amply repaid for the trouble in carrying them out. They will probably modify your ideas regarding "regenerative inverted burners;" and you will, I suggest, be convinced that the problem is, not to heat your burner or mixture, but to maintain the latter at a low temperature until it reaches the burner-mouth, as the loss of heat in feeding your flame with a cold mixture will be far more than compensated by the complete combustion you are able to bring about owing to the increased velocity of efflux of the mixture enabling your burner to aspirate its full quantity of air.

I mentioned under the second heading self-intensifying and high-pressure burners; but I do not propose discussing either of the two here, except to briefly examine the principles of each. The operation of the low-pressure burner is quite clearly understood; and we will now inquire into the principles underlying any high-power incandescent gas-burner, whether self-intensifying or high pressure. This is what we find. To obtain the maximum light from a given mantle surface area, it is necessary to consume efficiently as large a volume of gas as possible issuing from a burner-head made to fit the mantle in question. In other words, we concentrate a large volume of gas into the smallest possible flame by mixing with the gas its full complement of air, thus obtaining from a comparatively small mantle a light of great intensity—the light from each square mm. being about three times as great as from an ordinary mantle. For example, say we decide to consume 10 cubic feet of gas, and we want to render incandescent a mantle of (say) about 1 inch in diameter. This diameter of burner-head restricts the outlet area we can give to our mixture; and if we allow the mixture to issue in the ordinary way from the burner-head without any assistance, it will be found that the velocity of issue is not sufficient to draw in the full quantity of air at the air-holes for complete combustion. It is, therefore, necessary either to render the gas-jet more powerful by



increasing the pressure of the gas, as in the case of all high-pressure systems or the self-intensifying method of employing a draught chimney, or, if we may use the expression, increasing the pressure of the air as it enters the bunsen tube. Though in one case we have a push and in the latter case a pull, the result in both systems is that the necessary quantity of air is induced by the high-pressure gas-jet, or drawn in by suction of the draught chimney, and a mixture of air and gas giving complete combustion is brought about within the prescribed diameter, and we get a light of very high intensity.

It is not, perhaps, generally recognized that the outlet of a burner is the ideal point at which to control its power and capacity. Thus, within limits, if you increase your outlet area you draw in more air, and get more complete combustion; whereas if you gradually close your outlet area you reduce the volume of air drawn in at the bunsen tube, and the combustion is not so complete. The volume of air drawn into a bunsen tube may be regulated to the utmost nicety in this way, and is a far more delicate adjustment than can be obtained by means of an air-shutter on the bunsen tube itself. But there are, of course, difficulties in using adjustable burner-heads.

The really practical bearing of my remarks at this point is that the outlet of the burner must be kept clean, or the flow is being restricted and the candle power is affected. Thus, with a "C" burner it is absolutely essential that the gauze should be kept clean and periodically renewed, because after use the wire itself swells by oxidation and reduces the outlet area. This applies, of course, to all burners with gauze mixing-chambers, and especially to the Kern burner as regards cleaning only (not renewing, as it does not oxidize with its perforated inner cone), as, if this is dirty, it is equivalent to a reduced outlet.

We will now discuss our third heading—namely, mantles—which I have left to the last, because, though it is the most important, it will prove in practice to be the least offender, so far as loss of light is concerned, than either the gas supply or the burner; and if the two latter are performing their proper functions, the mantle will in most cases give no trouble. In other words, nine-tenths of the trouble experienced in lighting is not owing to the mantle—that is, except from breakage—but in nearly every case a reduction in light is due to a bad bunsen flame brought about either by dirty or inefficient burners or a faulty gas supply. I will now refer to a remark in the beginning of the paper regarding the hottest zone of a bunsen flame, as I wish to point out the vital importance of the mantle being absolutely immersed in this intense zone, and, to put this into practice, the mantle must fit the flame if good results are to be expected. If a mantle is too large in diameter for the flame, it only comes in contact partially with this intense zone, and the mantle is mostly on the extreme edge of the outer flame, where the latter is over-aerated, and where the temperature is considerably less than a little below the surface. As engineers and scientific men, you will all readily agree that if highly efficient results are demanded, conditions must be correct; and, as you do not expect your full yield of gas from a charge of coal if your retorts are not maintained at the right temperature, so you cannot expect the highest efficiency from a Welsbach mantle if it is not in contact with the hottest portion of a bunsen flame. The Kern burner, properly regulated, and fitted with a mantle of correct size, yields a result so far exceeding that given by any other low-pressure burner that the little extra care needed in maintaining it is amply repaid.

I would point out that whereas with an upright burner you make your mantle fit the flame yielded by the burner, with an inverted one, as at present made, you make the flame shape itself to the mantle; so that the inverted mantle is in control of the shape, and to some extent the size, of the flame, and there is therefore considerable latitude in both size and shape permissible with an inverted mantle which would be fatal in an upright one. Although, even here, the best results are, of course, obtained by a mantle properly proportioned in size and shape to the quantity of gas to be consumed, as a general remark one might add that when the mantle is giving bad results it is on account of the size being wrong in nearly all cases, and often because the diameter is too large and the mantle itself too long. In other words, if your mantle is on the small side, both in diameter and length, you are far more likely to get it immersed in the hottest zone of the flame, and get something approaching highest results, than if you have it too large.

This brings us to the effect brought about when the shape of the mantle alters by shrinking after being in use; and you will note that when a "C" mantle shrinks in badly, the light is considerably reduced. This is due to the mantle shrinking to within the hyper-incandescent zone, and it now requires a flame of smaller diameter to fit it. It is, therefore, of first importance that mantles should be thoroughly seasoned in the process of manufacture; so that all the shrinking should take place in that process. For this reason, it is always far more economical to use the best quality Welsbach mantles than cheap imitations, which, in most cases, are imperfectly seasoned and soon fall off in light-giving power, mostly for the above reasons. When mantles were made on a cotton base, it was very difficult to complete this seasoning or shrinking process in the factory; but now that they are mostly made on a ramie thread base, the shape will stand throughout its life if the seasoning has been properly done.

The discussion of the paper it was arranged should be postponed to a future meeting.

## REGISTER OF PATENTS.

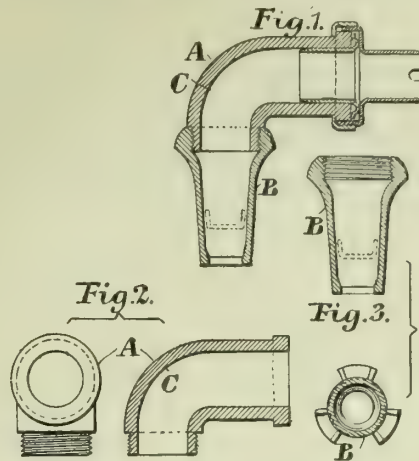
### Inverted Incandescent Gas-Burner.

ROSE, A., and BELLAMY, W. (Howlett and Co.), of Birmingham.

No. 27,290; Dec. 15, 1908.

This burner is moulded in plastic clay in two parts, so as to enable the sides of the hole in the vertical part to be made to taper, and so facilitate the removal of the cores; and the two parts are fixed together and fired as one piece, so that they cannot be separated.

Fig. 1 is a sectional side elevation of the burner. Fig. 2 is an end elevation of the upper bent part. Fig. 3 shows the lower vertical part.



Howlett's Inverted Gas-Burner.

In order that the burner may be formed with the easy bend C and internally tapering nozzle part, the burner is moulded in the plastic state in two separate parts A and B; the division being just at the bottom of the bend, so that the part A constitutes the horizontal inlet with the bend C, and has a small spigot (or a socket) to receive the lower part B, which constitutes the nozzle and has the lateral projections to carry the mantle. The two parts A and B may be fired independently of one another, and then connected by being screwed one within the other or by being merely pushed one within the other. When screwed, the screw threads are formed on the parts while they are in the green state. After the two parts have been connected, they are glazed and fired as one piece, so that they cannot be separated.

By moulding the burners in two pieces, the cores can readily be removed from both before they are fixed together.

### Incandescence Mantles.

ZDANOWICH, J. O., of Knaresborough Place, S.W.

No. 27,755; Dec. 21, 1908.

The patentee remarks that the conversion into oxides of the salts (and particularly of the thorium nitrate) used in impregnating the fabric of incandescence mantles by the methods commonly employed—viz., incineration or treatment with ammonia—"produces a mantle of extreme fragility, due to the loosely adherent condition of the resultant oxides." For increasing the strength, hardness, and durability of mantles, it has been previously proposed, as is well known, to impregnate the fabric with a solution containing nitrate of aluminium and nitrate of magnesium, and to calcine the fabric before applying the incandescing material. It has also been suggested to moisten the heads of previously impregnated incandescence bodies with a solution containing these nitrates, so as to impart tenacity to the heads after the incineration of the incandescence bodies. But, according to this invention, the defect of fragility is eliminated or reduced to any desired extent by utilizing the known property of hydrated oxide of aluminium (or of certain other metals) of shrinking and hardening when converted into de-hydrated oxide by heating.

The cotton or other fabric, therefore, before impregnating with the salts used in the production of the incandescence medium—and after treatment with a solution of one or more salts of aluminium, magnesium, or equivalent metal—has the hydrated oxide or oxides precipitated *in situ* by any known means, after which the fabric is dried and subsequently treated with any suitable incandescing mixture. Alternatively, the reverse treatment may be adopted; the aluminium salt being applied and reduced after the fabric has been impregnated with the incandescing solution, and either before or after incineration.

The skeleton fabric thus constituted tends to shrink and harden on its conversion into de-hydrated oxide during the incineration process, and thereby neutralizes the expansion of the illuminating salts, and results in the production of a mantle "of an altogether stronger and tougher character than can be obtained in the ordinary way." Further, the strength of the mantle is no longer dependent on the uniformity of the thread of which the fabric is woven.

The salts which give the best results are said to be the nitrates or acetates of the earthy metals or of the rare earth metals, and, in particular, the nitrates or acetates of aluminium, magnesium, or beryllium, or a mixture of such nitrates or acetates. In practice, a 4 per cent. solution of nitrate or acetate of aluminium has been found completely satisfactory. "In no case should too dense a solution be used—10 per cent. being about the superior limit for aluminium salts."

In the case of fabrics impregnated with a nitrate solution, the hydrated oxide is usually precipitated by subjecting the impregnated fabric to the action of ammonia vapour. When the fabric has been



impregnated with acetate solution, the hydrated oxide is precipitated by subjecting the fabric to steam under pressure—about 10 lbs. above atmospheric pressure giving good results.

After treating the fabric as described, and before treating it with the incandescing medium, it may first be incinerated, and the skeleton of de-hydrated oxide of aluminium, or the like, so formed is then (or after being partially melted by subjecting it to a gradually increased and finally high temperature) immersed in, or otherwise saturated with, a solution of the incandescing salt or salts. After being dried, it is again subjected to a gradually increased heat (or otherwise treated, as, for example, by exposure to the action of ammonia vapour) to convert the salt into oxides.

### Lighting and Extinguishing Gas-Burners.

CLERC, E., and BIDAULT, E., of Paris.

No. 4589; Feb. 24, 1909.

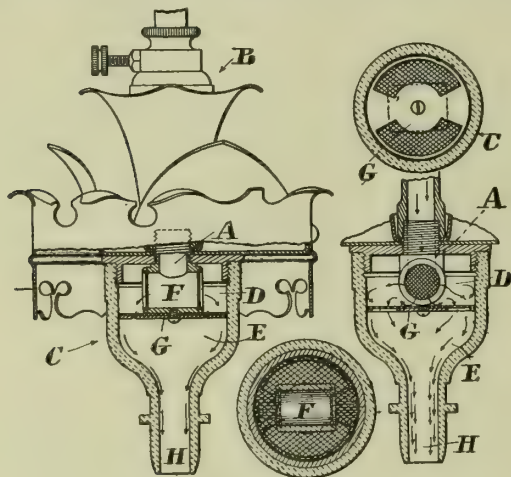
This invention relates to electrical devices for lighting and extinguishing gas illuminating appliances from a distance, in which a separate wire is provided for the three operations of opening the conduit, kindling, and extinction—the three wires being fed by a single source of electricity. The object of the invention is a switch of particular construction which enables the electric current to be passed at will through one of the three separate wires for: (1) Opening the gas-valve, (2) closing the gas-valve, and (3) operating any known kindling device.

### Inverted Incandescent Gas-Burners.

DARWIN, H., of Gravelly Hill, near Birmingham.

No. 3572; Feb. 13, 1909.

This invention has reference to inverted incandescent gas-burners of the type in which the gas-and-air induction tube depends into, and has its discharging outlets arranged within, the interior of an expansion and mixing-chamber communicating with the burner-nozzle; the object aimed at being to "construct burners that will produce a flame of such form or character as will completely fill the interior of a large incandescent mantle (such as a 4-inch mantle), and thus enable the combustible mixture of gas and air to be most effectively and economically utilized without it being necessary to employ pressure gas."



Darwin's Inverted Incandescent Burner.

In the burner represented, the central induction tube A, which depends from a suitable air-regulator or bulb and gas-inlet fitting B, leads directly into the upper part of a mixing and expansion chamber C, which is partitioned off horizontally into two separate and superimposed compartments D E. The induction tube has attached to its lower end a double branched or inverted T-shaped delivery piece F, which is wholly within the upper compartment of the mixing-chamber, and is arranged so that its lateral extension branches or delivery passages lie in a horizontal plane, and have their outlets presented to the inner walls of the upper or primary compartment D of the mixing-chamber. The ends of the T-piece are fitted with discs of metallic gauze or other reticulated medium for initially atomizing the mixture as it passes through them into the compartment D. The two superimposed compartments are divided from one another by a horizontally-arranged diaphragm or partition G suspended within the part C so that it will divide the chamber off into two inter-communicating compartments, the lower one of which is gradually constricted into the burner tube or nozzle H.

The diaphragm has large ports or apertures to admit of the mixture being drawn through them from the upper compartment to the lower one, and, moreover, it is preferably made of special form, so that it can co-operate with the branched delivery end of the induction tube in separating the mixture into separate streams. The diaphragm is so arranged below the delivery end of the induction tube that the openings come respectively on the opposite sides of the horizontal branches of the T-piece and out of the plane of the outlet ends of the branches, whereas the solid parts come in the same plane as the T-piece branches and constitute baffles, which prevent the gas and air issuing from the T-piece from being drawn directly downwards into the lower part of the mixing-chamber, and compel the mixture to impinge against the presented walls of the upper compartment and then to divide and pass laterally to the direction of its delivery from the branches to the partition openings on the opposite sides of the T-piece. The initially-formed mixture expands within the upper compartment, and is further atomized and incorporated by the gauze fittings of the separated openings, which co-operate with the separate discharge outlets of the induction tube in dividing the mixture into two distinct streams, which,

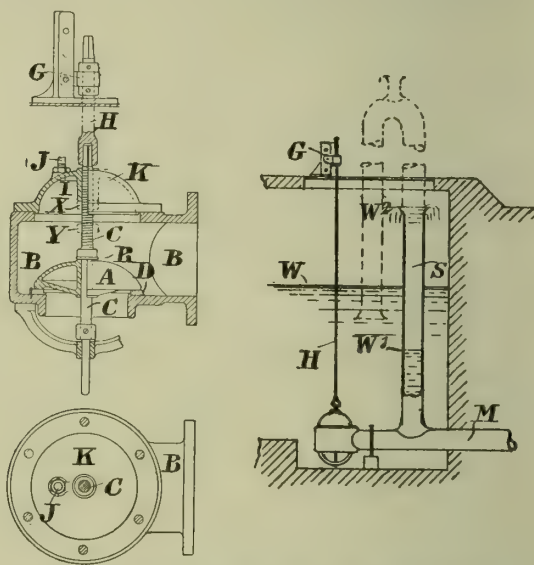
although they converge on being drawn to the restricted part of the lower compartment and thence to the burner-nozzle, do not coalesce or merge, but remain distinct and separate until they are discharged at the nozzle into the interior of the mantle. Thus "when they issue from the nozzle, the streams are separated by an intervening air stratum, and when burnt within the mantle the resulting fish-tail flame completely fills the interior thereof and ensures the gas being utilized to the maximum of its illuminating efficiency."

### Automatic Valves for Water-Reservoirs.

CRIPPS, F. S., of King William Street, E.C.

No. 4716; Feb. 26, 1909.

It is very usual, the patentee remarks, for high-level reservoirs to be fed by a single rising main from the pumping works, and which main, besides being the inlet to the reservoir, at the same time serves as the outlet or distributing main to the town or district supplied with water. His invention consists of a valve to be attached to the outlet branch from the reservoir, and so constructed that, as long as the pressure in the inlet or rising main exceeds the pressure due to the level of water in the reservoir, it remains closed, and will not allow water to pass out. But immediately the pressure of water in the rising main to which the outlet main is connected falls below the pressure of water in the reservoir, the valve opens automatically and allows water to pass out. The arrangement is more particularly applicable to cases where the inlet pipes are taken up to a higher level than the outlet, or where standpipes are adopted. In such cases where the water-level falls in the standpipes to a lower level than the water in the reservoir (due to the pumps stopping or any other cause), the valve opens automatically as stated.



Cripps' Automatic Valves for Water-Reservoirs.

The disc valve A is contained in the body B, and is free to rise and fall on a central spindle C when it is in its middle position of height. The valve opens inwardly—that is, A rises—when the pressure of the water outside B exceeds that of the pressure inside, by the pressure of water acting on the area of the valve. But the valve drops by its own weight and closes immediately the pressure inside exceeds that of the pressure outside the valve. To avoid damage from shock, as well as to make a sound joint, the valve drops on a rubber seat D. The central spindle is screwed in the upper portion which passes through the cover K, and can therefore be raised or lowered by turning. The valve is free to slide up and down the spindle; but collars are fixed in such positions on it that, when it is screwed right down, the valve is entirely shut, and will not allow water to pass either in or out—the valve being held down by the uppermost boss. When the spindle is raised to its full height, the lowermost boss suspends the valve fully open, so that it will allow water to pass either in or out of the reservoir.

In either of these two latter positions the valve acts as an ordinary stop or sluice valve; but when the spindle is raised to its middle position, so that the valve is free to either rise or fall, it will not admit water to the reservoir, but only act as an outlet. As shown, the valve is fixed completely closed, and prevents water passing either in or out of the reservoir through the valve. When fixed fully open, the spindle is raised so that the upper boss is in the position marked X. When, however, it is in the position marked Y, the valve is free to open inwards and discharge water from the reservoir when the head of water W in it is greater than that (such as W<sub>1</sub>) in the rising main M to which the valve is attached. But if the pressure in the rising main (due to water being at, say, W<sub>2</sub>) is greater than that due to the head of water in the reservoir, the valve closes automatically; thus forcing the water into the reservoir by the inlet standpipe S.

An indicator G is fixed on the spindle at the top of the reservoir (from which level it is worked) so as to show, by its height, which of the three positions the valve spindle C is placed in; and the spindle can be locked in either of the positions desired.

The valve A is so shaped or curved as to afford the least obstruction to the water flowing through. A rubber washer R (to deaden shock when the valve suddenly rises) is fitted with a loose metal washer under it, to prevent the valve being held up by suction of the rubber after pressure, and to enable the valve to part from the washer and drop by its own weight. The top of the valve cover K may be domed to form an air-chamber I, and from this chamber a small pipe J may be led to above the water-level in the reservoir, so as to admit of discharging any air from the main to which the valve is attached.

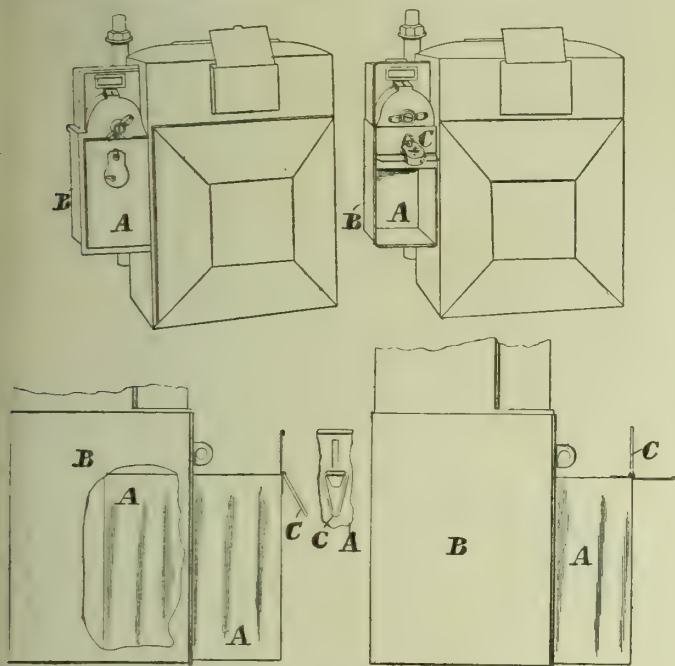


### Money Boxes of Prepayment Gas-Meters.

YOUNG, A., and R. LAIDLAW AND SON, LIMITED, of Edinburgh.

No. 10,141; April 29, 1909.

This invention consists in so constructing and fixing the money-box that it can be used in the ordinary manner for the reception of coins when the meter is in proper and authorized use. But when, for example, a house is vacated for a time, and the meter is out of use, the collector, after removing the coins, replaces the money-box in such a position that no money can be passed into it from the prepayment attachment; and the fact of the money-box being empty is shown by the inside of the box being exposed to view. By an arrangement of the lock and attachment, the money-box can be locked in either position. "This idea of exposing the inside empty money-box to view when the meter is not in use, deters any person from tampering with the prepayment appliance and damaging it."



Young and Laidlaw's Prepayment Meter Money-Box.

Under one form, the money-box A is rectangular, with a correspondingly shaped container B open at the front of the meter and into which the money-box is inserted; the front of the container being provided with a staple and the front of the money-box with a slot. The arrangement is such that when the meter is in authorized use, the staple protrudes through the slot of the money-box; and it is locked in position. When the box is not in use, it is withdrawn from its container, turned round, and the bottom of it presented to the open container; thus leaving the interior of the box exposed to view.

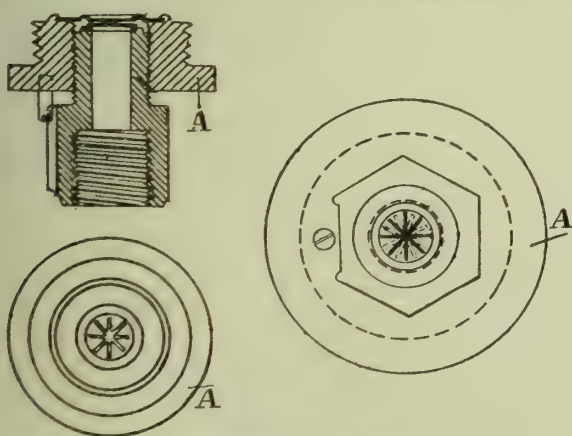
To effect the locking of the box A in this latter position the hasp C is provided, which is passed on to the staple and then padlocked—the empty money-box being thus retained in the receptacle.

### Gas-Burners.

SCHWIEGER, A., of Berlin.

No. 14,323; June 18, 1909.

This burner is of the kind in which the gas supply is regulated by two diaphragms barring the passage and having coinciding slots the area of which is regulated by rotating the one diaphragm on the other.



Schwieger's Gas-Burner.

The diaphragms are provided with slots in the form of stars or double crosses, "so as to produce, in all positions of the diaphragms relative to each other, a gas-jet, of star-shaped and perfectly symmetrical cross-section, supplying to an incandescent body, placed on the burner, an equal amount of heat on all sides."

The nozzle is formed of two cylindrical bodies, one of which is nut-shaped and provided with an internal screw-thread by means of which

it can be secured to the gas-pipe. Both diaphragms are provided with equal, symmetrical slots in the form of stars or double crosses. When the diaphragms are adjusted as shown in the enlarged bottom view, the slots only form a small central, star-shaped opening as an outlet for the gas; but by turning the part A, the rays of the star are gradually and symmetrically extended until the slots of both diaphragms register with one another, when the gas-outlet is at its maximum. The gas-outlet can thus be regulated in accordance with the pressure of the gas and the size of the incandescent body employed. A pin screwed in the part A serves to stop the movement of the latter at the maximum and minimum outlet of gas.

### Bunsen Burner Connection for Gas-Stoves.

JESSEL, W., of Bradford.

No. 16,339; July 13, 1909.

This invention relates to a construction of an injector or nipple for a bunsen burner. It is formed at the front end of a screwed tube, and is provided with a nut so that, after it has been inserted into the mixing-chamber, it is held in position by the nut and a milled collar. This screwed nipple is provided at its rear end with an extension tube formed as described in patent No. 632 of 1903—viz., as a hollow thin tube with a shoulder towards its inner end. Over the flexible metallic tubing to be connected to the injector a metal collar or band is passed which approximately fits the tube; and below the band is wound asbestos fibre for a short distance, so that some of the fibres taking into the helical grooves of the tubing serve to hold the packing in position. The end of the tube, with its packing and collar, is then inserted into the metal tube, so that the end of it bears against the shoulder.

The novelty of this arrangement is said to be that the two parts are made in one instead of two separate parts as heretofore; and thus there is simplicity of construction, there is less chance of leakage, and an avoidance of friction, as the passage of the gas is direct from the flexible metallic tubing into the injector, and thus into the mixing-chamber of the stove.

### APPLICATIONS FOR LETTERS PATENT.

- 30,238.—PARKINSON AND W. & B. COWAN, LTD., and LAYTON, A. E., "District pressure-governors for gas-distribution systems." Dec. 28.  
 30,244.—WILKINSON, H., and WIMHURST, F. L., "Anti-dip." Dec. 28.  
 30,271.—FLETCHER, RUSSELL, & CO., LTD., NEIL, J., FLETCHER, T. W., and RUSSELL, W. A., "Gas and water valve." Dec. 28.  
 30,304.—BECKMANN, C., "Gas-engines." Dec. 28.  
 30,362.—DUXBURY, T., and LEMMON, N. G., "Filling coke-skips." Dec. 29.  
 30,367.—LEWIS, J. P., & S., "Screw-down valves." Dec. 29.  
 30,378.—LELLIÉ, N., "Producer furnaces." Dec. 29.  
 30,383.—BRAZIER, J., and WATSON, H., "Lighting and extinguishing a system of gas-lamps at prearranged times from a given station." Dec. 29.  
 30,387.—KEITH, J. & G., "Controlling the supply of gas to burners." Dec. 29.  
 30,392.—PHILLIPS, F., and RICKCORD, R. V., "Automatically preventing the accidental escape of gas from a burner or other outlet." Dec. 29.  
 30,396.—PARKER, T., "Destructive distillation of coal." Dec. 29.  
 30,415.—CODY, S. F., "Fluid-tight joints." Dec. 29.  
 30,440.—BRISCOMBE, W., "Gas-engines." Dec. 30.  
 30,462.—BOAM, E., "Gas-heating apparatus." Dec. 30.  
 30,469.—FABRIS, G., and FREEMAN, W. A., "Illuminant signs." Dec. 30.  
 30,478.—FOSTER, C. E., "Pyrometers." Dec. 30.  
 30,563.—WELTI, C., "Valve-cocks." Dec. 31.  
 30,564.—BRITISH INCANDESCENT MANTLE WORKS, LTD., "Packing mantles." A communication from Deutsche Gasglühlicht Akt.-Ges. (Auerger.) Dec. 31.  
 30,581.—NÖRREGAARD, E. F., "Automatic gas-lighters." Dec. 31.  
 30,598.—HOLZWARTH, H., and JUNGHANS, E., "Gas-turbine plant." Dec. 31.

**The Assessment of the Plymouth Gas-Works.**—At the Plymouth Quarter Sessions last Friday, Mr. W. T. Lawrance mentioned to the Recorder the case of the Plymouth and Stonehouse Gaslight and Coke Company against the Guardians of the Poor of Plymouth—an appeal against the assessment of the Company's undertaking. The Guardians had received notice from the appellants that they did not intend to proceed with the appeal; and, under the circumstances, he had to ask that it might be dismissed with costs. Mr. Percival Clarke said he appeared for the Company, and it was a fact that they had given notice that they did not intend to proceed with the appeal. It was agreed that the costs should be taxed out of Court by consent; and the application was dismissed.

**Torpoint District Council and the Water Engineer's Charges.**—The failure of the Torpoint District Council to secure parliamentary approval of their scheme for the provision of an improved water supply was recalled last Thursday by the reading of a letter from Mr. J. Diggle, of Heywood, who was Engineer for the Council in connection with the scheme. There is still owing to Mr. Diggle a balance of his charges; and the suggestion had been made that he should accept a smaller sum in settlement. Mr. Diggle wrote that he thought such a proposal was altogether out of place. Members of the Council knew that he made an abatement of £500 in his charges at the time, and that the charges were not by any means proportionate to the vast amount of work he had done in connection with the unfortunate Bill. The Council were also indebted to him for agreeing to take part payment of his account in instalments, so as to assist the Council, and for accepting a much lower rate of interest than he obtained upon any other investments. Instead of asking for a reduction, the Council should have sent a cheque for the full amount with thanks. It was decided that the balance of the account, with interest, be paid forthwith.



## LEGAL INTELLIGENCE.

### THE CLAIM BY A FORMER GREENOCK GAS MANAGER.

Judgment by Lord Mackenzie.

On Thursday last, Lord Mackenzie, of the Court of Session in Scotland, issued his judgment in the action brought by Mr. W. Ewing, formerly Gas Manager in the employment of the Corporation of Greenock, now residing at Ardsbiel, Stepps, near Glasgow, against the Corporation of Greenock. (See "JOURNAL," Vol. CVIII., pp. 548, 894.)

LORD MACKENZIE said: The pursuer was appointed and acted as Gas Manager to the Burgh of Greenock from Nov. 15, 1900, to Sept. 8, 1908. The action is brought for payment of £1645 8s., for work which pursuer says did not fall within the scope of his duties as Gas Manager. The work embraced reports on the proposed extensions of the existing plant; reports on tenders; preparation of plans and estimates; and the supervision of the erection of plant and machinery. This work, according to the pursuer's contention, was engineering work, which his salary did not cover. It is clear from the pursuer's application for the post of Gas Manager that he dwelt upon his qualifications as a Gas Engineer. In his letter of Sept. 8, 1900, in which he applied for the position of Manager, he set out his training and experience in gas engineering, which he stated gave him the utmost confidence in "the carrying on of all departments of gas engineering and management." His testimonials bore this out. The letter of application concluded: "I have much pleasure in offering my services, with remuneration according to working results, or at the salary offered." He was appointed Gas Manager at a salary of £400, with house rent free. There can be no doubt that his qualifications for engineering work influenced the Committee in giving him the appointment.

The pursuer had, previous to 1900, been Gas Manager at Hamilton, where he had given his engineering skill for a salary which was £150 at first, and had risen to £275. He had also received an honorarium in connection with certain extensions. There was this difference—that at Hamilton a list of the pursuer's duties was drawn up; at Greenock, it was not. The pursuer's predecessor at Greenock was Mr. Stewart; and in his evidence Mr. Ewing admits that he knew that Mr. Stewart, in November, 1900, was Manager and Engineer with a salary of £400, with an allowance for a house. Mr. Stewart had been in the service ever since 1866; and special arrangements were made with him on the completion of his term of office. Mr. Chalmers, who was appointed to succeed him, never did so, on account of ill-health. It is proved that when, in 1871-73, the site of the gas-works was changed, Mr. Stewart, by arrangement beforehand, received a payment of £600, which included attendance in London. Since that date, he received nothing but his salary, though there were extensions at the works costing some £15,000.

In my opinion, the pursuer's understanding, when he got the appointment, was that he would, as Gas Manager, have to do engineering work. He seems immediately after his appointment to have assumed the title of Engineer and Manager. He had order forms printed (which were for general business, not merely for extensions), and note paper with "Engineer and Manager" printed on them. "Engineer" was put on the office door, as well as on a rubber-stamp for use in the Corporation business. The pursuer's own view of his position is to be found in an application he sent in for an appointment at Nottingham in 1902, in which he stated: "At the latter end of 1900, I was appointed Engineer and Manager of the Greenock Corporation Gas Department." This appears to me to prove, out of the pursuer's own mouth, that he got one combined appointment. The justice of this view is strongly supported by the consideration that there is no separate and special qualification for a Gas Engineer as distinguished from a Gas Manager. In deciding to advertise for a Gas Manager, the Committee at Greenock determined to make the range of choice as wide as possible. Some gas managers have more engineering skill, some less. Other things being equal, the candidate who has the engineering skill in addition to the other qualities necessary, will have the preference. In the specifications prepared by the pursuer, a uniform supervision clause was inserted in these terms: "On behalf of the Corporation, the supervision will be done by the Engineer and Manager of the works, who is referred to in this specification as the Engineer, or any qualified person he may appoint." This does not bear out the pursuer's contention that he regarded his position as Engineer as separate from his position as Manager. The minutes of the Gas Committee, copies of which the pursuer regularly received, always refer to him as Manager. His appointment was annually renewed in similar terms; and the pocket-book which he received each year from the Corporation had his name and office stamped on it: "William Ewing, Gas Manager." In carrying out any instructions he received, Mr. Ewing used the office staff, paper, and block plans, which indicate that he thought he was dealing with an office matter. He kept no separate notes to enable him to make the present claim. He resigned office in September, 1908, and had to get the Corporation minutes and accounts to enable him to make up his claim, which he sent in on Dec. 24 of that year.

The truth is that the present claim was an after-thought. There is nothing in writing about it until after the pursuer's resignation; and I am of opinion that the pursuer has entirely failed to prove that he ever, during the period of his employment, brought to the knowledge of anyone representing the Corporation that he intended to make any such claim. Unless it was an after-thought, there is no sufficient explanation why Mr. Ewing made no provision for his fees either in the annual estimates which were prepared by him of the outlays for his department, or in the statement of expenditure for the past year. He says it was because the Town Clerk advised him to wait till the work was completed. The Town Clerk denies any such conversation; and it is not proved it ever took place. Even if it did, the pursuer does not say it was until 1905, which leaves no reason for omitting the charges from 1902 to 1905. In several respects the present case is much weaker for the pursuer than that of *Machison v. Burgh of Dundee*

in 1909. A marked difference is that here all the defence witnesses clearly understood they were getting the pursuer's engineering services for the salary they were paying him. They had good grounds for this, because, according to their view, the pursuer was just taking up and continuing at the same salary the work that Mr. Stewart was ceasing to do. It is clear from the correspondence with Mr. Stewart that the Corporation never contemplated appointing a Manager at £400 a year, and appointing an Engineer as well. There is nothing in the estimates to suggest they had any doubt about the matter.

The pursuer's case is made to rest largely upon evidence of what is said to be general practice. After considering the evidence, I fail to see that the pursuer has adduced any instance of a corporation employee who has been held entitled (in the absence of special contract), as matter of right, to special remuneration for the extension of gas-works under his direction and supervision. The evidence falls under one or other of two categories—viz., cases of (1) special contract or (2) honorarium. No doubt in theory the evidence of some of the witnesses is favourable to the pursuer; but their experience does not support it. I am of opinion that there was no such distinction in the case of the pursuer as he seeks to draw between the duties of a Gas Manager and a Gas Engineer. In my opinion, all the work he did was regarded by both himself and his employers as falling within his contract to act as Manager, and that it did fall within his contract and was covered by his salary. It is not necessary to express an opinion on any general question. In my opinion, the case should be decided upon the true meaning and intention of the parties to this particular contract.

The pursuer attempted to make a case of special employment as Engineer. The terms of the agreement on this point are to be contrasted with the pursuer's evidence. He avers that he "received defenders' instructions to act as their Consulting and Resident Engineer in Mr. Stewart's absence." It now appears from the pursuer's evidence that these were verbal instructions from the witness Campbell, who was then Convener of the Gas Committee. The pursuer was asked: "Did he say anything to you about your being Consulting Resident Engineer?" His answer was: "No." Mr. Campbell's account of it is that the pursuer just stepped into the shoes of Mr. Stewart in regard to the work that was then in progress; that he may have told him to look after the erection of West's machinery (this was to substitute mechanical for hand stoking), in Mr. Stewart's place, but that he would not regard this as extraordinary work. The pursuer's case as to an interim appointment, in my opinion, fails.

The case for a permanent appointment rests on the following minutes: The minute of Oct. 8, 1901, which is in these terms: "Reference was made to the quality of gas reported; and it was agreed that the Gas Manager be instructed to report to a future meeting what is necessary to enable him to supply an improved and higher quality of gas. The Manager was also instructed to report what he considers necessary to be done to put the works into proper condition." The admission in one of the answers is to be read along with the terms of the minute. The report is dated Nov. 25, 1901. It was submitted at a meeting of the Committee on Nov. 25, and ordered to be printed and circulated. The minute of Dec. 17, 1901, says that it was resolved, with reference to the non-working of the stoking machinery at Inchgreen, that the Manager be asked forthwith to report on the best method of utilizing the works as they then were, and the cost thereof. This is the foundation for the report dated Jan. 7, 1902, which is an exhaustive one. Now, in both minutes it is the Gas Manager who is instructed; and the matter is dealt with as a Gas Manager's affair. There is nothing in the minutes about the appointment of an outside Engineer, or that any appointment as Engineer was ever conferred on the pursuer. The minutes do not bear out the pursuer's account in his evidence. There is nothing to show that the Committee had a large scheme in their minds, and that the pursuer was selected to carry it out in preference to an outside Engineer. The way in which the matter came up was on account of complaints as to the quality of the gas; and the remit was made to the Manager in consequence.

The pursuer did not suggest at the time that he was entitled to any extra remuneration. In the latter report, he proposed an elaborate series of works, to cost £45,000. This, as the witness Campbell says, the Committee did not take seriously, because it was outside their capability. They had not asked or expected any report of this character; and as regarded the detail of the various schemes, this was a matter which emanated from the pursuer himself. Against the pursuer's contention that he was from October, 1901, acting as Engineer, as distinguished from Manager, is the fact that in November, 1901, he admits he got his re-appointment as Manager without any reference to a separate appointment as Engineer. Nor is there sufficient reason for holding that the pursuer is entitled to extra remuneration on the ground of implied contract. The work was remitted to him as Manager, and performed by him without protest or claim during the whole course of his employment. There was clearly an *onus* upon him to make it known to his employers, if he intended to treat the work as of an extraordinary character.

It is unnecessary to enter into the details of the pursuer's claim as stated on the record or in the account he sent the defenders after he left their service, and which has been produced by them. The items, so far as insisted in, are open to criticism in many respects. I do not doubt that the pursuer spent time and trouble upon the reports, as well as upon other matters for which he now seeks to be paid. I am of opinion that the understanding, both of the pursuer and the defenders, was that this work was covered by his salary. If this was not the pursuer's view, he has only himself to blame for not distinctly intimating to his employers, when he was instructed to do the work, that it did not fall within his duties as Manager, and that he would have to be paid extra for it.

I think the pursuer's case fails. The defenders will be assuaged, with expenses.

The Swansea Water and Sewers Committee have recommended the acceptance of the tender of Messrs. Moss and Co., of Loughborough, at £18,700, for the construction of a service reservoir at Morriston. The recommendation is subject to the insertion of a clause in the contract providing that certain specified material shall be of British manufacture.



## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

## German v. English Retorts.

SIR,—With regard to the correspondence which has recently appeared in your columns on the above question, it is somewhat disappointing that no particulars have been given as to the work done by German retorts, as such information would be most useful in making comparison with our everyday work with retorts of English make.

So much has been said in favour of German retorts that I should like, in justice to some of the British makers of retorts, to give you my own experiences with the latter. At the same time, the discussion will undoubtedly have a bracing effect on the English makers; and those firms who have exercised much care in the manufacture of retorts in the past, will no doubt be spurred on to greater efforts in the future.

We intend pulling out and resetting five beds of retorts towards the end of March and early in April. These beds are fired on the Klönne regenerative system, and consist of eight retorts per bed—each retort being 22 inches by 16 inches by 20 feet long, of Stourbridge make—and were put in in the early spring of 1905. Since that time these retorts have been at work during 1467 days, and have carbonized 13 tons of coal per bed per 24 hours in 4 hours 48 minutes charges, or 18 tons per retort per 24 hours. Thus each retort during its lifetime has carbonized 2384 tons of coal. The gas made per ton of coal by these beds, during each of the five years, is as follows: 1905, 11,920 c. ft.; 1906, 12,198 c. ft.; 1907, 12,307 c. ft.; 1908, 12,292 c. ft.; 1909, 12,376 c. ft.—an average of 12,219, c. ft. per ton of coal carbonized  $\times$  2384 tons = 29,130,096 c. ft. of gas made per retort during its lifetime.

One is well aware that retorts can be made to last almost any length of time—depending, of course, on the temperature at which they are worked, and the amount of patching and mending done to them. During the five years the above retorts have been at work, a total sum of only £35 has been spent on material for repairing them, which proves that in this case at any rate the original retort has not been "mended and patched out of existence."

Then as to the temperature at which the retorts have been worked. The coal carbonized at Scarborough is a mixture of good all-round "South Yorkshire," screened through a 2-inch mesh. But, as it is of a friable nature, a good deal of fine powdery coal is mixed with the rough. As, however, the retorts referred to have been working off 6½ cwt. charges in 4 hours 48 minutes, and the gas has been made at the average rate of 12,219 cubic feet per ton of coal carbonized, it shows they were worked at a high (rather than medium) temperature.

In the "JOURNAL" for Nov. 9 last I read with great interest the remarks by Herr Körting, of Berlin; and I can thoroughly endorse all his statements in relation to horizontal retorts, as the life of a retort depends not only on the quality of the material, but very much indeed on the efficient construction of the furnace and combustion chamber arches, as well as in the regularity of the heating.

As a further proof of the importance of efficiency in workmanship, I may give as an instance the relining at the bottom of the generators in our carburetted water-gas plant, where, as is well known, a very high temperature obtains. Originally, the brickwork in the bottom part of the generators was burnt through after about 600 working hours, which necessitated relining. On looking into the matter, it was found to be due to the workmanship in the setting of the blocks. Now, however, by utilizing experienced labour, and with the same class of material (Stourbridge make) from the same firm as formerly, and working under exactly similar conditions, the generators run for 2200 hours before being burnt through, or nearly four times as long—thus showing the importance of having fire-brick work well executed.

It, therefore, behoves gas engineers to see that efficient workmanship is employed in the setting of the retorts, and the building of the furnace arches, and combustion chambers, as unless such work is properly executed, the quality of the retort material avails little.

Scarborough, Jan. 6, 1910.

ALEXANDER ALLAN.

## Coulson's Tar Patent.

SIR,—My attention has just been drawn to a letter appearing in the "JOURNAL" for the 28th ult., with reference to my patent of 1909.

In reply to same, I beg to say that if your correspondent will look carefully through the specification given in a previous issue, he will find that the small quantity of acid is added to the semi-pitch left in the still, after taking off some portion of the volatile matter, in order to make same sufficiently hard to admit of its being readily transported. The value of the small quantity of acid used is shown by the fact that the pitch made by my process contains about 73 per cent. of volatile matter, against 47 to 64 per cent. in the ordinary tar residue or pitch as now sold.

As quite 90 per cent. of the pitch now produced is used in the manufacture of briquette fuel, this product will be sold for that purpose, for which it is specially suitable—in fact, a briquette manufacturer has already stated that he is willing to take a daily supply at a price leaving a good margin of profit.

Sheffield, Jan. 6, 1910.

J. G. COULSON.

**Gas-Stokers' Wages at Neath.**—At a meeting of the Neath Town Council a few days ago, the question of the wages paid to the gas stokers came up for discussion. Mr. Victor Morgan, of the Gas Workers' Union, said that the Neath men received less than men in any other town in South Wales, and their work was much harder. Alderman Hopkin Morgan, however, replied that the Committee were advised that the work was not harder; while Mr. R. A. Browning, the Gas Engineer, stated that the stokers were better paid than men in any other South Wales town. A recommendation refusing an increase was adopted.

## PARLIAMENTARY INTELLIGENCE.

## PROPOSED EXPENDITURE ON GAS AND WATER WORKS.

According to the plans and estimates deposited in the Private Bill Office, under the Standing Orders, on behalf of the various gas and water undertakings promoting Bills in the forthcoming session, the following expenditure on works is proposed under the powers sought. The names in parentheses are those of the engineers connected with the schemes.

	Total.
Aberdeen Corporation, for water (Messrs. Alexander Binnie, Son, and Deacon, and Messrs. T. & C. Hawksley) . . . . .	£1,396,000
Abertillery and District Water Board (Mr. Baldwin Latham), exclusive of £100,707 for reservoir, draw-off works, catchwater, and £95,845 for trunk mains . . . . .	247,000
Cambridge University and Town Water Company (Messrs. T. & C. Hawksley) . . . . .	167,500
Clydebank and District Water Trustees (Mr. J. Stuart) . . . . .	61,770
East Grinstead Gas and Water Company (Mr. W. Vaux Graham) . . . . .	19,000
Egremont Urban District Council, for gas (Messrs. T. Newbigging and Son) . . . . .	14,800
Exmouth Urban District Council, for water (Messrs. G. H. Hill and Sons), exclusive of £3252 for pumping machinery and £10,519 for mains . . . . .	18,012
Fraserburgh Corporation, for water (Messrs. W. Allan Carter and W. Alexander) . . . . .	45,870
Fylde Water Board (Mr. G. Cook), exclusive of £91,500 for reservoir and equilibrium basin . . . . .	212,000
Hastings Corporation, for water (Mr. P. H. Palmer) . . . . .	128,486
Hoyland Nether Urban District Council, for gas (Messrs. T. Newbigging and Son) . . . . .	8,000
Little Hulton Urban District Council, for gas (Mr. W. Newbigging) . . . . .	2000
Maltby and Tickhall, proposed Company, for water (Messrs. Fairbank and Son) . . . . .	6,205
Middlesborough Corporation, for gas mains, meters, &c. (Mr. D. Terrace) . . . . .	50,000
Montrose Corporation, for water (Mr. J. B. Bennett) . . . . .	24,393
Mountain Ash Urban District Council, for water (Mr. W. Fox) . . . . .	74,765
Pontypridd and Rhondda Joint Water Board (Messrs. G. H. Hill and Sons), exclusive of £200,000 for reservoir and £123,472 for trunk mains . . . . .	407,000
South Hants Water Company (Mr. W. Matthews) . . . . .	16,500
Staffordshire Potteries Water Company (Mr. G. B. H. Soane) . . . . .	198,033
Thorne and District proposed Company, for water (Messrs. Fairbank and Sons) . . . . .	12,495
Wells and Fakenham, proposed Company, for water (Mr. G. H. Perry) . . . . .	6,960
Whitland, proposed Company, for water and gas (Mr. B. T. Rees) . . . . .	3,278

## CAMBRIDGE AND THE STANDARD BURNER BILL.

A Special Meeting of the Cambridge Town Council has been held to consider a report of the Lighting Committee with reference to the Gas Companies Standard Burner Bill which the Cambridge University and Town Gaslight Company, in conjunction with other Companies, are promoting in Parliament.

The Committee reported that the Town Clerk had been in communication with the authorities of other towns interested in the Bill; and after considering the information received from them, the Committee were of opinion that it should be made quite clear that the adoption of the proposed new burner would not in any way result in the Company being able to supply gas of a lower illuminating power than that of 16 candles under the present test, and that they should be asked to give an undertaking to insert a clause in the Bill to secure this object. The Committee were further of opinion that the Company should be asked to consent to clauses being inserted in the Bill providing: (1) That a standard calorific power of gas supplied by the Company shall be fixed, as has been done in section 39 (1) of the Gaslight and Coke Company's Act, 1909; (2) that the prescribed method and apparatus for testing the illuminating and calorific power of the gas shall be in accordance with the notification of the Metropolitan Gas Referees as issued by them from time to time; and (3) that the time for making official tests of at any rate the calorific power of the gas shall be extended to any time of the day or night, as provided for by section 18 (1) of the last mentioned Act. If the Company were unwilling to do this, the Committee were of opinion that steps should be taken to oppose the Bill, with a view to obtain the insertion therein of clauses for carrying out these objects, and also for limiting the pressure and for securing the purity of the gas; and they therefore recommended that, in the event of the Company refusing to insert such clauses, the Town Clerk be authorized to affix the Corporate seal to a petition against the Bill. The Committee further recommended that in this event they should be empowered to settle with the Town Clerk the exact form of the petition.

The adoption of the report having been moved and seconded, Mr. PURVIS said he thought the matter required further consideration in view of the importance of securing gas as free as possible from all



sulphur compounds. There was no doubt that sulphur compounds, besides being injurious from a health point of view, were also injurious to furniture, books, pictures, &c. It was difficult to remove all the sulphur compounds; but at the same time he did not think this released any company from the responsibility of giving a town a gas that was free as possible from all sulphur compounds. It was for this purpose he suggested either that an amendment should be put in the resolution or that the Committee should further discuss the matter before action was taken. He moved the addition of a clause providing for the exclusion of sulphur compounds from the gas.

Dr. DALTON remarked that the Public Health Committee considered this matter two or three months ago somewhat exhaustively; and they came to the conclusion suggested by Mr. Purvis.

The mover and seconder intimated that they were willing to accept the amendment.

Dr. DUCKWORTH said he thought the Bill only concerned a new burner; and he did not quite see the connection between this matter and the question of sulphur compounds. Was it proposed to take advantage of the new burner being asked for to secure greater purity for the gas?

Mr. INNES (who had moved the adoption of the report) explained that the Gas Company were proposing to have a new standard burner established, which would enable them to supply gas of a different quality in some respects, and differently tested, from the gas they were at present supplying. If they obtained this power to supply a different quality of gas, they should also ensure an improvement in the supply in other respects.

Mr. LINSEY remarked that a considerable sum of money was spent some time ago on apparatus for testing the illuminating power and pressure, and also for testing the amount of sulphur contained in the gas. If this apparatus was on their own premises, and they had control of it, what had they to complain of? He would like to know if their official tester had gone on without testing the gas for those ingredients which were so detrimental to the public health. Had they been waiting for the institution of this new burner to find all this out, when the apparatus would tell them all they wanted to know?

Alderman CAMPKIN said they had tested the gas from time to time; but, when they had made certain discoveries, they had no power to order the removal of the sulphur.

The TOWN CLERK explained that, under the original Act, the gas supplied by the Company was not to contain more than 4 grains of ammonia, or more than 20 grains of sulphur in any form, in 100 cubic feet. Later the condition with regard to sulphur was removed by the Sulphur Restrictions Act; so that, though the Council might search for sulphur, there was no remedy when they found it.

Mr. BLACK said there was something more important behind this question than simply a new burner to give greater illuminating power. It was quite clear that there were adulterations in the gas that were dangerous to health; and, if by combining with other authorities, they could compel the gas companies in the new Bill to supply a purer gas than they did at present, they were in duty bound to unite with others to safeguard the health and interests of the people of Cambridge.

The report, with the amendment proposed by Mr. Purvis, was adopted.

**New Joint Stock Companies.**—Frame Light, Limited, has been registered with a capital of £1500, in £1 shares, to carry on the business of merchants, manufacturers, and dealers in incandescent gas and other species or systems of artificial lighting and heating, with all appurtenances and accessories, &c. The Merlin Gas and Engineering Company, Limited, has been registered with a capital of £1000, in £1 shares, to carry on business as gas engineers, founders, &c.

**Heacham Water Supply.**—An inquiry directed by the Local Government Board was held in the Town Hall, King's Lynn, last Wednesday, by Mr. F. J. Willis, one of the Board's Inspectors, respecting an application made by the Urban District Council of Hunstanton for a Provisional Order, under the Public Health Act, 1875, to partially alter, or amend, the New Hunstanton Water and Gas Act, 1897, so as (1) to repeal the words "and every such agreement shall be by virtue of this Act determinable by the District Council on one month's notice in writing" contained in section 19 of the Local Act; and (2) to empower the Urban and Rural District Councils of Docking to enter into and carry into effect an agreement or agreements for providing a supply of water in bulk or otherwise for the parish of Heacham. Negotiations had been in progress for some time; and at a recent conference between the two Councils, at which a representative of the Local Government Board was present, it was agreed to take steps to eliminate the power of determining any agreement at a month's or longer notice. There was no opposition to the application.

**Gas Accounts of the Pontefract Corporation.**—Arising out of the recent discrepancies in the Gas Department of the Pontefract Corporation, mentioned in the "JOURNAL" for the 28th ult. (p. 903)—in connection with which the accounting clerk, George Hepworth, was remanded on bail on Monday last week for another fortnight—a Special Sub-Committee, appointed to inquire into the system of book-keeping at the gas-works, and into other matters relating thereto, presented their report to the Corporation last Wednesday. They report that a proper system of gas-works accounts does not exist; that the Manager is not entirely free from responsibility in the matter, particularly with regard to the undue detention at the gas-works of the receipts from slot-meters; and that the Borough Accountants have allowed, and have apparently been satisfied with, the present unsatisfactory system of accounts, and with an improper method of dealing with the receipts at the gas-works, and have neglected to exercise the requisite care and supervision in regard to transactions which belong to their department. The Committee recommend that an expert accountant should be called in to establish an efficient system of accounts; that a gas expert be requested to report upon the condition of the plant, the method of working, the cost of gas production, and generally on all other matters relating to the conduct of the works; and that a monthly report be presented to the Gas Committee by the Manager, showing all the important facts of the month's working. The whole of the proposals have been referred to a Committee of the entire Council.

## MISCELLANEOUS NEWS.

### PRESTATYN GAS TRANSFER ARBITRATION.

#### The Sum Awarded.

Sir Hugh Owen, the Arbitrator in this matter, has made his award. He fixes at £14,170 the price to be paid by the Prestatyn District Council to Lady M'Laren for the local gas undertaking; and, as arranged during the proceedings, as reported in the "JOURNAL" for the 21st ult. (p. 826), they will bear the costs of the arbitration.

### BUENOS AYRES AND ITS GAS SUPPLY.

#### The Amalgamation of the Companies.

Meetings of the Shareholders of the Buenos Ayres (New), the River Plate, and the Primitiva Gas Companies were held last Thursday for the purpose of confirming the resolutions, providing for the amalgamation of the three concerns, as duly passed at the meetings on the 21st ult., and published in the succeeding issue of the "JOURNAL." The whole scheme was then set out.

At the confirmatory meeting of the Buenos Ayres (New) Gas Company, Mr. J. C. im Thurn presided. The Solicitor merely read the resolutions; and, on the proposition of the Chairman, seconded by Mr. Ross Piment, they were confirmed.

The River Plate Gas Company's meeting was presided over by Mr. Albert E. Bowen. The four resolutions which were passed at the previous meeting were taken as read; and, on the motion of the Chairman, seconded by Mr. Campbell P. Ogilvie, they were straightaway confirmed.

Presiding over the meeting of the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Mr. H. E. Jones pointed out that the business to be transacted was purely formal; and he took it that those present had satisfied themselves, by looking into the various documents, as to the advisability of agreeing to the resolutions which were passed at the preliminary meeting. He would therefore not waste their time by making a speech, but would at once move the confirmation of the various resolutions, which had been read by the Secretary. He then put the four resolutions separately—the adoption of each one being seconded by Mr. C. H. Sanford—and they were all confirmed without comment.

### GAS SUPPLY OF GENEVA.

#### Working in 1908.

According to the report of the Municipal Council of Geneva for the year 1908, in which is recorded the progress of the gas undertaking, under the management of M. Des Gouttes, the quantity of gas produced in the twelve months was 11,022,780 cubic metres, about 389 million cubic feet, or 2.672 per cent. more than in the preceding year. The quantity consumed and unaccounted for, however, was 11,026,430 cubic metres (nearly 389½ million cubic feet), or 2.742 per cent. in advance of 1907. The following table shows how the gas was disposed of:—

	Cubic Metres.	Per Cent.
Consumed by meter . . . . .	9,267,810	84.05
Fixed burners, for stair and yard lighting . . . . .	437,447	3.97
Public lamps . . . . .	800,862	7.26
Works and offices, &c. . . . .	112,493	1.02
Unaccounted for (3.7 per cent. of the consumption, against 5.3 per cent. in 1907) . . . . .	407,818	3.70
Total . . . . .	11,026,430	100.00

The quantities of coal and water gas were 9.80 and 1.22 million cubic metres respectively; the proportion of water gas in the mixture being 11.06 per cent. The bulk of coal carbonized was 32,585,540 kilos., or 32,585½ metric tons; and it cost, delivered on the works, about 35 frs. per ton, or nearly 3 frs. more than in 1907. In addition to the ordinary coal, some of which came from the Wearmouth Colliery, *via* Marseilles, 60 tons of cannel were used. For making water gas, 540,075 kilos. of oil and 700,090 kilos. of large coke were employed; the oil coming from Galicia. In the naphthalene washer, which has been in operation since July, 1905, 42,840 kilos. of anthracene oil were used; and the report states that deposits of naphthalene in the mains continue to decrease. The production of residuals was as follows: Coke, 23,573,030 kilos.; tar, 1,776,902 kilos.; concentrated ammoniacal liquor, 258,500 kilos. The coke employed for heating the retorts was 18.08 per cent. of the coal carbonized; the production of tar was 5.45 per cent.; and the liquor contained an average of 22 per cent. of ammonia.

The total number of consumers on Dec. 31, 1908, was 26,748 by meter (26,643 of them taking less than 106,000 cubic feet of gas in the year) and 1303 by fixed burners—together 28,051, as compared with 26,996, or 3.91 per cent. more than at the end of 1907. The number of meters on hire was 26,437; but the total number fixed was 27,467, representing 188,806 burners. They were divided as follows: Wet, 18,887; duplex, 6618; dry, 1955; prepayment, 7. The number of cooking-stoves sold in 1908 was 1891, compared with 1671 and 1640 in the two preceding years. Since 1899, there have been 13,901 stoves placed; but since 1886, when the Municipality introduced the system of free fixing, the number sold has been 35,800. The quantity of gas consumed for motive power is not large; there having been only 14 gas-engines at work during 1908, and one of these was taken off by the close of the year. The number of public lamps in use at the end of 1908 was 2763—an increase of 69. They are nearly all fitted with incandescent



burners, for which 18,297 mantles and 4043 chimneys were used ; being an average of 6.62 mantles and 1.46 chimneys per lamp. The total length of mains at the end of 1908 was 227,084 metres, or 141 miles.

The sale of gas to private consumers produced 2,113,106 frs. (£84,524) ; and to the Municipality, for public lighting, 115,600 frs. (£4624)—being increases of 99,200 frs. (£3968) and 2170 frs. (£87) respectively. The 115,600 frs. includes a sum of 48,100 frs. (£1924) paid for the maintenance of the incandescent lamps and burners. Coke brought in 456,151 frs. (£18,246) ; tar, 52,302 frs. (£2092) ; ammoniacal liquor, 50,575 frs. (£2023). The expenses of working and administration came to 1,857,551 frs. (£74,302) ; and the revenue other than that derived from the sale of gas, to 636,709 frs. (£25,468) ; leaving the net expenses 1,220,842 frs. (£48,834), being 11.62 c. per cubic metre, or not quite 2s. 7d. per 1000 cubic feet, of gas sold.

ELECTRIC LIGHTING IN DUBLIN.

Increase in Charge to Cover Losses.

At the Meeting of the Dublin Corporation on Monday last week, the Standing Orders were suspended to allow of the discussion of the report of the Electric Lighting Committee, already noticed (*ante*, p. 53), in reference to the proposed increase in the charge for current.

The Chairman of the Electric Lighting Committee (Mr. Lennon), in moving the adoption of the report, said that, in the opinion of the Committee, it was absolutely necessary to increase the price of electricity if the undertaking was to pay. The Committee could do no more than they had done. Mr. W. M'Carthy, in seconding the motion, said that, as a member of the Committee, he had up to the present always voted against any proposed increase. He had gone very carefully into the matter, however, and had come to the conclusion that it was absolutely impossible that they could go on increasing their indebtedness in this department of the Corporation. It was urgently necessary to put a small increase on the rates. Alderman Bergin said he had opposed a similar report last year in the hope that it was only a temporary increase ; but as he found it had not been met by an increase of business, he felt compelled to vote for the recommendations in the report. He thought it would be well that it should be made clear to the public that the increased rate of 10 per cent. would be only for a temporary period—say, for twelve months. Mr. Ireland said the present was the third time this matter had been before the Council ; and he had opposed it on business lines from the very outset. There was no reason why the electric light undertaking should not pay at the existing charges and be a success, if it was properly managed. In the report, not a word was said about working with economy and the better management of the concern. It simply said that they could not go on as they were going, and that 10 per cent. should be added to the charges. The speaker cited, as an instance of laxity in management, the fact that bills to the amount of £2500 were outstanding. Seeing that the price of gas was coming down from 3s. 7d. to 3s. 4d., and that there was an improvement in its illuminating power, he asked how they could expect to get additional consumers of electric current at increased rates. The way to make any concern pay was to see that it was worked with economy ; and this, he submitted, had not been done in the present case. Alderman Farrell said he was in favour of the report, on condition that the management of the undertaking would be investigated. Alderman Birney moved, as an amendment, that the report be referred to a Committee of the Whole House. Alderman Kelly, in seconding, said there were serious statements in regard to the management of the concern ; and it should be the work of the Council to investigate the management of the undertaking rather than mulct the consumers. Mr. Sherlock expressed the hope that the amendment would be rejected. He said the ratepayers should not be asked to put their hands into their pockets to give light for nothing to

the comparatively few who used it. The matter should be dealt with in a business-like way. On a division, the amendment was rejected ; and the original motion, amended as suggested by Alderman Bergin, was carried by a large majority.

PROFIT-SHARING IN THE DARTFORD GAS COMPANY.

An addition has lately been made to the list of profit-sharing gas companies by the adoption of the system by the Dartford Gas Company. The circular announcing the decision of the Directors (a copy of which has just reached us) is dated October last ; but in order to give the scheme a good send-off, they determined to date the bonus from the preceding January. Consequently, on the 31st ult. a whole year's bonus was credited to each man willing to enter into the necessary agreement. This binds the Company to provide work for twelve months ; and the employee undertakes to obey orders. But there is a proviso to enable any man who has an opportunity of improving his position to leave on a week's notice, with the consent of the Manager, which will be given if the man can be spared without injury to the Company. Every regular man at the start may have an agreement ; but afterwards those who are indifferent or careless about their work, or show no interest in the Company, will not have their agreements renewed until they do better. The Directors make it clear that if no improvement is shown within a definite period (warranting the granting of an agreement again) dismissal must result, in fairness to the Company and to those employees who are doing their best in its interests. They also point out that their offer is made to encourage thrift ; the bonus being entirely additional to the ordinary salaries and rates of wages, and not in lieu of any benefits, legal or otherwise, to which the officials and men are entitled. It is calculated on the salaries and wages, exclusive of overtime. If the price of gas is at or above 3s. per 1000 cubic feet, there will be no bonus ; but for each penny reduction below 3s. the employees will get 1 per cent. The desire of the Directors is that all the officers and workmen should become shareholders in the Company ; and so they have decided to pay the annual bonus in shares, at all events for the first few years. Should the scheme not succeed in its objects, the Directors reserve to themselves the power to terminate it on giving not less than six months' notice, to expire at the end of any year.

CO-PARTNERSHIP SCHEMES IN THE GAS INDUSTRY.

Through the co-operation of the Labour Co-Partnership Association, "Co-Partnership"—a publication to which we have referred on several occasions—are able to give in their current issue the following particulars in regard to co-partnership schemes adopted by Gas Companies. The figures relate to the year ended the 30th of June last, which are the latest available.

Our contemporary says : "The figures show the successful application of co-partnership, and prove that nearly 20,000 workers are receiving substantial and tangible benefits from the operation of the various schemes. The actual addition to wages ranges between 3 and 7½ per cent. This phase of industrialism is beyond the experimental stage. It has an experience of two decades behind it, and a capital of more than 40 millions sterling to give it value in the world of commerce. No wonder, therefore, is it that many other companies and corporations are studying the co-partnership system ; regarding it as a means of linking the interests that, otherwise diverse, find common ground in the recognition of Labour as well as the rewarding of Capital." We may add that, in addition to the Companies mentioned in the table, those at Dartford, Enfield, Ilford, and Weston-super-Mare have now adopted co-partnership.

Name of Company.	No. of Years Scheme has been in Operation.	Capital in 1909 Total Share and Loan.	No. of Em-ployees under Agreement of Profit Sharing and Co-Partnership.	Amount Divided among Em-ployees for year ending June, 1909.	Amount per Cent. on Wages.	Total Profit to Employees since Scheme adopted.	Amount of Shares and Deposits held by Employees in the Company, Approx. market value, June 30, 1909.	May Em-ployees be on the Board of Directors	No. of Employees' Representatives on Board.
		£		£		£	£		
South Metropolitan . . . . .	Twenty	8,325,340	5138	37,123	7½	464,347	375,000	Yes	2 Workmen's 1 Officers'
Commercial . . . . .	Since 1901	2,528,280	1221	5,417	5	40,089	43,920	No	None
South Suburban . . . . .	" 1894	831,363	582	3,034	6	33,452	34,637	Yes	Two
Newport . . . . .	" 1900	318,380	156	384	3.41	3,180	3,607	No	None
Chester . . . . .	Eight	242,190	66	297	5	1,916	1,610	No	None
Leamington . . . . .	Year-and-a-Half	79,790	116	413	5	625	670	No	None
Rugby . . . . .	..	..	..	..	..	..	..	..	..
Walker and Wallsend . . . . .	One	272,918	99	360	4	360	423	No	None
Wrexham . . . . .	"	109,290	61	{ Dec. 31, '08 } 256	6	256	None as yet	No	None
Tunbridge Wells . . . . .	{ Since June 30, '08 }	174,000	130	425	4	425	550	No	None
Tottenham . . . . .	..	723,410	601	2,300	4½	6,272	{ Shares 7914 } { Deposits 4356 }	No	None
Croydon . . . . .	{ Since Dec. 13, '08 }	690,612	478	1,245	3	1,245	..	No	None
Gloucester . . . . .	One	228,000	113	361	5	361	..	..	..
Bournemouth . . . . .	"	651,259	390	1,609	{ Sliding scale, } { depending on } { price of gas }	1,609	1,609	No	None
Wellingborough . . . . .	"	90,853	59	242	5	242	242	No	None
Gaslight and Coke . . . . .	{ Since Jan. 1, '09 }	27,452,193	8439	38,683	5	38,683	None	No	None
Grantham . . . . .	{ No figures till after }	..	March next	..	..	..	..	..	..
Cardiff . . . . .	{ Since June last }	645,085	185	655	4	655	Nil	No	None
Watford . . . . .	{ Since July 1, '09 }	165,532	106	Nil	..	..	..	No	None
Total . . . . .	..	43,528,495	17,940	92,804	4.85 average	593,717	474,538	..	..



## GAS SUPPLY IN THE PAST YEAR.

The current number of the "Engineer" contains their customary reviews on various departments of engineering for the past year. The following are extracts from the remarks on the progress of gas supply.

The past year has witnessed no startling development in the use of gas, but a slightly improved efficiency has been secured in burners for lighting and in appliances for heating purposes. As a result of the continuous improvement in the duty obtainable from unit volume of gas through apparatus both for lighting and heating, the consumption of gas has not increased to any considerable extent. There has again occurred, as in the last two or three years, a falling off in the amount of gas supplied per consumer; but loss consequent thereon has again been more than counterbalanced by the gain in the number of consumers. The three Companies supplying Urban London together sold almost exactly the same quantity of gas in the twelve months ended June 30 last as in the preceding twelve months. The Suburban London Companies, however, experienced appreciable increases in their sales of gas, as did also Provincial gas undertakings in districts where growth of population occurred. If we extend our review to a longer period than a single year, returns show that in the decade 1898-1908 the amount of gas sold per annum throughout the United Kingdom increased by 36.6 per cent.

Gas has more than maintained its position for street lighting, thanks to the more general employment of inverted burners, and to the increasing use of gas at high pressure. High-pressure gas-mains have been laid in central parts of London and other large cities, primarily for the supply of gas to high-power lamps for public lighting, but incidentally also for similar lamps in adjacent works and factories. . . . The local authorities in certain suburban districts of London have made comparative trials in street-lamps with inverted burners consuming gas at ordinary pressure and metallic filament electric lamps; and the result has been that, on the score of economy and efficiency, the gas-burners have been preferred, and have been very extensively employed. Gas undertakings have therefore every reason to be satisfied with the progress which has been made in increasing the employment of gas for public lighting during the past year.

The interest in methods of manufacture has centred chiefly in the description of retort or oven used for the carbonization of coal. Inclined retorts set at nearly as may be at the angle of repose of broken coal, which have been very popular in many works for some ten or fifteen years past, are no longer regarded with favour. On the other hand, the horizontal retort, which they were intended to supersede, has regained to some extent its popularity—which, indeed, in many quarters it never lost—by reason of improvements in machinery for charging and discharging it, and of the quite modern procedure of as nearly as possible filling it with coal, instead of, as formerly, leaving a large free space above the charge of coal. The larger charges thus introduced into the horizontal type of retort afford an increased make of gas per retort per diem and per ton of coal carbonized; while stoppages of the ascension-pipes and hydraulic mains by thick deposits are of rarer occurrence. While, therefore, considerable improvement in the efficiency of the old type of carbonizing plant has been achieved in the past year or two, strenuous efforts have at the same time been directed to the perfecting of entirely different and novel systems of carbonization. Various forms of vertical retorts, some charged intermittently and others working on a more or less continuous system of charging and discharging, have been tried in a number of gas-works both here and abroad. Comparatively large chambers or ovens, somewhat resembling the modern forms of oven for the production of metallurgical coke, have also been tentatively adopted in various gas-works. Some of these carbonizing ovens have inclined and others horizontal bottoms; but, broadly, they are distinguished from horizontal and vertical retorts in being of much greater capacity, and in requiring at least double the time for working off this larger charge. At the moment, it is impossible to predict which of the many rival systems of carbonization in vertical retorts and in chamber ovens will ultimately prove the most successful. It can only be said that at best some of them have shown rather better results than are generally obtained from horizontal retorts; but proof is still wanting that the new retorts and ovens are as durable and economical as the old ones. In any case, a chief feature of the modern retort-house is the extensive plant for the mechanical handling of the large quantities of coal and coke which are dealt with therein. In constructional work, the most noteworthy feature of the year is the great number of large gasholders, some of novel design, which have been, or will shortly be, completed.

There has been little change in the price obtainable for gas coke since last year; but a number of gas undertakings have stimulated sales by putting up quantities of 28 lbs. of broken coke in brown paper bags for disposal locally at a low price. Thus the poorer classes are now able to buy from most of the London gas-works a package of  $\frac{1}{2}$  cwt. of coke for 3d. Several other varieties of semi-carbonized coal have been put on the market to compete with coalite, which, however, does not appear to have yet been produced on the extensive scale which was foreshadowed by those interested in its manufacture. But a certain amount has been made at one gas-works in the course of the year, and several gas-works have produced and sold very similar smokeless fuel without adopting the coalite plant. The selling price of sulphate of ammonia remains much the same as at the close of 1908; but the amount of that salt coming on the market from other sources than gas-works has considerably increased during the year. Tar and tar products, generally speaking, are now fetching somewhat better prices than a year ago. The use of tar as a binding material and surface covering for macadamized roads has greatly extended, and coal tar and coal-tar pitch have also been employed on an increasing scale in the manufacture of patent fuel. The production of tar in carburetted water-gas plant has not increased, as the amount of carburetted water gas made on gas-works in the United Kingdom remains about the same as in recent years—viz., about one-eighth of the volume of coal gas produced. As a result, however, of the general reduction in candle power of the gas supplied, less oil has been used for carburetting than formerly, and consequently the output of water-gas tar has become smaller.

## THE FATAL FIRE AT CLAPHAM JUNCTION.

## Incandescent Electric Lamp Causes the Fire.

The inquiry into the circumstances attending the fatal fire which occurred on the premises of Messrs. Arding and Hobbs, at Clapham Junction, on the 20th ult., was concluded by Mr. John Troutbeck last Tuesday, without any further reference to a suggestion made on the previous occasion that the disaster might have been the result of an explosion of gas.

Among the representatives of the various interests concerned who were in attendance was Mr. L. W. J. Pasmore for the South Metropolitan Gas Company.

On the resumption of the proceedings, the first witness to give evidence bearing on the cause of the fire was *Florence Philbrook*, an assistant, who was at the window where the outbreak occurred, waiting for the assistant window dresser to hand her a necklace taken from the window. She said he was reaching into the window when she heard him call out "Oh!" and then she saw flames on the top of the wadding lining the window. She did not hear an explosion, but a sound like wind escaping from a punctured tyre. Subsequently witness described the noise as "a small pop and a fuse." She was emphatic that the assistant did not knock anything down in the window that could have fallen against a globe, nor did he touch a globe with his arm.

Mr. *Ernest Cooper*, a partner in the firm of Messrs. Holmes and Cooper, electrical engineers and contractors, described in detail the fixing-up of the electric installation in the window for the Christmas decorations. He said the Phoenix Fire Office rules were not adhered to in this case, as the installation was only of a temporary character.

The CORONER: What are the points you have to consider, in work of this kind, in regard to the proper installation of electric light?

Witness: Of course, we have our own rules by which we are going continually. We follow the rules of the Institution of Electrical Engineers—that is, the rules so far as the carrying capacity of the wires goes.

Are you aware of any set of rules governing temporary installations?—No, Sir.

In the course of further evidence, witness said that Tantalum lamps were used, arranged in series of two, with a voltage of 120. He believed the fire was caused by the breaking of a lamp, either through atmospheric pressure or a knock. He thought the window dresser's coat might have caught on a lamp when he reached into the window, or something sharp in his pocket might have come against a lamp and broken it. The possible result of breaking a lamp would be to short-circuit the leads in the lamp itself, and thus put the whole voltage on the other lamp with which it was in series. The effect would be to blow out the internal part of that lamp, causing the globe to break.

The CORONER: How would that lead to fire?

Witness: By the filament dropping down.

Have you experienced that yourself?—No, Sir.

Do you know what happens when a globe breaks, the light being on, in a metallic filament lamp?—I could not speak from experience.

Do you think a metallic filament could drop with sufficient heat to set fire to the cotton wool underneath?—I believe it was so.

In the course of further evidence, witness stated that he had not previously believed it was possible for a metallic filament to keep its temperature for so long a time, nor did he think the temperature of the lamp itself was so great. He warned the window dresser not to put anything near the lamps, as the heat was great enough to warm things up to a dangerous extent if they ever came in contact with the lamps. Though he had heard of these lamps breaking simply from atmospheric pressure, he did not consider them an unsuitable form of lighting for the window in question, as he thought he had arranged them far enough away from the cotton wool to avoid danger.

Mr. *Sidney George Russell*, Consulting Engineer, of Lombard Street, E.C., said he was specially retained by the Phoenix Assurance Company as their Electric Adviser. The Company insured the greater part of Messrs. Arding and Hobbs' risk; but they were not consulted about this temporary work, as permission had been given to the firm to add to their electric lighting at Christmas without notice. Previously, however, he had always been requested to inspect the Christmas arrangements; and he believed it was by an oversight that he was not asked to do so on the present occasion. One of the Phoenix rules was that flexible cord conductors not provided with an efficient flame-proof covering must not be used in windows containing inflammable goods; and this rule was apparently not observed in the case under investigation. He was of opinion that the fire was caused by the bursting of an electric globe. A globe might burst simply through outward atmospheric pressure; and he had known a good many instances of this. It must be regarded as a thing quite possible. Then the filament itself might break, through short-circuiting, and sag against the globe, breaking it. Since the disaster, witness had made experiments with Tantalum lamps, with the following results: (1) A lamp was suspended one or two inches above a pile of dried cotton wool, and the lamp broken with a hammer. Explosion occurred, and the wool instantly set alight in a mass. (2) A lamp was hung 3 inches over wool slightly damp. The lamp was broken, and the same explosion followed; but in this case the wool, not being so dry, was only badly scorched. (3) A lamp was suspended a few inches over slightly damp cotton wool placed loosely below it, and a celluloid telephone mouthpiece was laid on the wool directly below the lamp. When the lamp was broken, the whole lot immediately fired. It was a well-known fact that these globes would explode; and in coal mines and gunpowder factories their use was regulated by Act of Parliament.

Asked by the CORONER if he did not make experiments to show the distance the filament might fall and ignite cotton wool, witness replied that he confined his experiments to a distance of about 3 inches; but he thought if the filament had fallen 9 inches the cotton wool would not have fired twice out of three times.

The CORONER: Do you think the metallic filament would retain the heat longer than the old carbon?

Witness: I do not know that I can fairly say that; but I think it would be almost as long.



In the course of further evidence, witness said he considered the practice of putting these lamps near such material as cotton wool so dangerous that he had often advised the Phoenix Company to give up the insurance rather than take the risk. The practice was one generally pursued in London. Witness added that the electricity installation in the window had been properly carried out, and, in his opinion, the fire was caused by the accidental bursting of the lamp.

The CORONER, in summing up, said it had now been proved that the employment of these electric lamps in connection with certain inflammable material was extremely dangerous; and if in future a fire occurred through their use, the firm responsible would be placed in a very serious position in the event of a fatality. The fact that, as they were told, there were many other business places lighted in this way, and running similar risks, made it most important that firms should take serious warning from the lessons of this fire.

The jury returned a verdict to the effect that the fire was caused by the breaking of an electric incandescent lamp in one of the windows of the premises; and in doing so they fully endorsed the Coroner's remarks as to the great danger of this style of window dressing.

## THE CASE OF GAS POISONING IN BELFAST.

### The Corporation and the Supply of Gas-Stoves.

It may be remembered that at the inquest on Mr. John Leeburn, who, as reported last week (p. 58), was found dead in his office in Belfast as the result of poisoning by carbon monoxide—the room containing a gas-stove from which the fumes were not properly conveyed away—the jury, at the suggestion of the Coroner, recommended that in future the Corporation should not supply any gas-stoves without seeing that there was in every case a proper flue or means of ventilation. The matter was referred to at the meeting of the Corporation on the 3rd inst., when Mr. J. A. Doran, in moving the adoption of the minutes of the Gas Committee, expressed their sincere regret at the fatality. He said that, as there had been some imputation cast upon the officials of the gas-works, it was his duty to state the facts. When the late Mr. Leeburn was ordering the stove used in his office, they told him that they would put in a flue; but he said he would put in one of his own. This was eighteen months ago; and, unfortunately for himself, Mr. Leeburn did not put in the flue. Lest the Committee might be blamed for any similar accident in future, they had determined never to allow anyone to get a stove until a flue was provided. Mr. Henry Johnston said he was surprised that the Committee had decided to refuse stoves unless they were allowed to put in flues. Hitherto any man going for a stove could get it, and he could put in the flue independently of the Gas Department. The gas officials had had no connection with the defectively arranged stove in Mr. Leeburn's office. Mr. Doran replied that it would be recognized by the Gas Department as their duty to see that flues were provided in future.

## OXFORD CORPORATION WATER SUPPLY.

### Local Government Board Inquiry.

At the Oxford Town Hall last Wednesday, Mr. A. G. Drury, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry in connection with an application made by the Corporation for sanction to the acquisition of certain land and the construction of works for the purposes of their water undertaking. The powers sought for were to alter and enlarge the service reservoir and the road of access at Forest Hill; the pumping-station, engine, and machinery erected by the Corporation at the reservoir, authorized by the Oxford (Corporation) Water-Works Act, 1875; a conduit or main pipe commencing in St. Clement's, and terminating at Forest Hill; and another commencing at the service reservoir at Forest Hill, and terminating at Headington Quarry. Authority for the expenditure of money on the works was also applied for. Among those present were the Parliamentary Agent for the Corporation (Mr. John Kennedy), the City Solicitor (Dr. H. F. Galpin), the Mayor (Mr. J. E. Salter), the City Engineer (Mr. W. H. White), and the City Accountant (Mr. W. S. Carver).

Mr. KENNEDY, on opening the inquiry, said he assumed the Inspector had had an opportunity of informing himself as to the nature of the application. It was in pursuance of a request of the Local Government Board, contained in a letter received by the Town Clerk from the department. In this letter, after dealing with the previous correspondence in relation to the water undertaking of the Corporation, the Board pointed out that the Corporation Act of 1885 did not enable the Board to sanction further loans in connection with the undertaking; and they suggested that the Corporation should apply for further powers to enable the Board to sanction certain water-works which had been constructed in the interest of the district and the consumers.

Mr. White was then called, and said the area of water supply for which the city was responsible was wider than the city of Oxford, and included the parish of Headington, of which there was a Rural District Council. When the district of Headington developed, the city was approached by the Council; and it was found they were under an obligation to keep the supply at constant pressure. Having ascertained that in this area there was no land at a sufficient height to give the pressure required, they looked elsewhere, and found a site outside Headington, but in the area of the District Council. Having acquired the land, a reservoir was constructed of a capacity of 100,000 gallons. It was a covered reservoir of brick and concrete, with steel girders carrying the roof; and it was placed in electrical communication with the other reservoir in Oxford. The cost altogether, apart from the land, was £1400. A sum of £750 was paid for the land. The cost of the pumping-station was £870. The district was one which was developing rapidly, and the population, which was mainly of the working class, had doubled the last few years. The work was carried out in

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the winter of 1902-3. The Corporation were at first unwilling to do the work. The average daily pumping in 1903 was 12,000 gallons, and it had now risen to 48,000 gallons. The figure for the rising main was £2130, and for the return main £320. The total for the various items was £5470; and this was the capital expenditure the Local Government Board were invited to sanction.

Mr. Carver produced the water-works capital account. He said the money in question was expended in 1908-9. They would accept any reasonable period for repayment of the loan, but would, of course, like as long as possible, as the works were permanent. As to the sum they had already borrowed, perhaps the Board would allow them to antedate their sinking fund to the date when they actually borrowed.

The INSPECTOR: You wish the sanction of borrowing to be retrospective; the period to run from 1908?

Mr. KENNEDY pointed out that in recent years the period allowed by Parliament for land was 50 years, and for reservoirs and embankments 45 years.

Mr. Carver said the population of the city, according to the census of 1901, was 49,336; it was now estimated to be 51,946, from the Medical Officer's returns. The assessable value was £406,000. The total net debt, excluding education, was £396,096. The general district rate was 3s. 9d. in the pound; the poor rate was, on the average, 10d. for the year—making a total of 4s. 7d.

Dr. GALPIN, on behalf of the Town Clerk, who was unavoidably absent, thanked the Board for their assistance, and the Inspector for his courtesy.

The inquiry then closed.

### TAR AND TAR PRODUCTS LAST YEAR.

From an article on "The Bye-Products Market in 1909," in the "Iron and Coal Trades Review" for the 31st ult., we take the following particulars in regard to tar and tar products.

The production of tar has expanded of late years, owing to the introduction of the recovery oven, and demand has hardly kept pace. Thus during the last ten years a heavy depreciation in values has had to be faced by producers. At the beginning of the year, prices were no better than 12s.; remaining at this level until the end of March, when, in response to the advance of pitch, values stiffened, and rose steadily to 18s. in July and to 19s. in August, when pitch was quoted at 31s. During the last quarter, however, pitch has dropped back to 27s., and tar closes the year at from 17s. to 18s. A new outlet has been found for the surplus in preparing dustless roads; and this promises to exercise an important bearing on future values, as protracted experiments have proved the superiority of dehydrated tar over all other substances for this purpose.

Pitch opened the year at 18s. 6d., London, advancing steadily to 30s. in August, and closes at 28s., with a good demand and encouraging prospects for 1910. Exports during the year have been less than in

1908; the decline approaching 47,000 tons. The principal constituent of coke-oven tar, the position of pitch bears prominently on tar values, is accepted in many instances as the principal medium or determining factor in adjusting sliding-scale contracts. Hence the desirability of ascertaining the position and prospects of this article when closing tar contracts.

Creosote oil has been in steady demand throughout the year; fluctuating but slightly in price, and closing at from 2½d. to 2¾d., London—practically the same price at which January fixtures were negotiated. The volume of trade has been fully equal to 1908, and the New Year opens with promise of a successful period.

Benzols have not been altogether a satisfactory feature (the supply having constantly been in excess), and remunerative prices have been the exception rather than the rule. German makers have produced less than half the capacity of their plants, and keen competition has been experienced in France by English makers; 50-90's have remained generally higher than 90's, and pure has been exceptionally difficult to sell. Comparisons in January and December are as follows: 90's, 6½d., 6¾d.; 50-90's, 7½d., 7¾d.; pure, 8d., 8d., all casks included—prices being nominal, and sellers generally experiencing difficulty in closing fixtures near quoted prices. The key to the situation appears to be the adoption of benzol as a motor spirit; but so far little progress has been made—one attempt during the year to exploit the use being attended by failure. However, it is stated that other trade interests are about to put on the market a quality used extensively in Germany; and it is hoped that more success will attend their efforts.

Toluol has been scarce, and in good demand throughout the year, closing quite 1d. better than the price at which earlier fixtures were arranged.

Naphthas, crude, solvent, and heavy, have been steady and profitable features during the year, fluctuating but little, and generally closing at higher prices than those ruling in the first quarter. Judging by the contracts recently fixed, prices are likely to be maintained for some time.

Carbolics have been very unsatisfactory, and prices compare unfavourably with those ruling during 1908. Exports have declined, and the home trade has been poor; cresylic having experienced, on the other hand, a good demand at better prices.

Anthracene has been dull and difficult to sell; exports being reduced approximately 40 per cent.

Naphthalene has been in better demand, and prospects for 1910 are encouraging.

Generally, from the distillers' point of view, the New Year opens with some encouraging features, which it is hoped may become established facts as the season advances.

**Liverpool Water-Works Rating Appeal.**—The judgment in this case (see *ante*, p. 49) was to have been delivered last Wednesday at the Preston Quarter Sessions; but the Chairman announced that it had been deferred till the 24th prox.

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## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I suppose that the item of information of most interest with which I have to deal this week is the disposal by Lord Mackenzie of the action brought by Mr. W. Ewing against the Corporation of Greenock. We all greatly regret, for Mr. Ewing's sake, that he has been unsuccessful. Lord Mackenzie has found that all the circumstances were adverse to Mr. Ewing's claims. He indeed goes further, and finds that, out of Mr. Ewing's own mouth and from his pen, it was evident he served at Greenock all along under the belief that he was Engineer as well as Manager. Besides the facts in his own case, Mr. Ewing had to overcome the presumption against him, arising from the decision, in quite recent times, of two somewhat similar cases—that of the representatives of Mr. Cooper, Burgh Engineer, against the Corporation of Edinburgh, and of Mr. Mackison, Burgh Surveyor, against the Corporation of Dundee. Both these cases were decided adversely to the claimants. The truth is that postponed claims are the most difficult of all to establish. The fact that they are postponed is evidence that the claimant has no great belief in the strength of his position. Were he convinced of the rectitude of his cause, there would be no reason for delay in letting his expectation be known, but, on the contrary, every reason, in his own interest, and likewise in the interest of justice to the other side, that he should not delay. It will be observed that Lord Mackenzie disposes of the case upon the facts. There is scarcely any law in his decision. This circumstance will make it more difficult for Mr. Ewing to obtain a reversal of it, supposing he should attempt to do so. Courts of appeal are chary of disturbing decisions which rest upon fact, for the reason that the judge of the first instance has the advantage of hearing the evidence and seeing the witnesses, and, consequently, is in a better position to judge of many things which cannot be reproduced so tellingly in the printed documents which are laid before the appellate tribunal. Mr. Ewing's chances of success, therefore, in going further are not hopeful. In the Edinburgh case, the Corporation, after gaining, voluntarily offered a substantial sum, which was accepted. This might be the better way in this case. There is no doubt that, whatever the legal position, Mr. Ewing did extra work, or that, at all events, he did work which in the case of an ordinary Corporation dealing with a manager with whose services they were satisfied, would have entitled him to some pecuniary recognition. Mr. Ewing's relations with the Corporation were of a strained nature; and this fact, coupled with our knowledge of the treatment by them in later years of Mr. S. Stewart, rather emphasizes the improbability of the Corporation agreeing to offer anything to Mr. Ewing. There are, however, two channels through which the Corporation might be successfully approached in such a matter. The one is that they might be induced to offer a sum by way of compromise; and the other is that someone might be found who would be willing to act as mediator between them, and get the Corporation after having obtained judicial certification that

their cause was a just one, to assume the more amiable spirit of generosity.

The two subjects, which are in effect twins, of high-pressure gas distribution and incandescent gas lighting, were before the Western District of the Scottish Junior Gas Association to-night. Both subjects were introduced by gentlemen who are in the inner circle of the experts, and, consequently, the information they were able to lay before the members was of a very high order. To students of gas-supply problems the papers will be very valuable, as they deal with the matters which at the present moment are exercising, more than any others, the minds of gas engineers. The Association were fortunate in obtaining two such authors.

This forenoon there was a somewhat unfortunate explosion of gas in Glasgow. The School Board of the city maintain a Truant School at Shettleston, in which there are over 120 boys. In the morning it was discovered that a gas-bracket in the store-room attached to the Shoemaking Department was broken, and as there was an escape of gas, the supply was at once cut off. No danger was apprehended, and the boys employed in the shoemaking department, and in the tailoring department adjoining, were allowed to continue at work. An hour later one of the lads had occasion to enter the store-room. There are no windows in the apartment, and he carried a light. As soon as he opened the door there was a loud explosion. A glass partition which separated the two workshops was thrown down, and in its fall it unfortunately injured a number of the boys. In all, about twenty of the boys were either cut or burned. Two of them were so seriously injured that they were sent to the Royal Infirmary for treatment; the others being treated in the school.

In the Inverkeithing Town Council last night, Mr. Paterson moved that a Committee be appointed to consider the advisability of introducing electricity in the burgh. There could be no doubt, he said, that electricity would be in great demand in the district shortly, and the Town Council ought to safeguard themselves with regard to any company that might come in to oppose them. He contended that electricity, whether generated locally or purchased in bulk, could be supplied at half the cost which was being charged for gas at the present time. From information he had obtained, electric light could be supplied at 3d. per unit, or equal to about 3s. per 1000 cubic feet for gas. Mr. Scott, who moved the previous question, thought that, seeing the whole matter of lighting was looming very much ahead, they might delay the matter meantime. Only Mr. Paterson and his seconder supported the motion, which was accordingly lost.

Owing to the failure of the switch mechanism at the Corporation Electricity Station in Leith last night, half of the consumers in the burgh were deprived of light for about a quarter-of-an-hour. The arc lights in the streets went out; and most of the thoroughfares were in darkness. The mishap occurred about half-past eight, when a large political meeting in the Assembly Rooms was being addressed by Mr. Munro Ferguson, the former Member of Parliament for the burgh; and the proceedings were stopped until a lamp and candles were procured. Mishaps with electric lighting are reported from Dumfries.

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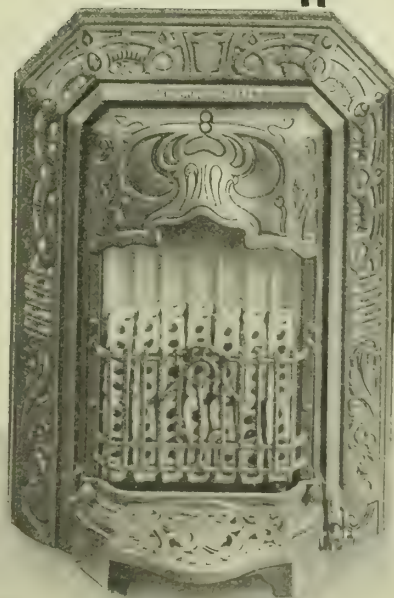
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## CURRENT SALES OF GAS PRODUCTS.

## Sulphate of Ammonia.

LIVERPOOL, Jan. 8.

The tone of the market has been buoyant the whole week, and all output continues to be eagerly sought after as it becomes ready for delivery. Not only are requirements to cover old contracts apparently still unsatisfied, but the firmness has been accentuated by new orders making their appearance. The result is that prices have again advanced somewhat; and the closing figures are £11 7s. 6d. to £11 8s. 9d. per ton f.o.b. Hull, £11 10s. to £11 11s. 3d. per ton f.o.b. Liverpool, and £11 11s. 3d. to £11 12s. 6d. per ton f.o.b. Leith. The forward position seems to have been rather neglected of late; interest being mainly centred in near delivery. £11 12s. 6d. per ton f.o.b. the best ports is still given as the quotation for January-June; but, so far, this price is not reported to have been paid.

## Nitrate of Soda.

This market is still without any new feature, and values are just quietly maintained at 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality, on spot.

## Tar Products.

LONDON, Jan. 10.

The market for coal tar pitch has been firm throughout the past week. Although prices have not actually advanced, they have been well maintained at previous levels, and buyers seem to be thinking more seriously of accepting offers put forward by makers. Creosote is quiet but steady; and it is believed that an improvement in this article will take place after the heavy winter make has been disposed of. For prompt delivery, 90 per cent. benzol is still very firm; while for forward, makers are asking better prices. Benzol, 50-90 per cent., is very firm indeed, owing to the demand for toluol, which is exceedingly scarce in the North and in good demand. Solvent naphtha is steady, although no advance has taken place in price. Heavy naphtha is quiet. Crude carbolic is weak, and Continental consumers decline to purchase at present except at very low figures. Naphthalene is dull; but creosote salts are in good demand.

The average values during the week were: Tar, 14s. 3d. to 18s. 3d., ex works. Pitch, London, 29s. 6d. to 30s.; east coast, 28s. 6d. to 29s.; west coast, 29s. to 30s. f.a.s., 28s. 6d. f.o.b. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11½d.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 10½d.; west coast, 10½d. Refined

naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit packages included and delivered.

## Sulphate of Ammonia.

This article remains firm, although the buying has not been quite so heavy as last week. Beckton prompt is £11 8s. 9d., and for January-June £11 12s. 6d. For outside makes London, £11 3s. 9d. to £11 5s. is asked; and in Hull the price is £11 6s. 3d. In Leith, the majority of makers seem fairly well sold for the prompt position; and for January-June, they are asking £11 12s. 6d. In Liverpool, £11 7s. 6d. to £11 8s. 9d. is quoted.

## COAL TRADE REPORTS.

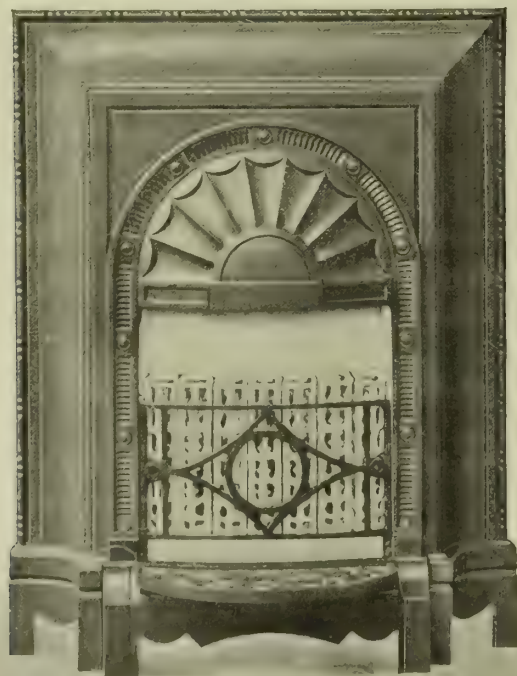
## Northern Coal Trade.

Both in Durham and Northumberland there has been friction between employers and employed as to the working of the Eight Hour Act, and the production has been very much reduced in consequence in both counties—a number of important collieries having been idle several days. Naturally, this has made sellers unable to do business and where sales were possible, prices have varied so greatly that it is very difficult to give any quotations. Both in the steam coal trade and in that of gas coal, the prices are more according to the needs of the buyer than to any standard. In the Northumbrian coal trade, there is some sign of a settlement, which would speedily change prices; but at present there is a wide variation. Best steams may be quoted perhaps at 13s. 6d. to 14s. 6d. per ton f.o.b.; but the rates will vary quickly. The gas coal trade of Durham is much affected, and many of the chief collieries have been laid idle for some days, so that the shipments on contract have been interfered with a good deal. Prospects are better at the time of writing; but a few days will be needed to see how far they will be realized. Until this is decided, there is not much disposition to quote prices, which for gas coal are not likely to move like those of steam coal. The former kind are much more sold on contract; and the chief result of the difficulty is the stoppage of shipments for the time being to a large extent. Gas coke is firm, with quotations varying from 13s. to 13s. 6d. per ton f.o.b.

## Scotch Coal Trade.

There was no market last week, and consequently quotations cannot be given. The shipments are reported to have amounted to 300,191 tons—a decrease of 18,636 tons upon the preceding week, but an increase of 120,388 tons upon the corresponding week of last year.

Another Gas Poisoning Case in Belfast.—Alderman John Rooney, a member of the Belfast Corporation, was found unconscious in his house last Friday night as the result of gas poisoning; and he died on removal to the hospital. The deceased gentleman had earlier in the day attended a meeting of the Council.



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**Mr. Masterman, M.P., and the West Ham Amalgamation.**

Speaking recently at a dinner hour meeting of gas workers, Mr. C. F. G. Masterman, the member for West Ham, said he had come there specially to give the employees of the West Ham Gas Company an opportunity of putting to him any question they liked with regard to the amalgamation of that Company with the Gaslight and Coke Company. The Government had nothing to do with the amalgamation. They could not stop it. All they could do was to obtain the best possible terms for the men. They had secured an undertaking that the works at Stratford should be kept open for ten years; and if the combined Company did not do this, the men should let him know, and then they could enforce their legal rights. Replying to a question as to why he had not voted against the amalgamation of the two Companies, Mr. Masterman said the Bill was sent to a Select Committee which consisted of one member from each section of the House; and when this Committee voted in favour of the Bill, no members of the Government could vote against it, though they could vote for it. He was not prepared to vote for the Bill; and, as a member of the Government, he could not vote against it. But had he been a private member, he should certainly have done so.

**Water Supplies to Hotel by Meter.**—The Torquay Town Council had under consideration on Tuesday last the question of enforcing a new scale of charges for water, under which hotels will be supplied by meter. A petition against the proposed change in the method of charging had been presented by the hotel proprietors; and, in view of their hostility to the new system, the Town Clerk sought Counsel's opinion as to whether the Council were acting within their legal rights, and what course of procedure should be adopted to enforce the charges. Mr. Macmorran, K.C., to whom the matter was submitted, advised the Corporation to bring an action against the hotel proprietors, and expressed the opinion that there was no practical danger of their failing to obtain a decision on the main issues in such action. The Water Committee recommend that it be left to the Town Clerk to take action as advised; and the recommendation was adopted.

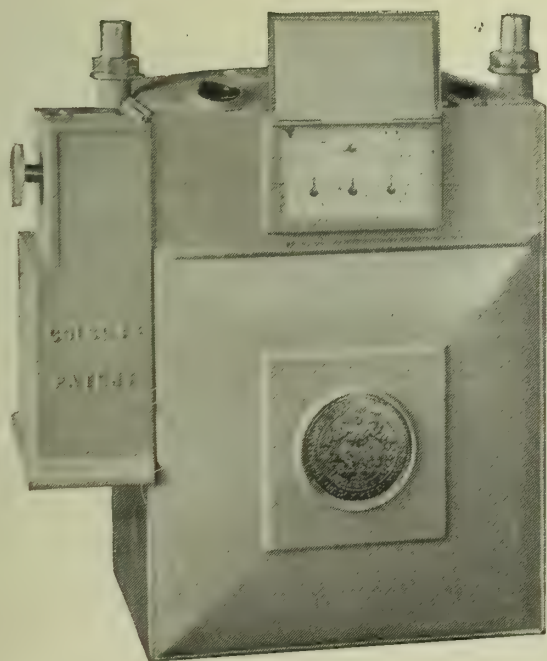
**Public Lighting of Bideford.**—In a report made to the last meeting of the Bideford Town Council, the Lighting Inspector complained that no reliance could be placed upon the lighting of certain lamps to which automatic controllers had been fixed. A letter was read from Mr. W. D. Joce, the Secretary to the Gas Company, in reference to complaints of the irregular lighting of the lamps, in which he stated that the extinguishing of them was almost entirely due to stormy weather. Mr. W. A. Cox thought the explanation unsatisfactory, as there had been no gales such as would account for the irregular lighting of the lamps. The Council decided to refer the question of the renewal of the gas contract to a Committee of the whole Council, and directed that in the meantime a letter should be sent to the Gas Company stating that the reply received from Mr. Joce did not meet the complaint, and requesting that the automatic controllers put in as an experiment should be removed forthwith.

**Exmouth District Council and the Gas Company.**—It was stated at a meeting of the Exmouth District Council last Wednesday that the Finance Committee had had under consideration a report by the Surveyor on the Bill which the Exmouth Gas Company are promoting next session, and saw no reason why the Council should oppose it. Mr. Daw thought they ought to have a clause inserted giving the Council power to purchase the Company's undertaking; and he moved that steps be taken to obtain this. The motion was carried.

**Suicide by Coal Gas.**—A verdict of "Suicide during temporary insanity" was recorded at an inquest held at the Wandsworth Town Hall a few days ago, by Mr. John Troutbeck, on the body of Joseph Hubert Leonard, aged 54, a newsagent, lately carrying on business in Putney Bridge Road. The wife of the deceased said her husband, from whom she was separated, had been drinking for three days, and had frequently threatened to commit suicide. A constable deposed that Leonard had placed a gas-ring upon a saucepan on the copper, covered his head with an overcoat, and inhaled the gas. Dr. John Trist, who was called in, said an autopsy revealed all the characteristics of poisoning by coal gas, which was the cause of death.

**Quality of Eastbourne Gas.**—At the meeting of the Eastbourne Town Council on the 3rd inst., the Town Clerk reported on the subject of an interview he had had with Mr. Arthur Valon, and the terms on which the latter was prepared to report upon the gas tests and the accounts of the Gas Company. The Borough Surveyor submitted the results of his tests as regards the calorific value of the gas. It was resolved to inform the Gas Company of the decreased and varying calorific value of the gas supplied; but the question of retaining Mr. Valon was deferred. The Borough Surveyor reported that the average illuminating power of the gas for November was 15.06 candles; the highest being 15.67 and the lowest 14.82 candles. The standard fixed by the Company's Act was 14 candles.

**Exmouth Water Bill.**—A special meeting of the Exmouth Town Council was held last Thursday evening, at which the resolution in favour of promoting a Bill for extending the Council's power in relation to the water supply was confirmed by a majority of 12 to 5. This was followed by a public meeting of owners and ratepayers of the town. Mr. W. C. Creedy, the Chairman of the District Council, presided over a large gathering. He said it had been proved that sufficient water was to be obtained from the well at Dotton, and that the quality was very good. The entire expense would not be more than £18,000. A resolution in support of the Bill was moved by Mr. R. Ley. Rev. O. J. Reichel, on behalf of the opposition, proposed to move a resolution against the Bill, on the ground that the scheme would unduly raise the rates. The Chairman, however, ruled that this was equivalent to a direct negative of the motion. After a long and animated, and occasionally noisy, discussion, a vote was taken on the resolution by show of hands. The Chairman declared the resolution carried, and a poll was demanded. On a poll last year, a majority of the votes given was against the scheme.



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### The Cow-Poisoning Case at Charing.

It will doubtless be remembered that a few weeks ago the Judge at the Ashford County Court was engaged for two days hearing a summons taken out by Messrs. G. Ellen and Sons, farmers, of Charing, against the Kent County Council, for £26 16s. 6d. as compensation for the loss of a cow which they alleged had been poisoned by tar from a main road under the control of the Council washing into a stream from which the plaintiffs' cows drank. The case aroused considerable interest, as it was believed to be the first of the kind which had arisen in the United Kingdom. At the close of the evidence on the second day of the hearing (Nov. 29 last), his Honour reserved his decision. This he gave yesterday in favour of the plaintiffs, with costs. The proceedings in the summons were reported in the last volume of the "JOURNAL" (pp. 414, 685); and the judgment will be given next week.

**Suicide by Gas in Dundee.**—In the early morning of Wednesday last, James Arnott, 29 years of age, a shoemaker, residing in Strathmartine Road, Dundee, committed suicide by inhaling gas. He was found by his brother lying on the bed. A gas-jet had been placed on a bench in front of the bed, and the unfortunate man had turned the gas full on, and had then pulled a waterproof coat over the jet and over his head.

**London County Council Expenditure.**—The annual report of the proceedings of the London County Council for the year ended March 31 last has just been issued. The volume contains detailed reports by the various Committees of the Council, an abstract of accounts, and a summary of the provisions of Acts affecting London or the work of the Council passed by Parliament in the session of 1908. The total expenditure of the Council during the year under every head of service on both income and capital accounts was £14,507,000; this amount including loans to other bodies. The net debt of London secured upon the rates on March 31, 1908, was £109,931,239, which was equal to more than two-and-a-half times the rateable value; and on March 31, 1909, it was £49,938,631 (comprising £40,105,573 in respect of remunerative services and £9,746,165 in respect of rate services), and £86,893 in respect of the Works Department.

**Price of Gas to Prepayment Consumers in Manchester.**—At the meeting of the Manchester City Council last Wednesday, an old controversy was revived by Mr. Jennison asking the Council to say that the time had arrived "when, in the interests of common justice to the poorest of our ratepayers, the price of gas to users of penny-in-the-slot meters should be the same as to users of quarterly meters." Mr. Jennison had given notice of a motion to this effect; but, acceding to the request of the Chairman of the Gas Committee (Alderman Gibson) the Council agreed to deal with the matter in conjunction with the minutes of the Committee. Alderman Gibson gave several reasons why, in his judgment and that of his colleagues, the Council ought not to accept Mr. Jennison's proposal. It cost, he said, 3½d. or 4d. more per 1000 cubic feet of gas to collect in the case of slot-meters than in that of ordinary meters. There were 60,000 of the former class in use in Manchester, and no complaint had been received from any consumer. If the Council would relieve the Committee of the obligation to contribute £50,000 a year in aid of the rates, the Committee would willingly endeavour to reduce the price of gas all round; but to single out the slot-meter users for preferential treatment they felt was utterly beyond their power. The motion was defeated.

**Universal Gas Methane and "Buisson Hella" Company.**—A circular has, says the "Financial Times," just been issued by Messrs. Robertson Lawson and Georges Lemarquais, Joint Liquidators of the Universal Gas Methane and "Buisson Hella" Company, stating that the scheme of arrangement for the purchase of the assets in exchange for shares in the Société Industrielle du Gas Methane, which was approved at meetings of the preference and ordinary shareholders last November, has now been sanctioned by the Court of Chancery. The Court has also fixed the period within which the creditors—whose claims must be settled before those of the shareholders—must come in and prove their debts, failing which they will be excluded from participation. The final date named is Jan. 31. The circular continues as follows: "As soon as all questions with creditors have been settled, we will notify by circulars and advertisements in the newspapers the date on which the exchange of shares will take place. This will be effected in the City of London, at the Liquidators' offices, and will be as follows: Each holder of ten preference shares will receive two Participating Shares, Series A, and one Participating Share, Series B. Each holder of ten ordinary shares will receive one Participating Share, Series A, and two Participating Shares, Series B."

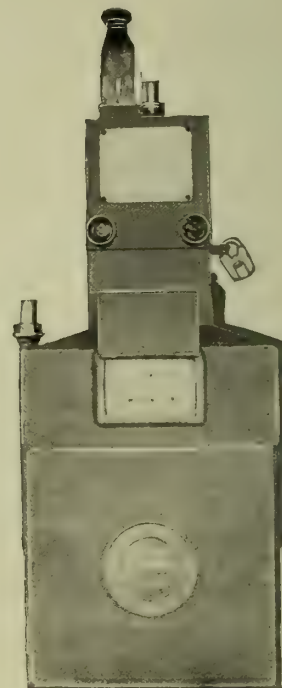
**Lighting of Nottingham Market by "Selas" Lamps.**—After a test of some weeks' duration, it has been decided to discard the present sixteen 1000-candle power arc lamps now used in Nottingham Market, and replace them by sixteen 3000-candle power high-pressure "Selas" gas-lamps. According to the "Trader," it is hoped to have the work completed and the lamps lighted about the end of the present month. It is estimated the saving in cost of current and maintenance will be £250 per year, with a candle power three times greater than that of the lamps hitherto used. A 60,000-candle power compressor is being fixed in the shambles, and will work in duplicate with that of the market; so that in case either one of the electric motors fails the other one will be equal to the demand for the 670 stalls lights as well as the 16 high-power gas-lamps. Alterations are being made in the shambles for the convenience of the compressors and lamps. No doubt a great number of people will wonder, says our contemporary, how the 670 lamps and over 3000 feet of piping can be moved in and out once and sometimes twice a week. This, however, is made very simple by a number of ingenious joints that have been invented by Mr. Docking, by which means the piping and lamps can be fixed by six men in five hours, and taken in and stored in three hours. The breakage of mantles does not exceed 8 per cent. per week, owing to the fact that the "Selas" mantles are specially made to stand excessive vibration. The whole of the market under the new system will, it is safe to assert, have a very striking appearance.

# ALWAYS FIRST

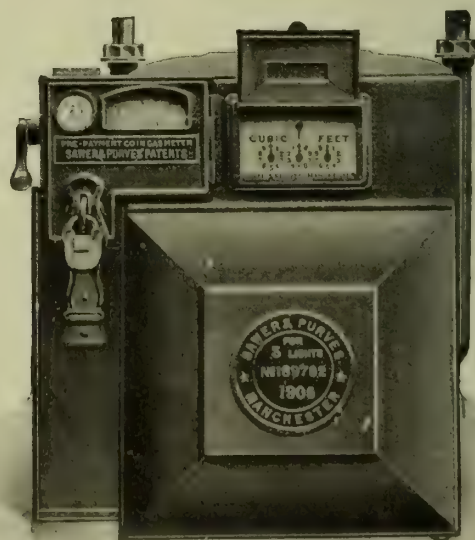
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**The Extensions at the Rochdale Gas-Works.**—At last week's meeting of the Rochdale Town Council, the extensions recommended by the Gas and Electricity Committee, already referred to in the "JOURNAL" (ante, p. 59), were approved.

**The Gas Explosion at Lydney Park.**—In the last number of the "JOURNAL" (p. 58), reference was made to a serious gas explosion which took place on the 30th ult. at Lydney Park, the residence of Mr. C. Bathurst, the Unionist Candidate for South Wiltshire. One of the maids, named Annie Pearce, was so badly injured by the explosion that late last Friday night she succumbed to her injuries.

Messrs. Chancellor and Sons, of Richmond (Surrey), will be offering by auction on the 25th inst., at the Greyhound Hotel, Richmond, by order of executors, £1958 of consolidated ordinary stock of the Richmond Gas Company, paying 5½ per cent.; also £360 of 5 per cent. debenture stock. The Richmond gas stock has always been held in great favour; and consequently it seldom comes into the market.

In connection with the amalgamation of the West Ham Gas Company with the Gaslight and Coke Company, a "farewell" dinner of members of the staff of the former Company has been held at the Falstaff Hotel, Eastcheap—Mr. A. G. Snelgrove, the Secretary, in the chair. In proposing the toast of "The West Ham Gas Company," the Chairman said he had received the following letter from Mr. J. L. Godlee, the Chairman of the Company: "The passing away of the West Ham Gas Company brings with it some regrets; but it leaves with me a long series of very pleasant memories. I trust that you and all the staff will also carry away pleasant recollections of the old Company, the old works, and the old Board of Directors; and in parting with you all, I do it with a sense of deep indebtedness for good work well done by all of you, and with very hearty good wishes for your happiness and prosperity in the New Year and very many years to come." Mr. Snelgrove then proceeded to give an interesting account of his half-century's connection with the undertaking, contrasting the conditions of fifty years ago and now. The toast was responded to by Mr. G. T. Gwinn.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

ENGINEER AND MANAGER. Beccles Water and Gas Company Applications by Feb. 1.  
FOREMAN (Tar-Works). No. 5169.

### Patent Rights, &c., for Disposal.

APPARATUS FOR GASIFYING RAW COMBUSTIBLE MATERIAL. S. F. Paul and Co., Doughty Street, W.C.  
SAFETY GAS VALVE AND METER VALVE. C. B. Forbes, New York.

### Plant, &c., for Sale.

WASHER SCRUBBER. Mansfield Gas-Works.

### TENDERS FOR

#### Boiler.

BURSLEM GAS DEPARTMENT. Tenders by Jan. 20.

#### Elevator (for Purifiers).

BURSLEM GAS DEPARTMENT. Tenders by Jan. 20.

### Fire-Clay Goods, &c.

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.  
GUILDFORD GASLIGHT AND COKE COMPANY. Tenders by Jan. 28.

HEYWOOD GAS DEPARTMENT. Tenders by Jan. 18.

Retort Bench, &c. (Dismantling Old and Re-building New), Complete.

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.

### Tar

PRETORIA MUNICIPALITY. Tenders to London Agents by Jan. 20.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1910, are reminded that this can only be done during the present month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,474,200	Stk.	Oct. 14	5	Alliance & Dublin Ord.	85-87	..	5 14 11	4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
200,000	5	Oct. 28	6½	Bombay, Ltd.	5½-6	..	5 8 4	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
40,000	"	"	6½	Do. New, £4 paid.	48-49	..	5 6 8	561,000	Stk.	"	10	Liverpool United A.	223-225	..	4 8 11
50,000	1	Aug. 26	15	Bourne 10 p.c.	28½-29	..	5 3 5	718,100	"	"	7	Do. B.	166-168	..	4 3 4
311,810	1	"	7	mouth Gas B 7 p.c.	164-165	..	4 3 7	306,083	"	Dec. 29	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water 6 p.c.	154-155	..	3 16 2	75,000	5	Nov. 6	6	Malta & Mediterranean.	44-5	..	6 0 0
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	560,000	100	Oct. 1	5	Met of 5 p.c. Deb.	59-102	..	4 18 0
300,000	"	"	9½	Do. New	19-191	..	4 19 6	1,775,892	Stk.	July 29	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3½	Monte vid o. Ltd.	124-13	..	5 7 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	518,795	Stk.	Dec. 29	3½	Newc'te & G't'st'd Con	106-108	..	4 3 4
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	55,940	10	Aug. 20	7	Do. 3½ p.c. Deb.	9-9½	..	3 15 3
246,320	"	"	8	Do. A Ord. Stk.	154-157	+1	5 1 1	300,030	Stk.	Nov. 26	8	North Middl sea 7 p.c.	13-13½	..	5 3 8
460,000	2½	Oct. 14	10	British	424-432	..	4 11 11	60,000	5	Sep. 10	8	Oriental, Ltd.	137-139	..	5 15 1
100,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118-120	..	5 0 0	31,830	53	Aug. 26	13	Ottoman, Ltd.	68-68	..	6 5 6
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	60,000	50	"	13	Portsea Island A.	129-131	..	4 19 3
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	100,000	5	"	12	Do. B.	122-124	..	4 16 9
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8	114,800	50	"	10	Do. C.	102-104	+1	4 16 2
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14-14½	..	4 16 7	398,490	5	Oct. 28	7	Do. D and E.	78-78	..	4 14 11
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	796,451	5	July 29	5	Primitiva Ord.	58-58	..	4 13 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3 4	..	—	485,900	100	Dec. 1	4	Do. 5 p.c. Pref.	97-99	..	4 0 10
50,000	50	Nov. 2	6	Do. 4½ p.c. Pref.	54-54	..	6 2 6	312,650	Stk.	Oct. 14	8	Do. 4 p.c. Deb.	17-17½	..	4 11 5
100,000	Stk.	Dec. 29	4½	Do. 6 p.c. 1st Mort.	48-49	..	5 10 9	250,000	10	Sep. 29	8	River Plate Ord.	68-100	..	4 0 0
157 15½	Stk.	Aug. 12	5	Do. 4½ p.c. Deb. Stk.	80-82	..	4 10 6	62,500	10	"	6	Do. 4 p.c. Deb.	144-15	..	5 6 8
1,493,280	Stk.	Aug. 26	5½	Chester 5 p.c. Ord.	108½-110½	..	4 13 8	125,030	50	Jan. 3	5	Do. 6 p.c. Pref.	114-124	..	4 18 0
560,000	"	"	5½	Commercial 4 p.c. Stk.	109-111	..	4 15 3	135,000	Stk.	Sep. 10	10	Do. 5 p.c. Deb.	50-51	..	4 18 0
475,000	"	Dec. 29	3	Do. 3½ p.c. do.	103-105	..	3 12 3	209,98	"	"	10	Sheffield A.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Do. 3 p.c. Deb. Stk.	8-8½	+1	3 12 3	523,50	"	"	10	Do. B.	233-235	..	4 5 1
200,000	"	"	7	Continental Union, Ltd.	95-97	..	5 3 1	70,000	10	Oct. 14	10	Do. C.	233-235	..	4 5 1
492,270	Stk.	"	11	Do. 7 p.c. Pref.	137-139	..	4 1 4	6,429,895	Stk.	Aug. 12	5½	South African	124-124	..	7 16 11
55,000	"	"	4	Derby Con. Stk.	121-123	..	3 16 2	209,82	Sk	Aug. 26	8	So th Met., 4 p.c. Ord.	120-122	..	4 7 4
144,995	"	Oct. 11	5	Do. Deb. Stk.	103-105	..	5 0 0	605,000	Stk.	Aug. 12	5½	Do. 3 p.c. Deb.	82-84	..	3 11 5
386,090	10	July 14	12	East Hull 5 p.c. Ord.	98-100	+1	4 16 0	60,000	"	July 14	5	South Shields Co., Stk.	160-162	..	4 18 9
451,660	10	"	12	European, Ltd.	24½-25	..	4 16 0	117,088	"	Nov. 11	5	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
15,141,545	Stk.	Aug. 12	4½	Do. £7 los. paid.	184-19	..	4 19 9	502,310	Stk.	Nov. 11	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
2,600,000	"	"	3½	Gas 4 p.c. Ord.	103½-104½	+½	4 9 4	120,000	Stk.	Aug. 12	6½	Do. 5 p.c. Deb. Stk.	120-124	..	4 0 8
3,799,735	"	"	4	light 3½ p.c. max.	87-89	..	3 16 2	453,940	"	Dec. 29	4	Tottenham Ord.	110-112	+1	4 9 3
4,193,975	"	Dec. 29	3	and 4 p.c. Con. Pref.	103-105	..	3 12 3	149,470	"	Jan. 3	5	Tottenham A 5 p.c.	133-135	..	5 1 9
258,740	Stk.	Sep. 10	5	Coke 3 p.c. Con. Deb.	81-83	..	5 4 2	182,390	10	Dec. 29	8	and B 3½ p.c.	111-113	..	4 15 3
82,500	"	"	6½	Hastings & St. L. 3½ p.c.	94-96	+2	5 4 2	236,476	Stk.	Aug. 14	5	Edmonton 4 p.c. Deb.	98-100	..	4 0 0
70,000	10	Sep. 29	11	Do. 5 p.c.	118-120	+1	6 2 3	255,66	Stk.	Aug. 26	6½	Tuscan, Ltd.	9-9½	..	8 8 6
171,020	Stk.	Sep. 10	6½	Hongkong & China, Ltd.	174-18	..	4 0 0	79,416	"	Dec. 29	3	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,790	"	"	5	Ilford A and C	144-146	..	4 10 11					Tynemouth, 5 p.c. max.	110-112	..	4 9 3
65,500	"	Dec. 29	4	Do. B	108-110	..	3 18 5					Wands 1 B 3½ p.c.	139-141	..	4 14 0
				Do. 4 p.c. Deb.	100-102	..						worth 3 p.c. Deb. Stk.	72-74	..	4 1 1

Prices marked \* are "Ex div."



**OXIDE OF IRON.****O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

**WINKELMANN'S****"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old  
Broad Street, London, E.C. "Volcanism, London."

**LUX'S GAS PURIFYING MASS.**

See Advertisement on p. 123.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**BROTHERTON & CO., LIMITED.**

Offices: City Chambers, LEEDS.  
Correspondence invited.

**KRAMERS AND AARTS WATER-GAS PLANT.**

K. &amp; A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

**GAS TAR wanted.**

BROTHERTON AND CO., LTD., Tar Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.

**METER INDICES**

WITH AND WITHOUT DIALS.

**A. ROUX & CO., Limited,**

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND  
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
WORKS, HANDSWORTH, BIRMINGHAM.

**BRISTOL RECORDING GAUGES AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.

"V.S.C." PAINT FOR GAS-  
WORKS PLANT.

**JOHN E. WILLIAMS AND CO.,**

LOWER MOSS LANE,  
MANCHESTER, S.W.

Telegrams: "ENAMEL." National Telephone 1759.

**SULPHURIC ACID.****SPECIALLY prepared for Sulphate of AMMONIA Makers by**

CHANCE AND HUNT, LIMITED,

WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

**AMMONIACAL Liquor wanted.**

BROTHERTON AND CO., LTD., Ammonia Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
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CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.  
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**HYDRATED OXIDE OF IRON.****PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**J. & J. BRADDOCK** (Branch of Meters  
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54 & 47, Westminster Bridge Road, LONDON, S.E.  
WET AND DRY GAS-METERS, PREPAYMENT  
METERS, STATION METERS, AND GOVERNORS.  
REPAIRS RECEIVE PROMPT ATTENTION.  
Telephones: 815 Oldham, and 2412 Hop, London.  
Telegrams:—  
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**OXIDE OF IRON (BOG ORE).**

ANY QUANTITY. ANY PORT. ANY STATION.

**DONALD M'INTOSH,**

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**BENZOL  
AND****CARBURINE FOR GAS ENRICHING.**

ALSO

**THE MAXIM PATENT CARBURETTOR.**

For Prices, &amp;c., apply to

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LONDON, E.C.

Telegraphic Address: "Carburine, London."

**W. EDGAR, Blenheim Works,**

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GAS APPARATUS MANUFACTURER  
AND CONTRACTOR.

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**GAS PLANT for Sale—We can always**

offer NEW and SECOND-HAND GAS AP-  
PARATUS, including Retorts and Fittings, Condensers,  
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,  
Tanks, Valves, Connections, &c. Also a few COM-  
PLETE WORKS. Compare Prices and Particulars  
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,  
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**SULPHATE OF AMMONIA**

SATURATORS and all LEAD and TIMBER

WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-  
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with CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.

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Telephone: Central Manchester, 7002.

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Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,  
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.

**GEO. NEWTON, Limited,**

Wires: "AUTOMATIC, MANCHESTER."

40 YEARS' REPUTATION.

WET, DRY, ORDINARY and PREPAYMENT,  
STATION METERS, &c.

Late of Oldham—Note new Address:—

39, RIVER STREET, HULME, MANCHESTER.

**SULPHURIC ACID for Sale, specially**

suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers,  
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-  
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**OXIDE OF IRON.**

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

**BALE & CHURCH,**

5, CROOKED LANE, LONDON, E.C.

**SULPHURIC ACID.**

**SPECIALLY prepared for the Manu-  
facture of SULPHATE OF AMMONIA.**

SPENCER CHAPMAN &amp; MESSEL, LTD.

with which is amalgamated WM. PEARCE &amp; SONS, LTD.

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**J. E. C. LORD, Ship Canal Tar Works,**

Weaste, Manchester. Pitch, Creosote, Benzols,  
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,  
Carbolic Acid, Sulphate of Ammonia, &c.

**"GAZINE" (Registered in England and**

Abroad). A radical Solvent and Preventative  
of Naphthalene Deposits, and for the Automatic  
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West  
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-  
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Telegrams: "DORIC," Newcastle-on-Tyne. National  
Telephone No. 2497.

**SPENCER'S PATENT HURDLE GRIDS.****THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement, Dec. 7, p. 705.

**WANTED, Regular Supplies of Sul-**

PHUR from the Claus Process.

Apply to HENRY ELLISON, LIMITED, Cleckheaton,  
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**DO** you appreciate how much success  
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Preparation of Applications, and am continually re-  
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Apply, by letter, stating Experience and Wages  
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**CAST-IRON Pipes. Spigot and Socket**

or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.

A. LOWCOCK, LIMITED, SHREWSBURY.

**GASHOLDERS—Splendid, 45 feet dia-**

meter, and New STEEL TANK fixed complete,  
to Plan and Specification. Also 50 feet Single-Lift  
and 50 feet Double-Lift. Cheap, with STEEL TANKS  
Can be seen temporarily erected.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

**FOR SALE.****THE Mansfield Corporation have for**

SALE a Laycock and Clapham's "Eclipse,"  
WASHER-SCRUBBER. Capacity, 500,000 Cubic Feet  
per Day. In good working order. May be seen at  
Work. Reason for disposal, putting in larger Plant.

For further Particulars, Apply to ARTHUR GRAHAM,  
Gas and Water Engineer, Gas-Works, Mansfield.

**BECCLES WATER AND GAS COMPANY.**

GAS ENGINEER AND MANAGER.

**THE Directors of this Company invite**

APPLICATIONS for the post of GAS ENGINEER

and MANAGER.  
Candidates must possess a competent knowledge of  
Gas Engineering, and must be Conversant with the  
Manufacture and Distribution of Gas and of Sulphate  
of Ammonia and other Products.

The Person appointed will be required to devote the  
Whole of his Time to the Duties of his Office.

The Salary will be at the rate of £190 a Year.

The make of Gas for the past year was 22,603,700

Cubic Feet.

Applications, in Writing, Stating the Candidate's Age  
and Experience, and accompanied by recent Testi-  
monials, are to be sent to the Secretary of the Com-  
pany not later than the 1st of February, 1910.

By order,

Beccles, Suffolk,  
Jan. 5, 1910.

F. S. Rix,

Secretary.



**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
and ELEVATING and CONVEYING PLANT, ROSE  
MOUNT IRON-WORKS, ELLAND.

#### BOROUGH OF HEYWOOD.

**THE Gas Committee of the Corporation**  
of Heywood are prepared to receive TENDERS  
for the Supply of RETORTS and FIRE-CLAY GOODS.  
Specification and Quantities and Form of Tender may  
be obtained upon Application to Mr. W. Whatmough,  
Gas Manager.  
Sealed Tenders, endorsed "Retorts and Fire-Clay  
Goods," to be sent to me not later than Tuesday,  
Jan. 18, 1910.

By order,  
Geo. G. BOUCHIER,  
Town Clerk.

Municipal Buildings,  
Heywood, Jan. 1, 1910.

#### MUNICIPALITY OF PRETORIA, TRANSVAAL.

##### COAL TAR FOR ROAD-MAKING PURPOSES.

**TENDERS** are invited for the Supply  
and Delivery of approximately 35,000 Gallons of  
Gas-Work COAL TAR suitable for Road-Making pur-  
poses; delivery free at Pretoria, Transvaal. No Water-  
Gas Tar, Coke-Oven Tar, or Blast-Furnace Tar will be  
accepted.

Conditions and Specification may be obtained from  
the Agents for the Municipality, Messrs. Mosenthal,  
Sons, and Co., 72, Basinghall Street, London, E.C., on  
and after Wednesday, the 12th of January.

Tenders must be sent in to the undersigned on or  
before Thursday, the 20th of January.

The Municipality do not bind themselves to accept  
the lowest or any Tender.

MOSENTHAL, SONS, AND CO.,  
London Agents.

72, Basinghall Street, London, E.C.

#### BOROUGH OF EAST RETFORD.

##### GAS UNDERTAKING.

**THE Gas Committee of the above Cor-**  
poration are open to receive TENDERS for the  
DISMANTLING and REMOVAL of an old BENCH of  
SIX SETTINGS of RETORTS, on the Direct-Fired  
System, and the REBUILDING of a Complete New  
Stack of Six Settings of Seven RETORTS, with  
SHALLOW TUBULAR REGENERATIVE TYPE of  
FURNACES.

The Contract to include the Supply and Erection of  
all the necessary Steel and Ironwork for same, including  
Retort Mouthpieces, Ascension Pipes, Hydraulic  
Mains, Girders, Buckstaves, Valves, Furnace Fittings,  
Sight Boxes, Girders and Cover Plates for Subway.

The Specification may be seen, and further Particulars  
obtained, on personal Application to the undersigned.

Tenders to be sent in not later than Feb. 3, 1910,  
addressed to the Chairman of the Gas Committee,  
endorsed "Tender for Retort Settings."

The lowest or any Tender will not necessarily be  
accepted.

J. B. FENWICK,  
Engineer and Manager.

Gas and Water Offices, Grove Street,  
Retford, Jan. 5, 1910.

#### GUILDFORD GASLIGHT AND COKE COMPANY.

##### FIRE-BRICK ARCHES, MAIN FLUE, AND CHIMNEY.

**THE Directors of the above Company**  
invite TENDERS for the Supply of all Material  
for and the Erection of Nine Arches, one Main Flue,  
and one Chimney at their Gas-Works, Onslow Street,  
Guildford.

Specification, Blue Print, and further Particulars  
can be obtained, on deposit of One Guinea (which will  
be returned upon receipt of a *bond-fide* Tender), from  
Mr. P. C. Cleasby, Gas-Works, Guildford.

Tenders, sealed and endorsed "Tender for Arches,"  
addressed to the Chairman of this Company, to be  
delivered at these offices not later than noon on Friday,  
the 28th day of January, 1910.

The Directors do not bind themselves to accept the  
lowest or any Tender.

By order,  
WM. TITLEY,  
Secretary.

Gas Offices, Onslow Street,  
Guildford, Jan. 7, 1910.

#### BURSLEM CORPORATION.

##### (GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for**  
the Supply and Erection Complete at their Long-  
port Gas-Works:—

Contract No. 11. OXIDE ELEVATOR for FOUR  
PURIFIERS.

Contract No. 12. LANCASHIRE BOILER, 8 feet  
diameter.

Plans, Specification, and General Condition may be  
inspected at the Gas Office, Longport, and Forms of  
Tender obtained from the undersigned on payment of  
One Guinea, to be returned on receipt of a *bond-fide*  
Tender.

The Committee do not bind themselves to accept the  
lowest or any Tender.

Sealed Tenders, endorsed "Oxide Elevator" or  
"Steam Boiler," as the case may be, to be sent to  
Arthur Ellis, Esq., Town Clerk, Burslem, not later than  
Ten a.m., Jan. 20, 1910.

EDWARD JONES,  
Engineer and General Manager.

Gas Offices, Burslem,  
Jan. 8, 1910.

#### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to  
notify that their SALES BY AUCTION OF NEW  
CAPITAL ISSUED UNDER PARLIAMENTARY  
POWERS, and of STOCKS and SHARES belonging to  
EXECUTORS and other PRIVATE OWNERS in LON-  
DON, SUBURBAN, and PROVINCIAL GAS and  
WATER COMPANIES, take place PERIODICALLY  
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including  
other Gas and Water Stocks and Shares in these Periodi-  
cal Sales, will be forwarded on Application to MESSRS.  
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

**THE Proprietor of the Patent No. 2245,**  
of 1906, relating to "AN IMPROVED METHOD OF,  
AND APPARATUS FOR GASIFYING RAW  
COMBUSTIBLE MATERIALS," is desirous of enter-  
ing into Arrangements, by way of LICENSE and  
otherwise, on Reasonable Terms, for the purpose of  
EXPLOITING the same and ensuring its full Develop-  
ment and Practical Working in this Country.

All Communications should be addressed in the first  
instance to S. F. PAUL and Co., 60, DOUGHTY STREET,  
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#### PATENT RIGHTS FOR SALE.

##### The Hasty Safety Gas Valve

AND THE

##### Hasty Automatic Meter Valve

caused a sensation at the New York Gas Show.

In order to increase the size of our American  
Factory, we offer FOR SALE the Patent Rights on  
these Two Contrivances in Great Britain, United King-  
dom, Australia, Australian Commonwealth, Belgium,  
France, and Germany.


Correspondence Solicited by

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New Rochelle, New York, U.S.A.

\*  **BRASS AND STEEL**  
\*  **PINION WIRE**  
any lengths.

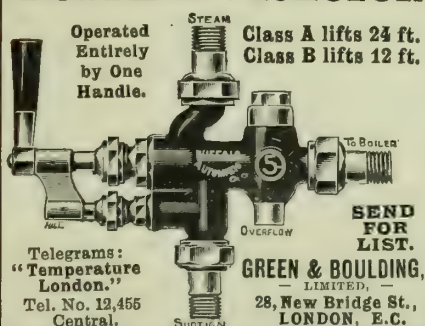
\*  **John Rigby & Sons, Ltd.**

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**CLECKHEATON.**

\*  Head Office & Works:  
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**Salford, MANCHESTER.**

Also IRON and STEEL WIRE of all descriptions.

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##### STOURBRIDGE,

Manufacturers of

#### FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED  
FOR SHIPMENT.

#### PYROPHORIC GAS LIGHTERS.

Genuine Novelty.  
Selling Splendidly.



"Presto," 7/8", as illustrated, retails complete, 1/9;  
"Pyros," for Shop Windows, 36" long, complete, 4/6.  
Refills (5000 sparks) 9/1. and 1/- each retail.

PAUL METZ (G. L. Dept.), 29, Newhall Hill, Birmingham.

#### THOMAS DUXBURY & CO.,

##### 16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illu-  
minating Power, Large Yield per ton, and  
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1806.

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Gas and Water Works Engineers,  
Inspectors, and Merchant Shippers,  
5, Laurence Pountney Hill, LONDON, E.C.

NOTE. Much expense and trouble is often saved by  
Colonial and Foreign Gas and Water Companies, and  
City Corporations, by having their requirements from  
Great Britain bought or properly inspected by practical  
men. We have a staff of experts for Buying, Shipping,  
and Inspection, of Gas Plant and Machinery of every  
description, Cast Iron Pipes, &c., and may add that our  
Engineering Branch is under the direction of Mr. John  
Coates, M.Inst.C.E., and Shipping Branch under Mr.  
Alfred J. Kingdon, both with over 20 years' experience.  
J. C. & Co.

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Manufacturers of

##### DIALS (Enamelled)

For Gas, Water, Electric, &c., Meters.

##### DIALS

For Pressure Scales in One Length up to 4 feet.

##### DIALS

For Clocks, Barometers, Thermometer  
Indicators, and for every purpose.

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#### JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,  
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS, 1 1/2 to 48 inches  
in diameter, and make and erect to order  
RETORTS, PURIFIERS, and TANKS, with  
or without planed joints, COLUMNS,  
GIRDERS, SPECIAL CASTINGS, &c., re-  
quired by Gas, Water, Railway, Telegraph,  
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.  
These are cast in one piece, without Chap-  
lets; doing away with Bolts, Nuts, and Covers,  
and rendering Leakage impossible.

#### LUX'S Gas Purifying Material

is now used in many Gas-  
Works throughout Scotland  
with gratifying success.

#### FRIEDRICH LUX Ludwigshafen-am-Rhein

Sole Agent for Scotland:

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Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.



*Testing Instruments*ALEXANDER WRIGHT & CO., LD.  
WESTMINSTER.**HEATHCOTE GAS COAL**

from the

**GRASSMOOR COLLIERIES,  
CHESTERFIELD.**

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality  
of Coke.

Maintains a High Standard in Residuals.

NOW READY.

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TWENTY-SEVENTH YEAR

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**Complete Reports**

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**GAS MANAGERS****FOR 1909.**

Most of the previous Volumes are still on Sale.

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**THOMAS TURTON****AND SONS, LIMITED,****SHEAF WORKS, SHEFFIELD,****MANUFACTURERS OF****FILES OF BEST QUALITY****FOR ENGINEERS.****STEEL OF ALL DESCRIPTIONS.**

SCREW STOCKS, TAPS AND DIES,

SPANNERS, RATCHET BRACES, LIFTING JACKS,

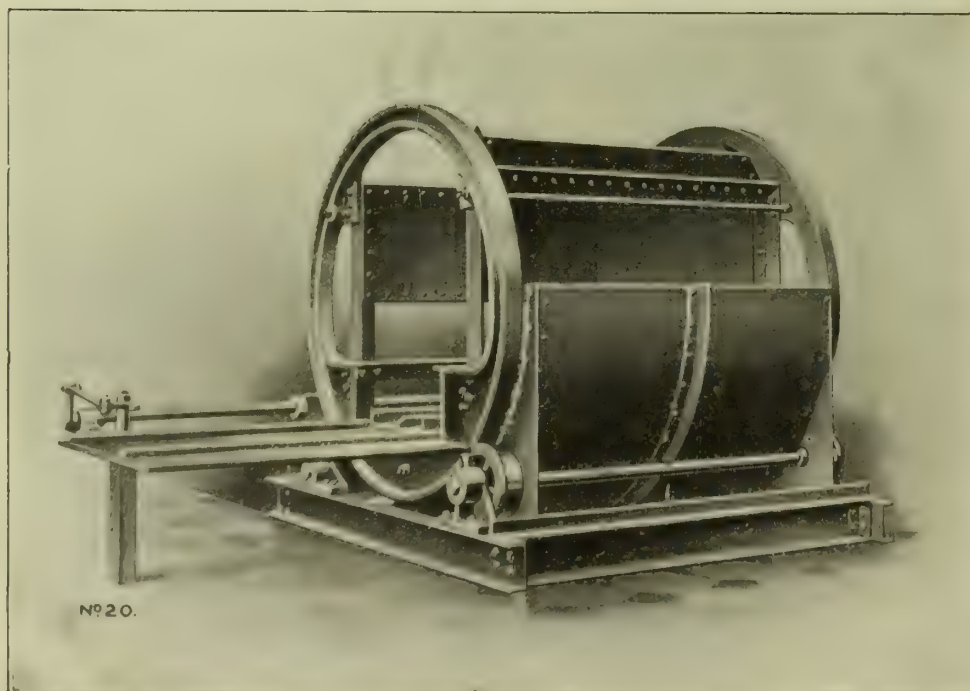
ANVILS, VICES,

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**90, CANNON STREET, E.C.****THE SILICA FIRE-BRICK COMPANY,****BOUGHTIBRIDGE.****RADIATE MORE HEAT**

BY USING

**SILCO BRICK RETORTS.****SILCO BRICKS** prevent all settling of setting.**SILICA BRICKS** for Combustion Chambers, any shape.**EDGAR ALLEN & CO., LIMITED,****MAKERS OF ELEVATING & CONVEYING MACHINERY.**

SOLE MAKERS OF

**THE MANSFIELD PATENT  
AUTOMATIC TIPPLER,**Capable of dealing with  
400 TUBS per Hour.**CRUSHING MACHINERY**

FOR

All kinds of Material a Speciality.

**Steel Structural Work.****ROOFS and BUNKERS.****ALLEN'S****AUTOMATIC****DUST-PROOF MEASURERS****STEEL CASTINGS, TOOL STEEL,**

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**IMPERIAL STEEL WORKS, SHEFFIELD.**



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## Important Improvements.



### BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

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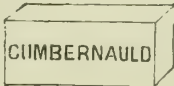
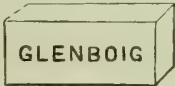
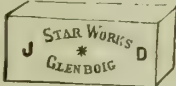
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

# THE GLENBOIG UNION FIRE-CLAY CO., LTD.

## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

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BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

Works: GLENBOIG, LANARKSHIRE.

Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

#### CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

#### PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " 1050° C.	4.76 %
" " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " 1050° C.	12.6 %
" " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. to 3362 F.

(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.



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Highest Results in Gas, &amp; Excellent Coke.

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Manufacturers of GAS RETORTS, GLASSHOUSE  
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TILES, and every description of FIRE-BRICKS.  
Special Lumps, Tiles, and Bricks for Regenerative  
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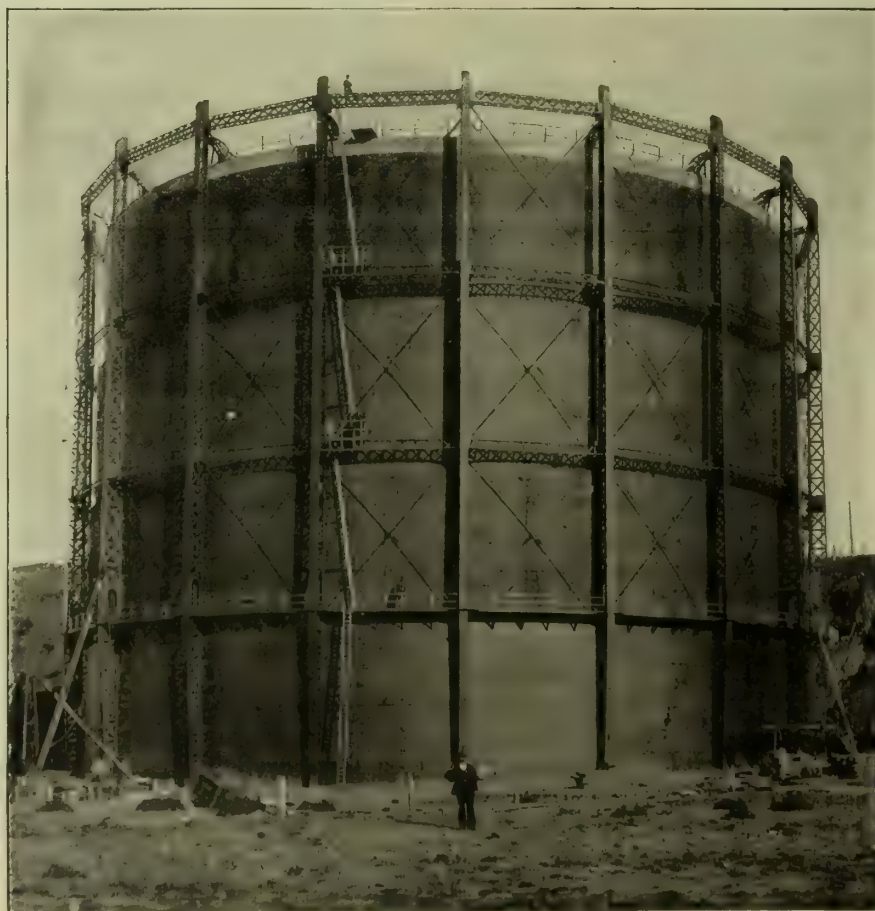
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# Welsbach

## LIGHT

### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

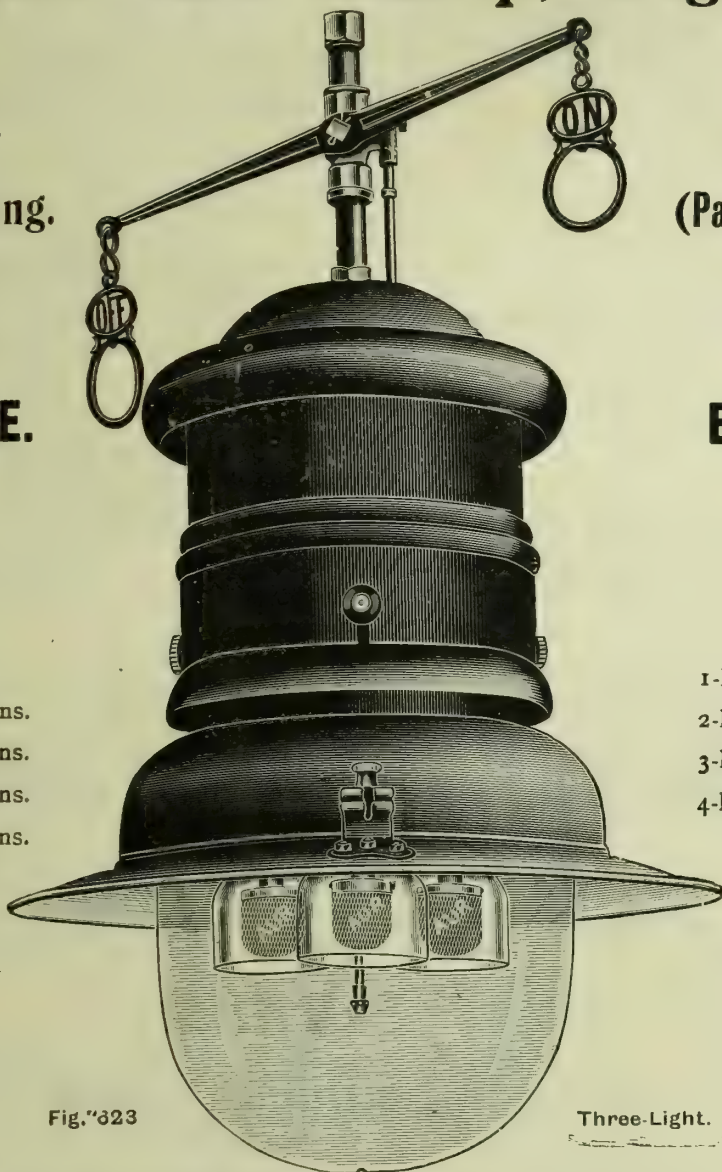


Fig. 623

Three-Light.

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

#### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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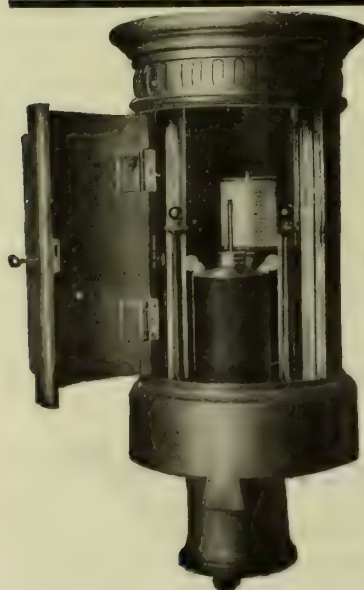
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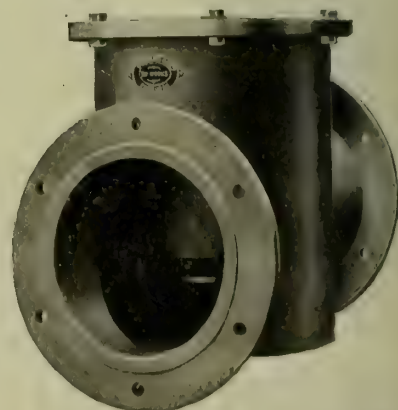
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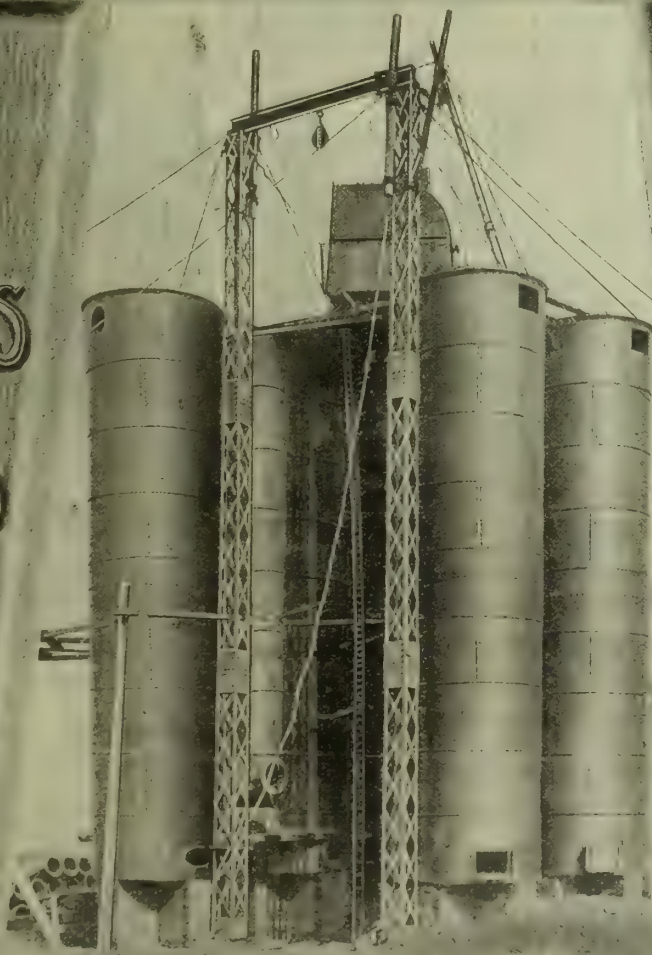
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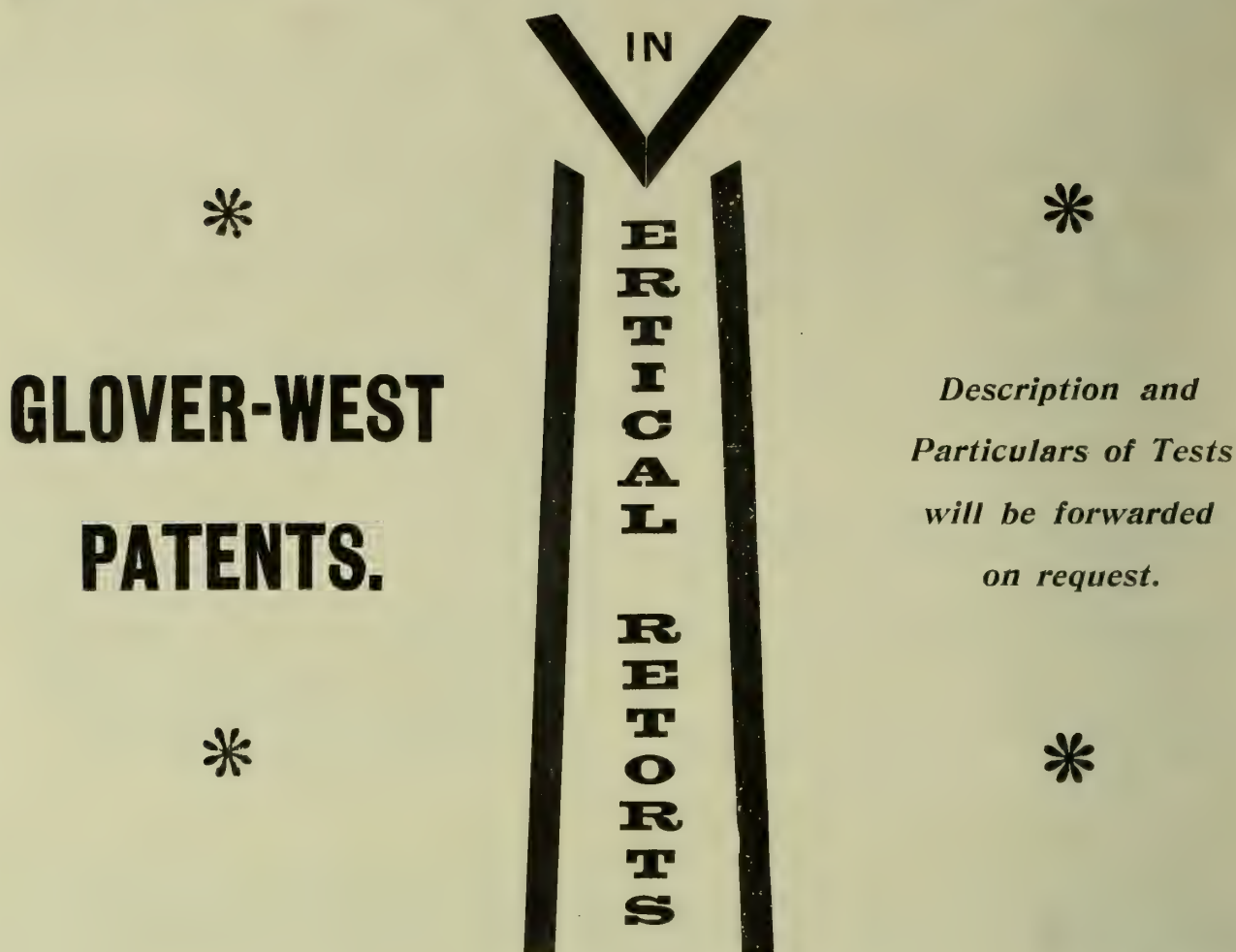


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VOL. CIX. No. 2436.]

LONDON, JANUARY 18, 1910.

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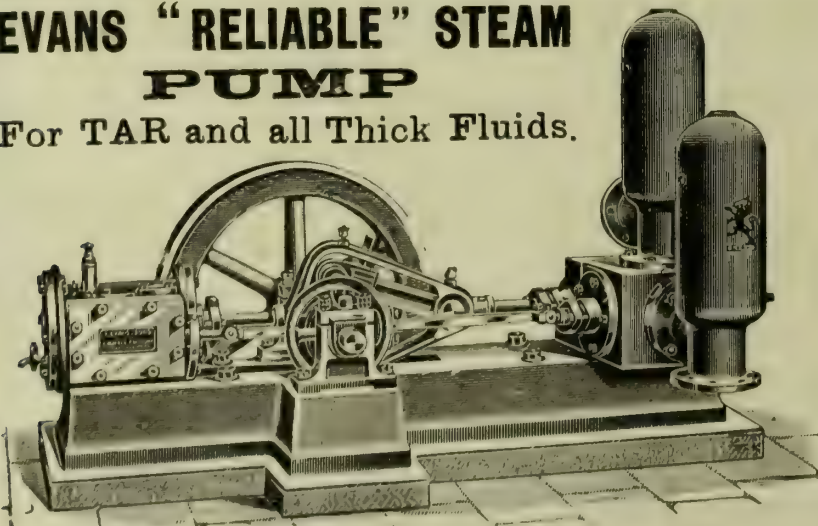
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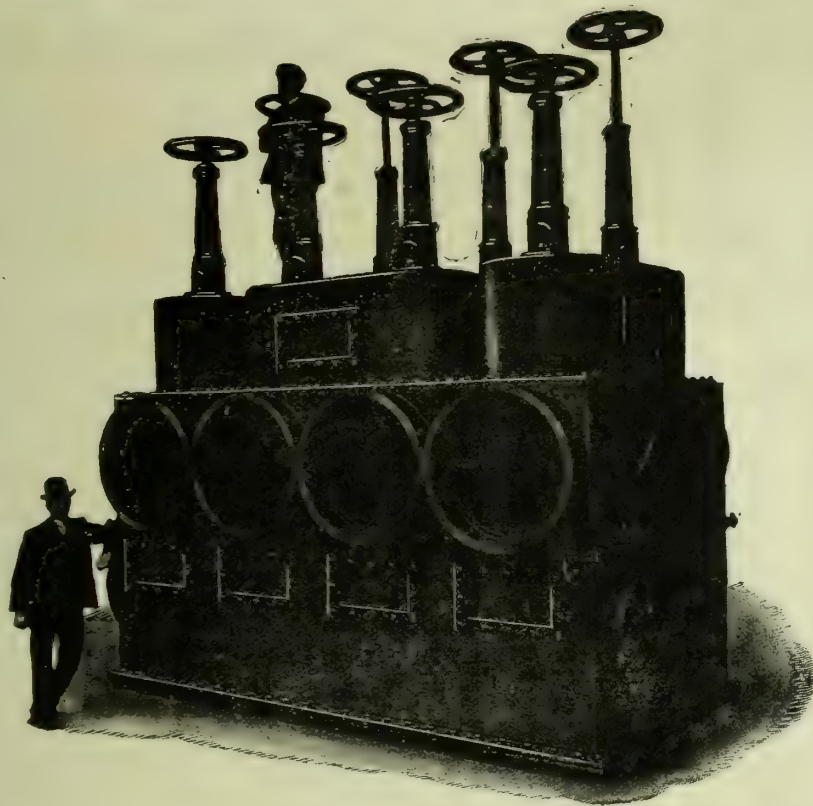
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**FIRST.****“NICO”****BEST.****The ORIGINAL Inverted Burners and Mantles**

ARE NOW SUPPLIED

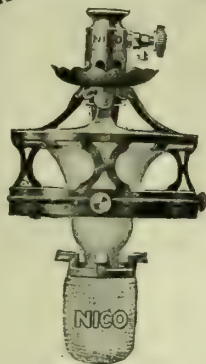
Complete with “NICO” Patent Gas Regulators.

**LEADING****THE NEW MEDIUM SIZE.****LINES.**ARTISTIC  
and  
ECONOMICAL.EFFICIENCY  
combined with  
DURABILITY.

No. 4.

Standard “Large” Size.  
75-candle power.

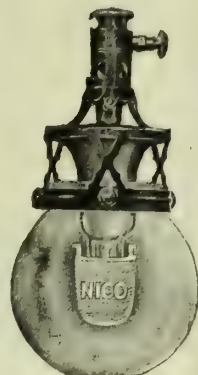
“NICO”  
BURNERS are used and  
recommended by all leading  
Gas Companies.



No. 6.

Medium Size.  
55-candle power.

“NICO”  
MANTLES are unrivalled  
for  
Brilliance and Durability.

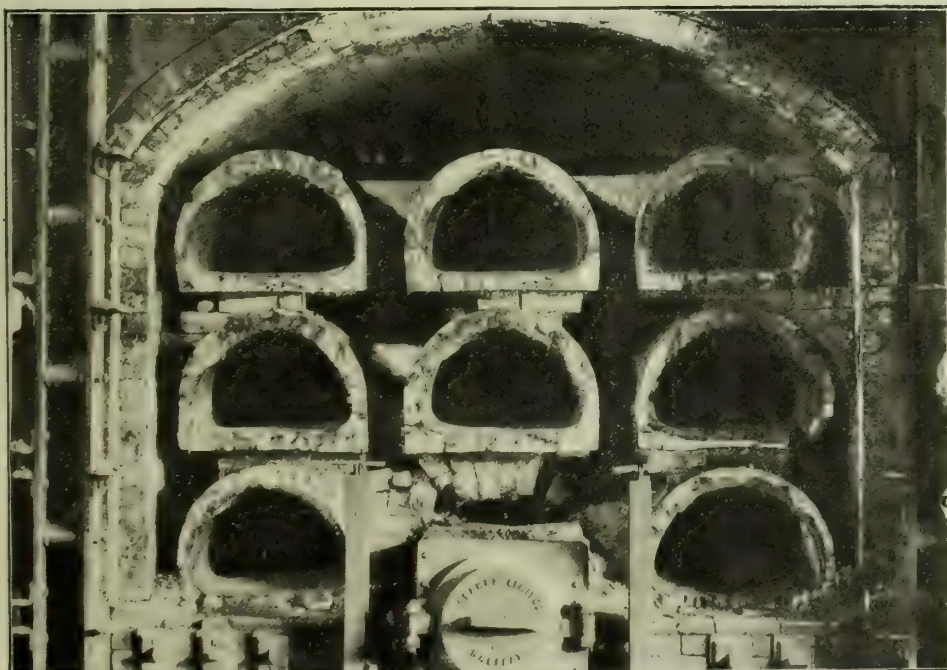


No. 5.

Bijou Size.  
30-candle power.**THE NEW INVERTED INCANDESCENT GAS LAMP CO., Ltd.****19 & 23, Farringdon Avenue, London, E.C.**

Telephone: Nos. 2680 and 2681 HOLBORN.

Telegrams: “VALIDNESS.”

**YET ANOTHER RECORD.****2323 DAYS' WORK.**All our Retorts  
are Patent  
Machine made.Horizontal,  
Inclined,  
Vertical.Special Patent  
Expanding Dies  
for making  
Taper Retorts  
at one  
operation.Bricks, Tiles,  
and Blocks  
for all Types of  
Settings.

Specials.

Silica Bricks.

Alumina  
Bricks.Non-Con.  
Cement.**REPORT.**—“This Bed worked for 2323 days, at high heats, and is still in very fair condition. Working results were exceptionally good.”**The LEEDS FIRECLAY CO., Ltd.**

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“FIRECLAY, WORTLEY, LEEDS.”

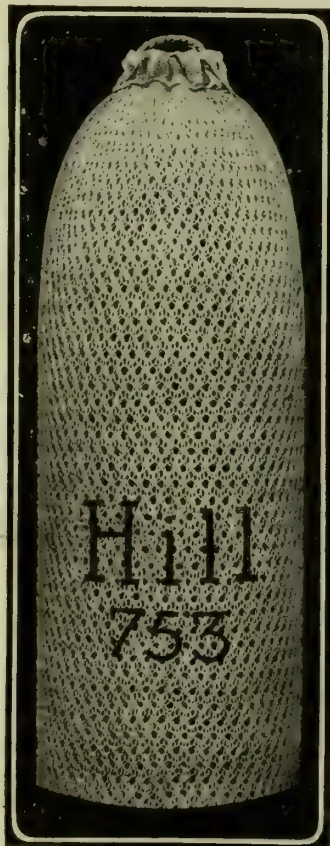
**WORTLEY, LEEDS, ENGLAND.**

Telephones:

610, 612 1649, 2322, Leeds



The Hill Four Star "C," "Kern," and "Inverted"  
are the Finest Mantles Made for Gas Lighting.



*Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.*

Their distinctive features are:

The patent Beehive Knitting of finest Ramie, obtainable in no other Mantles.

Absolute unshrinkability.

Heavy impregnation on special principles.

Full particulars may be obtained from Mr. H. WHITE THOMPSON, the special English representative of HENRY HILL & Co., Ltd., who will also call by appointment in London and advise the selection of Mantles for all special purposes, whether Gas, Petrol, Petroleum or Acetylene.



*Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.*

HENRY HILL & CO., LIMITED,  
Specialists in MANTLE MANUFACTURES,  
Alexandrinenstrasse 11, Berlin, S.W.

All enquiries should be addressed to the ENGLISH REPRESENTATIVE:  
H. WHITE THOMPSON, 28, The Drive, Fulham Park Gardens, Fulham, S.W.

**ASHMORE, BENSON, PEASE & CO., LTD.,**  
**STOCKTON-ON-TEES.**

Telegrams:  
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MANUFACTURERS AND ERECTORS OF  
Gasholders, Purifiers, Condensers,  
Washers, Steel Mains, Roofs,  
AND ALL OTHER GAS-WORKS PLANT.



# SEE THE NEW SAND BLAST PROCESS FOR COOKER CLEANING.

It is without a doubt the Process "par excellence."

- 1. The Stoves are thoroughly Scoured Inside and Outside, every Crack, Crevice, and Ornamental Part being cleaned perfectly.
- 2. It does this in less than half the time of existing methods.
- 3. It saves Labour.
- 4. The work is easier and healthier for the Men.
- 5. Costs are Lower and the Stoves are Cleaned equal to New.

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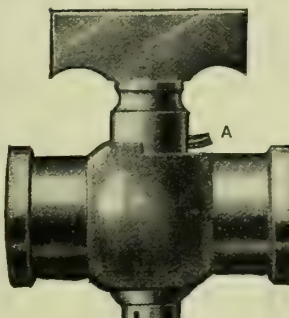
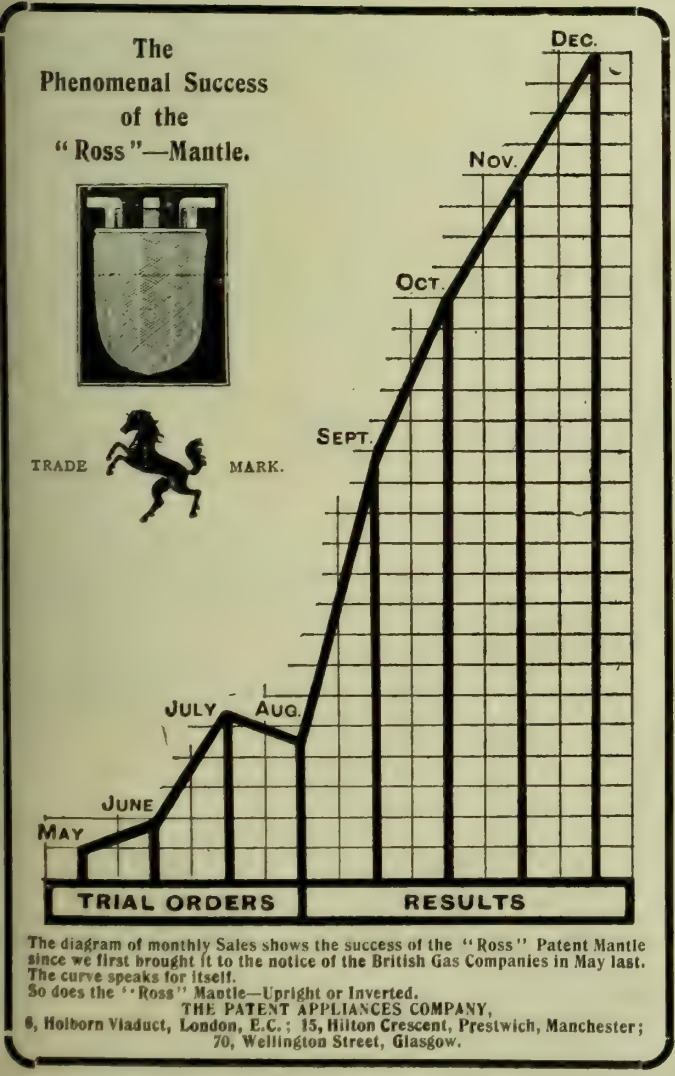


FIG. 1. The Old Style with the Old trouble. Note the Pin A.

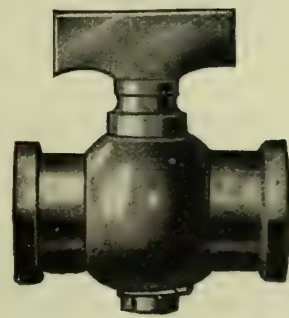


FIG. 2. Evered's Patent "Safety Stop." No Pin. No trouble.



FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

## EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

## EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

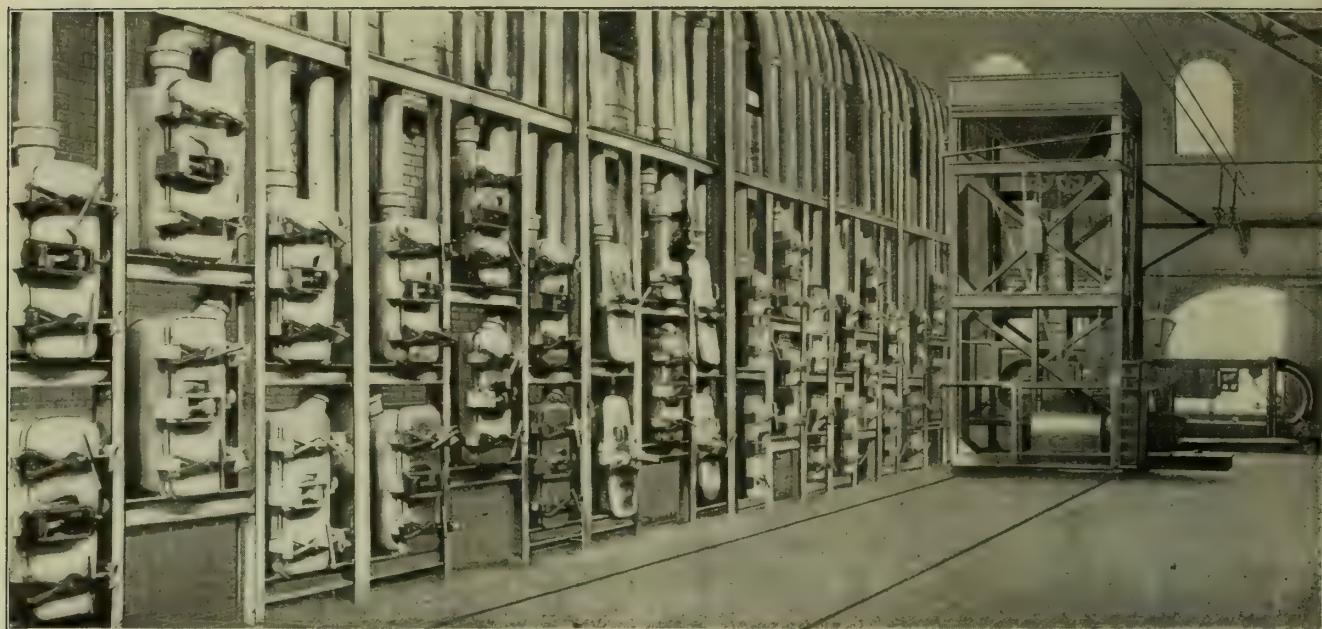
The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

**EVERED & CO., LD.,**  
27 to 35, DRURY LANE,  
LONDON, W.C.  
Surrey Works, SMETHWICK.



# GLOVER'S PATENT NORWICH CHAMBER RETORT SETTINGS.



## SPECIAL ADVANTAGES:—

**21 CWT. CHARGES** or larger if required.

**GAS RESULTS,** 13,600 cub. ft. of 14·5 c.p. gas per Ton of coal carbonized.

**COKE,** GREY, DENSE, and MASSIVE, suitable for many metallurgical purposes and for malting.

**OPERATING COSTS** considerably lowered owing to greatly reduced number of operations.

**ADAPTABLE TO EXISTING REGENERATORS.**

The work of **CHARGING AND DISCHARGING** these Chamber Retorts is performed by the "D.B." **STOKING MACHINES** with the same **SMOOTHNESS** and **RELIABILITY** that characterizes the working of the "D.B. MACHINES" with ordinary Retorts.

**THE ONLY MACHINES THAT WILL COMPLETELY FILL CHAMBERS OR RETORTS.**

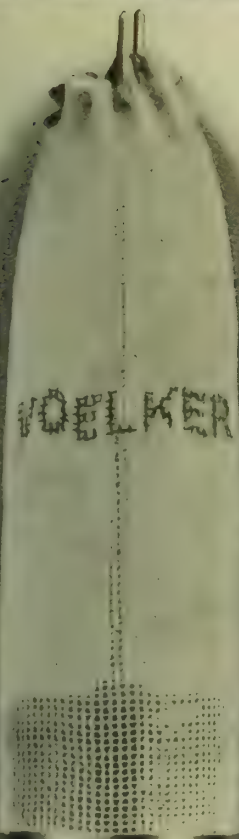
Write for full Particulars to

# W. J. JENKINS & CO., LTD.,

## Engineers, RETFORD, NOTTS.



# "VOELKER" LOOM WOVEN MANTLES



are made in

the following sizes:

**"C," KERNS 2, 3, 4.**

**SUGGS, 3 AND 4.**

Let us send you

Samples and Prices.

**THE VOELKER LIGHTING CORPORATION, LTD.,**  
Albert Works, Garratt Lane, **WANDSWORTH, S.W.**

**SAML. CUTLER & SONS, MILLWALL, LONDON,**  
And at 39, VICTORIA STREET, WESTMINSTER, S.W.

## **CARBURETTED** **WATER-GAS** **PLANT.**

**MAXIMUM EFFICIENCY GUARANTEED.**  
**Inspection of Working Plants Invited.**

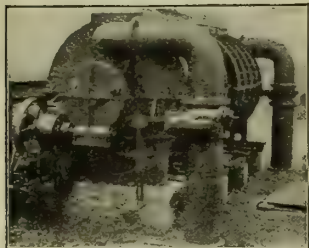
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## **MOBBERLEY & PERRY, LTD.,** **STOURBRIDGE,**

Proprietors of large areas of Old Stourbridge Fire-Clay, are enabled to supply First Quality of every description of Gas Retorts and Fire-Clay Goods.



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WASHER-SCRUBBER.

## "Standard" Specialties.



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TAR &amp; NAPHTHALENE WASHER.

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Oxide and Laboratory, 2369 Manchester.

Blackburn, 295 Blackburn.

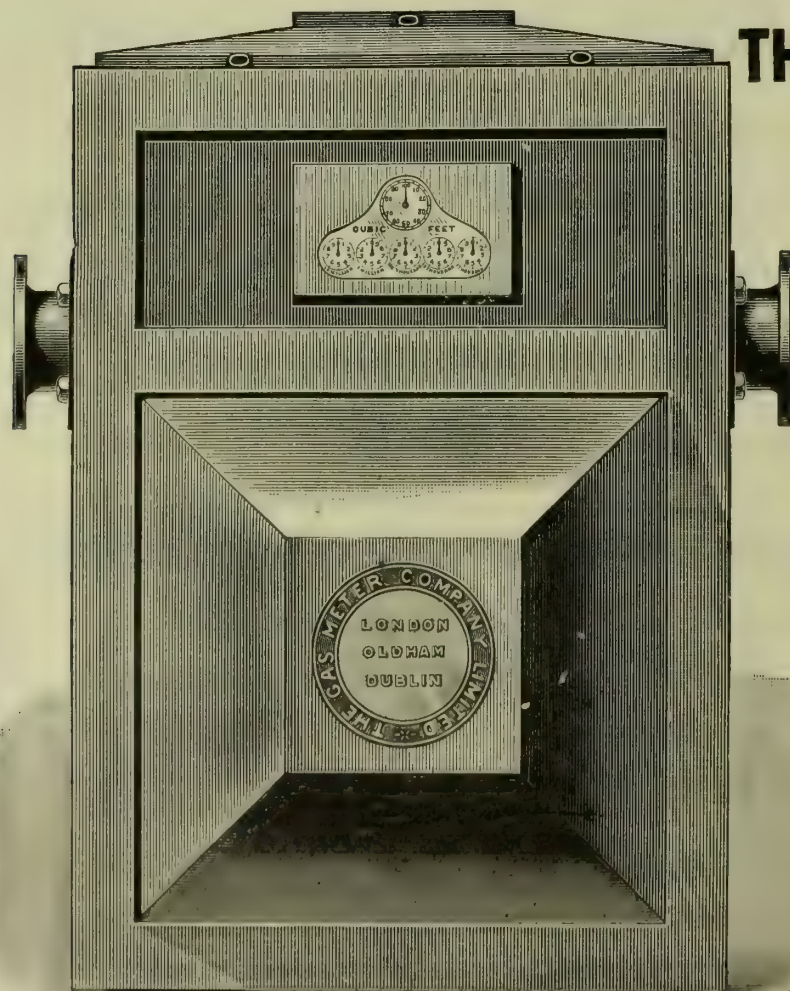
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# MANCHESTER.

All Bye-Products from the Distillation of Coal dealt with.

## SPECIALITIES

{ Hydrated Oxide of Iron for Gas Purification, and of different Strengths to suit conditions of Purification, Sulphuric Acid (free from Arsenic) for Sulphate of Ammonia Manufacture, Recovered Sulphur, and Prussiates of Soda, Spent Oxide bought on Sulphur and Cyanide Contents, Tar and Gas Liquor purchased. See our Advertisement last week.



## THE GAS METER CO., LIMITED.

### CROLL'S PATENT

### IMPROVED

### DRY GAS-METERS.

ALL SIZES IN STOCK.

For Prices and Particulars apply to—

WORKS: 238, KINGSLAND ROAD, LONDON;

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"METER OLDHAM,"  
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"METER MANCHESTER."

Telephone Nos. { 142 DALSTON (National).  
340 OLDHAM (National).  
1995 DUBLIN (National).  
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Agent for Scotland: THOS. WATSON, 34, St. Andrew Square, EDINBURGH.



# VERITAS

## GAS MANTLES

BRITISH  
MADE.

For all UPRIGHT and INVERTED Burners.

The Pioneer Ramie Mantle and STILL THE BEST.

Please Write us for Particulars and Prices of our IMPROVED TRIPLEX TEXTURE INVERTED MANTLES (XXX Quality), and also our "VERITAS-EFESCA" UPRIGHT MANTLES. Both are extra strong and give an absolutely PURE WHITE LIGHT of HIGHEST CANDLE POWER.

FALK, STADELMANN & CO.,  
LTD.,

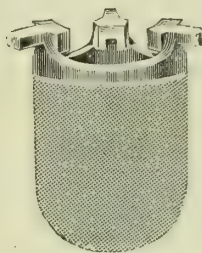
LONDON:

&

GLASGOW:

83-87, Farringdon Road.

74-78, Gt. Clyde Street.



# SULPHATE OF AMMONIA PLANT

Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

### ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity.
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

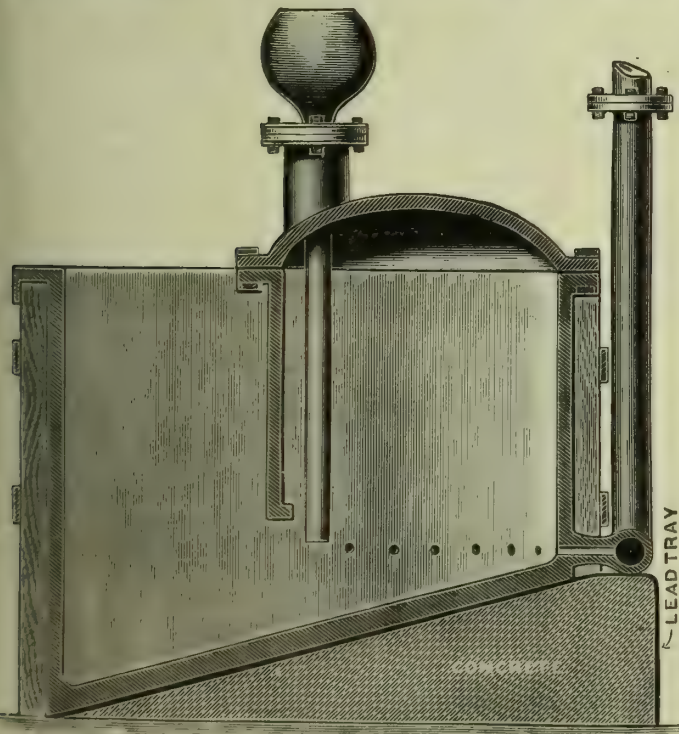
LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

**BIGGS, WALL & CO.**

13, Cross Street, Finsbury Pavement,  
LONDON, E.C.

Telegrams: "RAGOUT LONDON." Telephone: 273 CENTRAL.



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.



# HUMPHREYS & GLASGOW,

## CARBURETTED-WATER-GAS.

	Cubic Feet Daily.		Cubic Feet Daily.		Cubic Feet Daily.
Aarhus, Denmark . . . . .	800,000	Faversham . . . . .	200,000	Poole . . . . .	1,500,000
Agram, Croatia . . . . .	200,000	Flensburg, Sleswig . . . . .	300,000	Port Elizabeth, S.A. . . . .	400,000
Alkmaar, Holland . . . . .	400,000	Forst, Brandenburg . . . . .	300,000	Portsmouth . . . . .	1,000,000
Allenstein, Germany . . . . .	200,000	Frankenthal, Germany . . . . .	175,000	Posen, Germany . . . . .	450,000
Antwerp, Belgium . . . . .	1,500,000	G. L. & C. Co. Beckton . . . . .	2,250,000	Posen (2nd) . . . . .	700,000
Antwerp (2nd) . . . . .	1,000,000	G. L. & C. Co., „ (2nd) . . . . .	10,750,000	Prague, Austria . . . . .	140,000
Ashford . . . . .	250,000	G. L. & C. Co., Bromley . . . . .	3,750,000	Preston . . . . .	1,400,000
Augsburg, Bavaria . . . . .	425,000	G. L. & C. Co., Fulham . . . . .	1,750,000	Reading . . . . .	1,000,000
Aylesbury . . . . .	150,000	G. L. & C. Co., „ (2nd) . . . . .	750,000	Redhill . . . . .	275,000
Barmen-Rittershausen . . . . .	500,000	G. L. & C. Co., Kensal Green . . . . .	2,250,000	Redhill (2nd) . . . . .	300,000
Barrow . . . . .	300,000	G. L. & C. Co., Nine Elms . . . . .	2,750,000	Reichenberg, Bohemia . . . . .	200,000
Bath . . . . .	1,000,000	Gablonz, Austria . . . . .	140,000	Reichenberg (2nd) . . . . .	200,000
Belfast . . . . .	1,700,000	Gelsenkirchen, Westphalia . . . . .	175,000	Revel, Russia . . . . .	350,000
Belfast (2nd) . . . . .	4,500,000	Gelsenkirchen (2nd) . . . . .	350,000	Rhymney Valley . . . . .	175,000
Benrath, Germany . . . . .	125,000	Geneva, Switz. . . . .	500,000	Romford . . . . .	300,000
Berlin-Charlottenburg . . . . .	2,500,000	Gosport . . . . .	200,000	Romford (2nd) . . . . .	350,000
Berlin-Rixdorf . . . . .	650,000	Göteborg, Sweden . . . . .	300,000	Rotterdam, Holland . . . . .	850,000
Berlin-Rixdorf (2nd) . . . . .	700,000	Göteborg (2nd) . . . . .	600,000	Rotterdam (2nd) . . . . .	1,500,000
Berlin-Tegel . . . . .	3,500,000	Graudenz, Prussia . . . . .	200,000	Rotterdam (3rd) . . . . .	750,000
Berlin-Tegel (2nd) . . . . .	6,350,000	Guildford . . . . .	350,000	Rotterdam (4th) . . . . .	750,000
Bilston . . . . .	375,000	Guildford (2nd) . . . . .	200,000	Rotterdam (5th) . . . . .	600,000
Birmingham . . . . .	1,500,000	Haarlem, Holland . . . . .	850,000	St. Albans . . . . .	700,000
Bishop's Stortford . . . . .	200,000	Hamburg, Germany . . . . .	1,750,000	St. Gallen, Switz. . . . .	225,000
Bochum, Westphalia . . . . .	530,000	Hampton Court . . . . .	500,000	St. Gallen (2nd) . . . . .	225,000
Bognor . . . . .	100,000	Hampton Court (2nd) . . . . .	600,000	St. Joseph, Mo. . . . .	750,000
Bordentown, N.J. . . . .	125,000	Hartlepool . . . . .	750,000	San Paulo, Brazil . . . . .	700,000
Bournemouth . . . . .	1,000,000	Hebden Bridge . . . . .	200,000	Santiago de Cuba . . . . .	400,000
Bournemouth (2nd) . . . . .	500,000	Heidelberg, Germany . . . . .	200,000	Scarborough . . . . .	800,000
Bremen, Germany . . . . .	550,000	Holyoke, Mass. . . . .	600,000	Schwelm, Westphalia . . . . .	100,000
Bremen (2nd) . . . . .	950,000	Hong Kong . . . . .	450,000	Shanghai . . . . .	225,000
Bremen (3rd) . . . . .	850,000	Hull . . . . .	1,500,000	Shanghai (2nd) . . . . .	225,000
Brentford . . . . .	1,200,000	Ilford . . . . .	650,000	Shanghai (3rd) . . . . .	1,600,000
Brentford (2nd) . . . . .	850,000	Innsbruck, Austria . . . . .	200,000	Southampton . . . . .	800,000
Bridgewater . . . . .	200,000	Ipswich . . . . .	750,000	Southampton (2nd) . . . . .	500,000
Bridlington . . . . .	150,000	Kampen, Holland . . . . .	350,000	Southampton (3rd) . . . . .	600,000
Bridlington (2nd) . . . . .	200,000	Kiel, Sleswig . . . . .	1,000,000	Southgate . . . . .	400,000
Brieg, Silesia . . . . .	100,000	Kiel (2nd) . . . . .	880,000	Southport . . . . .	750,000
Brighton . . . . .	1,750,000	L. & N.W. Rly., Crewe . . . . .	700,000	Southport (2nd) . . . . .	900,000
Brighton (2nd) . . . . .	1,850,000	Lausanne, Switz. . . . .	250,000	South Shields . . . . .	650,000
Bromley . . . . .	1,500,000	Lawrence, Mass. . . . .	400,000	Stafford . . . . .	500,000
Bruges, Belgium . . . . .	200,000	Lea Bridge . . . . .	350,000	Staines . . . . .	600,000
Brussels-Anderlecht . . . . .	350,000	Lea Bridge (2nd) . . . . .	350,000	Stettin, Germany . . . . .	880,000
Brussels-Anderlecht (2nd) . . . . .	350,000	Lea Bridge (3rd) . . . . .	400,000	Stockholm . . . . .	1,500,000
Brussels-Forest . . . . .	1,000,000	Lea Bridge (4th) . . . . .	1,000,000	Stockholm (2nd) . . . . .	1,750,000
Brussels-Koekelberg . . . . .	1,000,000	Leeuwarden, Holland . . . . .	400,000	Stockport . . . . .	600,000
Brussels-St. Gilles . . . . .	1,000,000	Leiden, Holland . . . . .	500,000	Stockport (2nd) . . . . .	600,000
Brussels-St. Josse . . . . .	1,000,000	Leiden (2nd) . . . . .	575,000	Stockport (3rd) . . . . .	400,000
Brussels-St. Josse (2nd) . . . . .	600,000	Leigh, Lancs. . . . .	350,000	Stockton-on-Tees . . . . .	500,000
Brussels-Ville . . . . .	750,000	Lemberg, Galicia . . . . .	260,000	Swansea . . . . .	750,000
Brussels-Ville (2nd) . . . . .	750,000	Lemberg (2nd) . . . . .	500,000	Swansea (2nd) . . . . .	1,000,000
Brussels-Ville (3rd) . . . . .	1,500,000	Liège, Belgium . . . . .	1,000,000	Swansea (3rd) . . . . .	450,000
Brussels-Ville (4th) . . . . .	350,000	Liège (2nd) . . . . .	750,000	Swindon . . . . .	300,000
Bucarest, Roumania . . . . .	1,100,000	Lincoln . . . . .	500,000	Sydney-Harbour . . . . .	500,000
Budapest, Hungary . . . . .	50,000	Liverpool . . . . .	3,500,000	Sydney-Harbour (2nd) . . . . .	500,000
Budapest (2nd) . . . . .	1,750,000	Liverpool (2nd) . . . . .	4,500,000	Sydney-Mortlake . . . . .	500,000
Carlisle . . . . .	600,000	Longton . . . . .	600,000	Sydney-Mortlake (2nd) . . . . .	500,000
Carlsruhe, Germany . . . . .	500,000	Louvain, Belgium . . . . .	800,000	Syracuse, N.Y. . . . .	850,000
Chigwell . . . . .	350,000	Lübeck, Germany . . . . .	400,000	Taunton . . . . .	225,000
Chorley . . . . .	300,000	Maastricht, Holland . . . . .	200,000	Taunton (2nd) . . . . .	350,000
Commercial, London . . . . .	850,000	Magdeburg, Germany . . . . .	1,400,000	The Hague, Holland . . . . .	1,000,000
Commercial (2nd) . . . . .	850,000	Maidenhead . . . . .	225,000	The Hague (2nd) . . . . .	500,000
Commercial (3rd) . . . . .	1,250,000	Maidenhead (2nd) . . . . .	225,000	Tilburg, Holland . . . . .	400,000
Commercial (4th) . . . . .	2,000,000	Maidstone . . . . .	500,000	Torquay . . . . .	350,000
Copenhagen . . . . .	700,000	Malines, Belgium . . . . .	500,000	Tottenham . . . . .	750,000
Copenhagen (2nd) . . . . .	2,500,000	Malmö, Sweden . . . . .	350,000	Tottenham (2nd) . . . . .	750,000
Courtrai, Belgium . . . . .	250,000	Malta . . . . .	400,000	Tottenham (3rd) . . . . .	350,000
Coventry . . . . .	600,000	Manchester . . . . .	3,500,000	Tottenham (4th) . . . . .	1,000,000
Coventry (2nd) . . . . .	600,000	Manchester (2nd) . . . . .	3,500,000	Tottenham (5th) . . . . .	1,000,000
Cracow, Galicia . . . . .	200,000	Marlborough . . . . .	100,000	Tottenham (6th) . . . . .	1,250,000
Cracow (2nd) . . . . .	200,000	Mayence, Germany . . . . .	700,000	Tunbridge Wells . . . . .	1,000,000
Crefeld, Germany . . . . .	500,000	McKeesport, Pa. . . . .	500,000	Utrecht, Holland . . . . .	1,000,000
Croydon . . . . .	1,250,000	Merthyr Tydfil . . . . .	300,000	Utrecht (2nd) . . . . .	1,000,000
Croydon (2nd) . . . . .	625,000	Middlesbrough . . . . .	1,250,000	Verviers, Belgium . . . . .	1,000,000
Croydon (3rd) . . . . .	625,000	Namur, Belgium . . . . .	175,000	Vienna . . . . .	3,500,000
Croydon (4th) . . . . .	550,000	Nelson . . . . .	400,000	Vienna (2nd) . . . . .	2,500,000
Debreczin, Hungary . . . . .	100,000	Newburgh, N.Y. . . . .	600,000	Waltham . . . . .	400,000
Deventer, Holland . . . . .	150,000	New York . . . . .	5,200,000	Wandsworth & Putney . . . . .	1,800,000
Deventer (2nd) . . . . .	200,000	Nichteroy, Brazil . . . . .	250,000	Watford . . . . .	300,000
Dorking . . . . .	150,000	North Middlesex . . . . .	150,000	Watford (2nd) . . . . .	350,000
Dublin . . . . .	2,000,000	North Middlesex (2nd) . . . . .	200,000	Wellington, N.Z. . . . .	350,000
Dublin (2nd) . . . . .	2,000,000	North Middlesex (3rd) . . . . .	75,000	West Bromwich . . . . .	550,000
Dublin (3rd) . . . . .	650,000	Norwich . . . . .	1,000,000	West Ham . . . . .	1,500,000
Dundee . . . . .	1,500,000	Norwich (2nd) . . . . .	300,000	West Ham (2nd) . . . . .	800,000
Dunedin, N.Z. . . . .	150,000	Norwich (3rd) . . . . .	500,000	Weston-super-Mare . . . . .	350,000
Dunedin, N.Z. (2nd) . . . . .	275,000	Nottingham . . . . .	1,000,000	Weston (2nd) . . . . .	350,000
Durham . . . . .	200,000	Nottingham (2nd) . . . . .	1,000,000	Wexford, Ireland . . . . .	100,000
Düsseldorf, Germany . . . . .	1,000,000	Nuneaton . . . . .	125,000	Wiesbaden, Germany . . . . .	850,000
Eastbourne . . . . .	1,250,000	Oberhausen, Germany . . . . .	175,000	Winchester . . . . .	225,000
Edinburgh . . . . .	2,000,000	Oldenburg, Germany . . . . .	200,000	Winchester (2nd) . . . . .	125,000
Epsom . . . . .	225,000	Ostend, Belgium . . . . .	100,000	Wolverhampton . . . . .	1,500,000
Epsom (2nd) . . . . .	300,000	Ostend (2nd) . . . . .	200,000	Zwolle, Holland . . . . .	200,000
Falmouth . . . . .	150,000	Perth, W.A. . . . .	125,000	Zwolle (2nd) . . . . .	200,000

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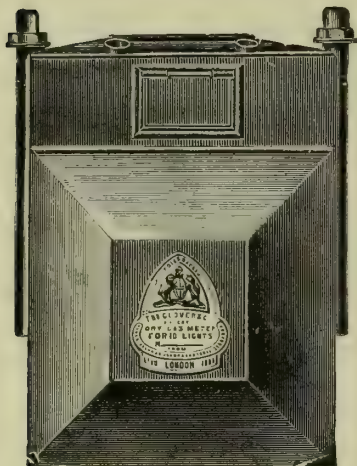
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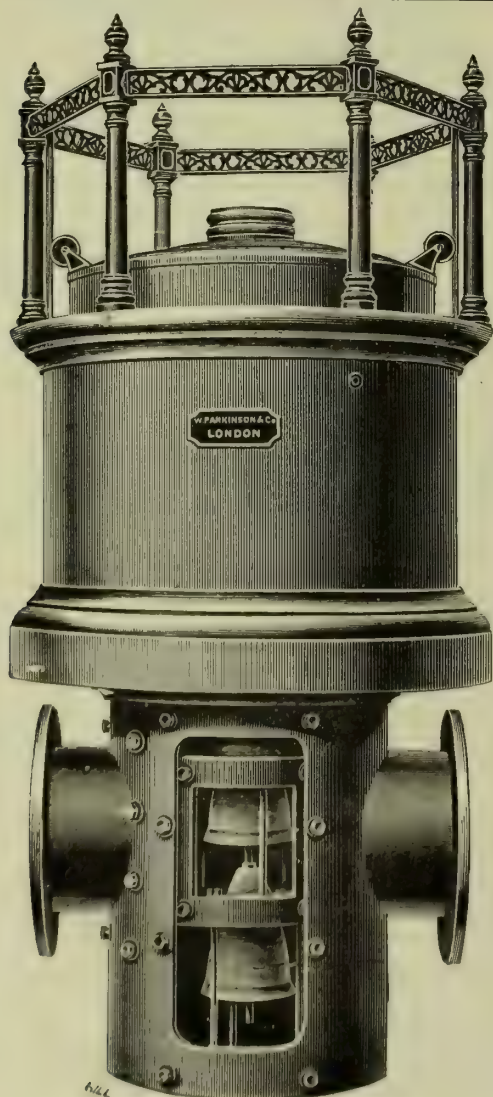
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2436.—TUESDAY, JANUARY 18, 1910.

## EDITORIAL NOTES—GAS, &c.

### The Sunderland Verticals at Work.

THE Dessau 4-metre vertical retort installation at Sunderland has now been at work some five weeks; but the greater part of the time has been spent by the Engineer (Mr. Charles Dru Drury) in experimenting with the plant in different ways, with and without steaming, in order to satisfy himself as to the best method of operation to meet his particular requirements. But in the midst of the experiments, an opportunity has been taken to put the installation through its guarantee test; and we have pleasure in publishing the results in another column. The guarantees have been in every respect fulfilled, without need for qualification in any particular. Therefore, there may be complete congratulation to both Mr. Drury and the Contractors (the Dessau Vertical Retort Company) on the success achieved at this the initial stage. Over figures with Mr. Drury's signature attached, there can be no captious disputation. No doubt from the Vertical Retort Syndicate's point of view, an important feature is that the results effectually lay the bogey which has been raised in so many quarters in regard to the illuminating power of the gas produced by Dessau retorts. It is somewhat strange, after the numerous well-attested figures that have been published, that there should have been any doubt whatsoever on the subject. But it will be readily seen from the Sunderland trial results that, had the object not been to obtain gas of a fairly high illuminating power, a much larger yield per ton might have been realized. The coal carbonized was Holmside (Durham); and the quantity used in the trial was 124.11 tons. The production per ton (without steaming) was 12,028 cubic feet, of an illuminating power of 17.55 candles, tested by the "Metropolitan" No. 2 burner. The calorific value was good—635.4 B.Th.U. gross, and 568.9 B.Th.U. net. These figures are highly satisfactory, and show that, under a lower quality requirement, there is abundant room for stretching the make beyond the 12,028 cubic feet realized under present conditions. In fact, those interested in the system see no reason—using coal of the quality of that employed at Sunderland—why a production should not be realized of considerably over 14,000 cubic feet of 14.5-candle gas, with a calorific value of about 500 B.Th.U. net.

### Glare.

THE multifarious definitions of glare offered by Dr. J. Herbert Parsons, F.R.C.S., and his brother physiologists at the meeting of the Illuminating Engineering Society last Tuesday were such admitted and conspicuous failures that we may perhaps be pardoned for not presenting to readers of the "JOURNAL" an exact definition of the meaning of the word. Nevertheless, the impression of glare is certainly susceptible of interpretation in a manner comprehensible to persons not trained in the ways of thought of the physiologist; and we may therefore indicate broadly what are its distinguishing factors. In the first place, however, it may be pointed out that it was ignored by many speakers at the meeting, and insufficiently emphasized by the rest, that the impression of glare is essentially one of relative brightness or of contrast between lights of widely different intensity. An electric arc lamp or an acetylene flare light, if in the line of vision after dusk, certainly conveys the impression of glare; but the same lights may be viewed in the open on a bright sunny day, and they will appear relatively dull and the impression of glare will be minimized if not wholly eliminated. On the other hand, a feeble electric glow lamp, such as those which, by "terminological inexactitude," the electricians are wont to describe as of 16-candle power, will, if it confronts one suddenly in the country on a dark night, undoubtedly convey the impression of glare. It is mainly, if not wholly, a question of contrast between the light to which the eyes for the time being have become accustomed, and the stronger light of the object from which the so-called

glare emanates. The contention that glare is chiefly a relative or contrast effect is supported by the fact that it is most noticeable with lights of varying intensity. Thus the impression of glare is more pronounced with an electric arc lamp which flickers violently from time to time, or with an acetylene head-lamp on a car proceeding rapidly along an uneven road, than with incandescent gas-lamps of equal intensity, or with the same head-lamp when the car is at rest. In those cases, part, though not the whole, of the phenomenon of glare is due to the eye receiving a light much stronger than that with which it had become familiarized a few moments earlier.

That glare is not a question of sheer intensity of the light is evident from the fact that the effect of glare is common in cases of artificial illumination where the illumination is considerably lower than that of full daylight, although with the latter the sense of glare is generally absent. In full daylight, however, the source of light is well overhead; and it is only by direct intention that, in the ordinary pursuits of life, the individual gazes at the sun. In his general avocations of walking and working abroad in daylight, a man's eyes are directed towards the ground or occasionally towards the horizon; and it is only when the surface of the ground is of such a character that the sunlight is strongly reflected from it, that he is troubled with glare. In this country glare out-of-doors is only experienced on a white and dusty road or the shining surface of smooth water or wet asphalt. The phenomenon of snow blindness is not a pure case of glare, and need not be discussed. In so far as artificial illumination reproduces as exactly as may be the illumination afforded by sunlight, glare will, generally speaking, be absent; but regard must be paid to the work or pursuits of the individual at the time. In the artificial conditions of existence, which the necessity of spending many hours of the day and night indoors has called forth, we have become accustomed to the use of floor and wall coverings, drapery, books, and the general *bric-à-brac* of a room, all contributing to a more subdued illumination than that afforded by direct sunlight. Nothing is more trying in respect of glare than the reading of a book fully lighted by the mid-day sun; and anyone who wishes to read continuously out-of-doors on a bright summer day, takes care to screen the printed page from the direct sunlight. Otherwise, the glare from the illuminated surface would prove a cause of serious discomfort and even pain. Indoors, too, we are in the habit of curtailing the daylight illumination from our windows by the use of blinds and curtains; and with the thus curtailed illumination, we go about our ordinary home or office pursuits in comfort, and with an absence of any impression of glare.

Artificial illumination of an interior should aim at producing the general intensity and uniformity of lighting that is afforded by daylight as thus transmitted through windows and curtains. This aim is best fulfilled by the indirect illumination from a ceiling which is lighted directly and by reflection from artificial sources screened on their lower side. Such indirect illumination, if adequate, is relatively costly; and it is not every room or interior which is adapted for its application. The next best form of artificial illumination is direct lighting by inverted gas-burners suspended at a sufficient height from the floor to be above the ordinary line of vision of the occupants of a room. In rooms up to a size of 20 feet square, a height of 7 feet from the floor fulfils this condition; but for larger interiors, where the lights may be viewed from a greater distance, a higher elevation of the lights is desirable. The uniform distribution and the steadiness of the light from modern inverted gas-burners give them a superiority over electric lamps quite apart from the immensely higher cost of maintenance of the latter. Adequate illumination of a room 25 feet by 15 feet may be secured by the use of three inverted gas-burners each of about 100-candle power; and, provided they are suspended at a height of not less than 7½ feet from the floor, the users of the room will not be troubled with the effects of glare. Such illumination will suffice for reading in any part of the room, and objects on the floor and walls will be well lighted.



On the other hand, if reading is pursued in the same room by the help only of the typical table reading-stand fitted with an ordinary electric glow lamp, the impression of glare will be obtained from the printed page whenever the eyes are directed on the latter after gazing for a moment or two at the gloom in which the rest of the room is enshrouded. The intensity of the effect of glare will, of course, depend on the surfacing of the paper of the book. With most modern highly faced printing papers, the effect of glare in the latter conditions is very marked; but, if the eyes have become accustomed to approximately the same degree of illumination of all the surrounding objects, glare from the surface of the paper will scarcely be remarked. For the reasons indicated, it is evident that, as anyone who doubts may easily prove for himself, the impression of glare with its troublesome effects is much more easily to be obtained by the adoption of the methods of illumination which are more commonly followed in installations of electric lighting than in those of gas lighting.

To sum up, glare is palpably an effect produced mainly by the contrast of light, whether direct or reflected, from different sources or objects of widely divergent relative intensity. This prosaic view of the question of glare is likely to be fruitful of more good effects if properly regarded by illuminating engineers and the public than the disquisitions of the learned physiologists and medical men who essayed to discuss it at last Tuesday's meeting. Stripped of all the jargon of the physiologist and anatomist, there is little left of real value in what was said at the meeting. The Illuminating Engineering Society will do well in future not to confine the treatment of a subject at any of their meetings to the one-sided views of one section of scientific men, however able the representatives of that section may be in their own branches of research. Otherwise, the general body of practical technical men will cease to take interest in its proceedings.

### Tar-Painted Roads and Farm Stock.

THE judgment given in the Ashford (Kent) County Court on the 10th inst., and which is reported on another page of to-day's "JOURNAL," in a case by which a firm of farmers at Charing obtained damages for the loss of a cow which the Judge decided had been poisoned by swallowing tar, or water containing tar, coming from a road which had been painted with tar by the Kent County Council, deserves notice, in view of the fact that, if allowed to stand, it may tend to hinder the authorities responsible for the maintenance of roads in different parts of the country from using tar as a means of keeping in repair the main roads under their charge.

The farmers alleged that the cow, which was one of a number grazing in a field adjoining the main road, had been poisoned through drinking from a ditch or pool in the field, into either of which it was possible that rain washings from the tarred road might gain access. In support of their contention that this cow alone of the whole herd had been poisoned by tar washings from the road, the farmers called a veterinary surgeon who had made a postmortem examination on the animal and Professor Lander, D.Sc., of the Royal Veterinary College, who had made an analysis of a portion of the viscera. In cross-examination, both of these witnesses stated that they had no direct evidence of poisoning by coal tar, except the fact that a large quantity of phenols (carbolic acid and its homologues) had been found in the viscera. Other constituents of coal tar, such as pitch and sulphocyanide, were not observed or detected by them. By what we cannot but regard as an unfortunate departure from scientific terminology, these witnesses spoke of the phenols as "tar-acids"—an expression that might well convey to the Court the impression that the poison must necessarily have been derived directly from tar. They admitted that they had no more than a general knowledge of the character and composition of tar, and did not impugn the good quality or the fitness for its purpose of the particular tar used. The defendants, the Kent County Council, did not dispute the plaintiffs' evidence that the cow had really died from phenol poisoning; but they contended that the phenols must have been taken in a more concentrated state than that in which they exist in tar or tar washings, and suggested that a tank of creosote on another part of plaintiffs' farm was a possible source of the poison taken by the cow. Mr. H. P. Maybury, the Surveyor of the Kent County Council (who, as readers will remember, was formerly in charge of the Malvern Gas-Works), stated that no cases of poisoning of cattle

by washings from tarred roads had come to his knowledge though there were now 500 miles of tarred roads in Kent and he knew of a pool which was supplied solely by the surface washings from such a road, from which cattle drank freely without suffering injury. Mr. W. J. A. Butterfield gave evidence to the effect that the amount of phenols found by Dr. Lander in the viscera implied the consumption by the cow of several gallons of the tar itself or several hundred gallons of water which had been in contact with tar. He also laid stress on the fact that there was no evidence of the animal having been in contact with tar or of other constituents of tar having been found in its stomach. Nevertheless, the County Court Judge decided that the plaintiffs' cow had died through swallowing tar, or water containing tar, and that the tar had come from the road. In regard to the latter point, it must be remembered that the tar had been on the road for several days before rain fell, and that the layer, which had in the first instance been very thin and had been covered with sand, had become thoroughly incorporated with the road surface before the rain fell. It is difficult to reconcile the Judge's finding with these facts; and it is to be hoped that the County Council will obtain redress on the appeal which they have still time to enter.

Other points of interest in the judgment are that the County Court Judge regarded it as proved that the tarring of roads was a proper and efficient method of repairing them, and more economical than the use of granite without tar. But he found that it was not absolutely necessary to repair the road with tar; and hence he held the County Council liable for the consequences of its use therefor. It had not been contended by the plaintiffs that there had been negligence in the application of the tar. The judgment, as it stands, is extremely unsatisfactory from the point of view of all interested in the use of tar for road maintenance. Unless it is reversed on appeal, it will undoubtedly prove a check on the employment of tar for road repair and maintenance; and all classes of the community using country roads will suffer accordingly. Moreover, so far as we can judge from the reports to hand, it rests on such an unsatisfactory basis in respect of the facts, that it should not be difficult to secure its reversal, if the Kent County Council can see their way to carry the case to appeal.

### Sulphate of Ammonia.

HELPFUL, as usual, is the annual review by Messrs. Bradbury and Hirsch of the sulphate of ammonia market during 1909. There may be some question in a few minds as to the value of a market retrospect of the kind, seeing that the year has been passed through, and, for good or ill, the financial results for producers have been shaped, and are unalterable. A review of this kind, however, by a firm occupying a special position for making observation, whose business it is to note tendencies as well as actualities, enables one to form a fair idea of the drift of things, and as to where to look for developments that may materially influence the future. The present review is replete with suggestiveness; and there is much in it that urges the importance of home producers pushing forward at this period, in no uncertain manner, in the endeavour to fully maintain their position in the fertilizer trade both at home and abroad. Competition is growing more and more acute; and this is inevitable with production increasing at a substantial rate. Except for a rise of a few shillings at the end of March, the price of sulphate of ammonia during the year did not vary much—the difference between the close and the beginning being only about 2s. 6d. per ton, with the price at the end at £11 7s. 6d. As to export business, the year terminated better than the conditions at the opening allowed one to hope would be the case. There were the lower prices of nitrate of soda, the falling off of the Japanese demand, the diminishing requirements of the Continent owing to its own increasing production, and the knowledge regarding the augmented activity of Germany in competing for distant demand. But, in the result, while exports to the Continent fell away by about 8000 tons, compared with 1908, in all other directions shipments from this country increased. Japan provided the one sensational feature of the year, by, in the second half, moving from sluggish to vigorous purchasing conditions, and ending the year with an excess shipment compared with 1908 of between 10,000 and 11,000 tons. With the increases in other directions, the export business showed a gain of close upon 30,000 tons.

After carefully reading through the review, one puts it



down strongly impressed as to the need in this market for keeping an eye on Germany. Production is increasing in that country, Belgium, and France; but it is from Germany that competition will be the keenest for oversea business. From stated premises, Messrs. Bradbury and Hirsch make this deduction: "In Germany, where the sulphate of ammonia propaganda is still being vigorously pushed, we think that more and not less sulphate of ammonia will be used; but from the reservation of their own market in recent months, and in offering more freely in foreign markets than they did a year ago, it is fair to infer that German producers are of opinion that their output has increased more rapidly than their home consumption is likely to increase." That is then one direction from which an accentuated competition may be looked for. But our own increase in production will not allow ground to be cut from under our feet by the commercial acumen of competitors abroad. Last year's home production in all directions exhibits an augmentation compared with 1908—the estimated total increase being 26,500 tons, which was more than absorbed by additional export trade. This extra output is divided between gas-works, 6000 tons; iron-works, 1000 tons; shale-works, 3500 tons; and coke and carbonizing works, 16,000 tons. This indicates the source of largest augmentation in future; and the last-named figure also materially lessens the margin between gas-works and coke-oven productions. Only as recently as 1904, the latter source of production was 116,500 tons behind gas undertakings; but by the end of last year, its yield had caused a contraction of the difference to 70,000 tons. In view of the industrial position in the country, there is no prospect of any great access of production from gas undertakings.

The position then is this: Production is increasing. So far, we have done very well in, either at home or abroad, absorbing the increase. But owing to enlarged and still enlarging production in neighbouring countries, the Continent is a declining market; while the increasing production there and at home forces the pace of competition for demand further abroad. In addition to this, the conditions and prospects are considered good for the nitrate of soda market in respect of volume of business. All this points to the need of a vigorous policy in connection with sulphate of ammonia, not less in regard to the export trade than in respect of the home market. The work required at home is educational; and we are glad to see that the Sulphate of Ammonia Committee are leavening their past propaganda with new schemes. It passes understanding why among users there should still be, with all that has been done, the want of appreciation as to the substantial difference there is in the market value of the unit of nitrogen in sulphate of ammonia and nitrate of soda. That value is even now something like 9d. less for sulphate of ammonia than for nitrate of soda. This marks the cheaper article in point of intrinsic value; but it requires a great deal of perseverance to drive the fact home among agriculturists who, owing to custom or other cause, have not yet pinned their faith to sulphate of ammonia.

### Gas Legislation.

Among the Gas Bills reviewed this week will be found that of the Brighton and Hove Gas Company; and one of the objects in view, it will be remarked, is the formation of a capital redemption fund. A fortnight since, attention was called to the Bishop's Stortford instance. In the Brighton case, it is intended to form the fund by half-yearly appropriations from revenue not exceeding  $\frac{1}{4}$  per cent. on the paid-up capital; but the section is not to operate in respect of any half year immediately succeeding any period of twelve months ending in June or December during which the gas sold by the Company has exceeded the rate of 1 million cubic feet for each £500 of paid-up capital. In the Bishop's Stortford case, the proposal is half-yearly appropriations at a rate not exceeding  $\frac{1}{2}$  per cent.; and the limit of operation is £400, instead of £500. The Company are also dealing with the question of illuminating power and testing. And so are the Bristol Company in their many-featured Bill. Among other matters, the latter are taking power to obtain better supervision over consumers' fittings in connection with escapes, and fittings in unoccupied houses. A clause giving the Company protection in the matter of stand-by supplies is included, as is also one abolishing penalty testing in connection with sulphur compounds other than sulphuretted hydrogen. Coming events sometimes cast their

shadows before; and in the Bill, it is noticed, the Directors are proposing to take power to appoint from among themselves a Managing-Director. We feel sorry the Ammanford Gas Company have occasion, after last year's Act, to appear in Parliament this coming session. But some grades of mud have a nasty way of sticking tight; and part of that collected by the Amman Valley Company is tenaciously adhering to the new Ammanford Company. They have a difficulty, in consequence, in issuing capital upon reasonable terms; and they have also trouble in getting satisfactory information as to the issue of certain debentures by the old Company. The Bill that is being promoted is intended to help the Company in both respects.

### The Volume of Increase.

In the "JOURNAL" last week, extracts were given from the paper recently read by Dr. W. B. Davidson before the Birmingham Section of the Society of Chemical Industry. The author commented on the notable increase in the output of gas that took place during the eighties and nineties. "Naturally," he remarked, "this extraordinary development could not be maintained for very many years; and so it is not surprising that the last decade has witnessed a considerable slackening in the demand for town gas." This is rather a sweeping assertion. He illustrates the point by giving the outputs of 24 of the largest gas undertakings in the United Kingdom for 1888, 1898, and 1908, together with the decennial percentage increments for the two intervals. The decennial average percentage increases are shown to be 40·8 for 1888-1898 and 28 for 1898-1908. These percentages do not correctly show the relation of the increase in the two periods. And the volumes of gas sold—51,677 millions in 1888, 72,786 millions in 1898, and 93,179 millions in 1908—hardly justify the expression "considerable slackening in the demand;" seeing that in the first decade the increase was 21,109 millions, and in the second decade 20,393 millions—a decrease of only 716 millions in the volume of increase in ten years spread over 24 large undertakings.

### Electricity and Fires.

Electricity this Christmas and New Year's time is earning for itself a very bad name; and the electrical press find the facts too hard for them to deny. Damage by fire to the estimated amount of £100,000 was done last Thursday at the drapery and furnishing stores of Messrs. D. D. Evans and Co., of High Road, Kilburn; and there appears no loophole for escape from the charge that it was due to electrical fusion or the explosion of an electric lamp. The facts are simple. The shops were closed for the day; but the manager decided upon an evening display of the shop windows. He went to the basement of the underclothing department, and switched on the current. No one, it appears, was in the window at the time; in fact, there were no assistants at all in the part of the shop where the fire broke out. Before the manager knew what had happened, the whole window was ablaze; and the flames were rushing through the other shops with remarkable rapidity. In all, five shops were involved in the conflagration. The head of the firm states that the electric light installation was of the most up-to-date kind. And so was the installation at Messrs. Arding and Hobbs's. Fortunately, there was no loss of life in the Kilburn catastrophe; but the destruction of property, as stated, was enormous. There must to-day be a great many uneasy heads of firms whose premises are electrically lighted, and contain valuable stocks of goods. They may be insured; but the insurance does not cover the losses caused by the interruption of the ordinary course of business.

### A Denial.

Since the above was written, Mr. G. H. Cottam, Chief Engineer of the Hampstead Electricity Department, has sent a letter to the papers denying that the fire was due to electricity. His denial is not based on personal knowledge; but he asserts that he "can produce several witnesses, among whom is the man who rang the fire alarm, and who noticed the fire at one of the first-floor windows, on which floor electric light is not installed. In fact, the interior of the building where the fire originated is lit with gas." The man who rang the fire alarm does not appear to have been on the premises; but the manager of Messrs. Evans and Co. was. The window that first blew out was electrically lighted; and as flames have a natural habit of ascending, we should not be surprised to learn that, when noticed outside the premises, they had



found means of exposing themselves at the first-floor windows. Mr. Cottam's evidence will have to be very strong to upset the original version of the tale as to the starting of the fire. It is noticeable how ingenious electricians are in putting, by insinuation, the blame for these disasters on to gas. The "Electrical Times" tried it in the case of the Clapham fire—and ignominiously failed.

### An Enterprising Electrical Editor.

Opportunity is a fine thing. There is a little-known paper called the "Electrical Field;" and it has an Editor who considered the tragic Clapham fire an excellent opportunity to obtain an advertisement for his paper. In the London and provincial press, there has appeared within the last few days a letter signed "The Editor of the 'Electrical Field,'" in which he stated that he fears the extraordinary publicity that has been given to the cause of the fire in South London will have likely lead to a wrong impression. "People," he says, "will have been led to believe that electricity is a dangerous illuminant. As a matter of fact, fewer fires are caused by electricity than by any other illuminating agency." Opportunity, we repeat, is a fine thing. The so-called "fewness" of the fires is simply due to the fact that electricity is not so extensively used as gas in respect both of the number of consumers and purposes. To prove his statement as to the fewness of the fires caused electrically, the Editor states that, from the last report issued by the Fire Brigade of the London County Council, it appears that, during 1908, 106 fires were attributed to electricity; while gas was responsible for 361 fires. In the "JOURNAL" for April 6 last (p. 14), we discussed these figures, but calculated that there were 366 fires due to gas, and 102 to electricity. On this point therefore, the Editor of the "Electrical Field" will not quarrel with us, as we attributed five fires more than he has done to gas and four less to electricity. Without taking any account of the hundreds of thousands of gas-fires, cooking-stoves, and other appliances in use in the Metropolis, it was found that the electricity fires equalled 1 to every 980 consumers, while the fires caused by gas spread over the actual number of consumers of the three London Companies equalled 1 in 2623 consumers, or spread over the (estimated)  $1\frac{1}{4}$  millions of gas consumers in the areas served by the 29 London electricity concerns 1 in 3415 consumers. The calculations and other points will be found in the article published by us on April 6; and we would suggest that in those cities and towns where the letter of the Editor of the "Electrical Field" has been published, the corrective should be applied, through the same channels of publicity, by showing what his figures really represent.

### A Gas Explosion before the Courts.

An endeavour on the part of a lady to fix upon one party or another the liability for a gas explosion by which she was injured while walking along the Fulham Road on the Tuesday following Easter in 1908, occupied the attention of Mr. Justice Phillimore and a Common Jury in the King's Bench division on two days of last week. Originally there were three sets of defendants to the action—the Gaslight and Coke Company, the Metropolitan Water Board, and Mr. Rogers, the proprietor of the tailoring establishment in which the explosion occurred. Before the case came on, Mr. Rogers was, by consent, dismissed from it; and during the hearing Mr. Justice Phillimore entered judgment in favour of the Water Board. This left only the Gaslight and Coke Company's liability to be decided by the Jury; and at the conclusion of the case, a verdict was given for them. This result was an unsatisfactory one from the plaintiff's point of view; but, as Mr. Danckwerts remarked when addressing the Jury on behalf of the Gas Company, though everyone must be sorry she had been injured, no one had a right to express his sorrow at the expense of someone else's pocket. The Gaslight and Coke Company denied liability on the ground that the explosion was primarily due to a leakage from a pipe of the Water Board washing away soil from underneath the gas-pipe; while the Board replied that they would not be liable, inasmuch as any leakage was not from their main, but from a service-pipe belonging to a customer on whom notice to repair had been served. As for Mr. Rogers, in his evidence he stated that at the time of the explosion no one was working in the shop, and all the burners were carefully turned off; so that he did not know what ignited the gas. A gas-stove in the back-kitchen was alight; but the explosion took place in the front

basement, where there was no fire. Both gas and water pipes were found to be fractured; but Mr. Danckwerts pointed out that, as the action was simply based on negligence, it was necessary to prove injury from gas which escaped from the pipe through the negligence of the Gas Company. On the Thursday when the shop was closed, there was nothing wrong; and, this being so, he asked what evidence there was that the Gas Company could possibly have found out that there was an escape of gas. He attributed the fracture to the fact that leakage from the water-pipe which crossed the gas-pipe at right angles had caused subsidence and subsequently the gas-pipe, being left unsupported, was unable to bear the weight imposed upon it, not, this time, by a steam-roller, but by what must be admitted to be an almost equally great infliction—a motor omnibus. All the evidence called for the Gas Company tended to strongly support this view of the case.

### Electric Wiring and Gas Piping.

As has been remarked before in these columns, electric wires and gas-pipes are not, under any circumstances, desirable close companions in a house or other premises; and in the fitting up of a building of any kind by electricity in which gas is used, or *vice versa*, a very precise specification for the work should be prepared and be carefully followed. Some time ago the Electrical Engineer of Glasgow called attention to the number of fires in the city that had been traced to the fusing of gas-pipes by electric wires and the subsequent ignition of the gas; and now the death of Mr. Alderman John Rooney, of Belfast, has to be acknowledged to be due to the same cause—the electrical fusion of a gas-pipe, and leakage of gas, which resulted in asphyxia. The fact that a branch gas-pipe was carried over an electric wire by a gas-fitter employed by Alderman Rooney shows that ignorance exists among gas-fitters—and the remark applies equally to electrical contractors—as to the undesirability of any close relationship between electric wires and gas-pipes. This is a matter that should be carefully impressed upon gas-fitters and electrical contractors in all towns. Had there not been contiguity between the gas-pipe and electric wire in this Belfast case, Alderman Rooney would, in all probability, have been in the land of the living to-day. At the inquest, there was much evidence of an academical order laid before the Coroner as to carburetted water gas and carbon monoxide; and there was danger of the more important question as to electrical fusion being lost sight of in the mass of statement made on this point. It would not have mattered in the least if the percentage of carburetted water gas had been much greater than is distributed in Belfast if the gas had not been let loose from the pipes. The relative toxicity of gases is a question of secondary importance; the primary one is the necessity for maintaining fittings in a gas-tight condition. It is absurd to say that the number of deaths has increased in the country since the introduction of carburetted water gas, without pointing out that, in the past twenty years, which about covers the period of the use of carburetted water gas, the consumption of gas has doubled. There is no evidence that shows that the number of accidental deaths—excluding suicides, which are really not accidental—has risen during that period in proportion to the use of gas. With the growth of traffic and population in London, the number of fatal accidents in the streets has increased; and that is a result every man of common sense would expect.

### A Conference in the North.

One of the telegrams despatched from Berlin by Reuter's Agency on Friday said that "in consequence of the English coal strike, there is a recrudescence of activity in the German coal trade. The Westphalian Coal Syndicate is benefiting by large orders which in ordinary times are placed in England." Another statement of the same Agency, quoted from a foreign paper, is to the effect that "the English imports of Westphalian coal, especially bunker and factory coal, show a heavy increase, which is most opportune for the Ruhr Collieries, as they have large stocks in hand, and prices are rising." Thus the stoppages which have taken place in Durham and Northumberland have benefited Germany, while they have injured this country. If the miners will carefully consider the aspect of the matter which is here so clearly set forth, it should assist materially in urging them to settle their present unfortunate differences. Last Saturday, a conference was held between the Northumberland Coalowners' Association and the Miners' Association; and



there was certainly an air of hopefulness about the conclusion of the proceedings—it having been agreed that further meetings between the workmen and the management should be held at the individual collieries, with the view of endeavouring to arrive at a settlement “in the light of the conversations which had taken place between the representatives of the two Associations.” At the headquarters of the Durham Miners' Association on Saturday, there was no intimation of any new stoppages having taken place, nor of any of the pits previously idle having restarted work. There is, however, an undoubted feeling that the prospect of a general strike is diminishing. It is impossible to say how far this brighter outlook has been brought about by the definite statement that no funds, either from the Durham Association or the Miners' Federation, can be applied to an unauthorized strike. But whatever may be the cause, it is certainly gratifying to be able to reproduce a report—even though it is so far unofficial—that at more than one colliery already ballots have been taken, with the result that a majority of the men are found to be in favour of returning to work.

### Obituary.

The death occurred a few days ago, at his residence at Newton Grange, Dalkeith, of Mr. JOHN ROMANS, who was known to many of our readers as the head of the firm of Messrs. John Romans and Son, who carried on, in Edinburgh, business as suppliers of Scottish cannels, fire-clay goods, and pipes and apparatus for gas and water works. Deceased, who had reached the advanced age of ninety, had been for about sixty years a prominent political figure in Scotland.

The death occurred recently at his residence in Birmingham, at the age of 58, of Mr. HENRY DARWIN, who was well known in the gas industry in connection with his various inventions, especially for the inverted gas-burners bearing his name, one of which was noticed in our “Register of Patents” last week (p. 108). Mr. Darwin was for some years associated with the firm of Messrs. Wright and Butler, and while with them, in addition to producing his burner, made many useful suggestions for the improvement of gas stoves and radiators. The manufacturers of Mr. Darwin's burners are now Messrs. Charles Joyner and Co., Limited, of Birmingham, of which Mr. Butler is one of the Managing-Directors.

**Hamburg Gasholder Disaster.**—The “Journal für Gasbeleuchtung” reports that the Imperial Continental Gas Association have given, through their Berlin office, a sum of 1000 marks (£50) for the relief of the sufferers from this disaster.

**Aix-la-Chapelle Gas Supply.**—It is announced by the “Journal für Gasbeleuchtung” that the Municipality of Aix-la-Chapelle have decided not to renew the contract with the Imperial Continental Gas Association, which terminates on April 1, 1912, for the gas supply of the town. They intend to take the gas supply into their own management.

**Projected Engineering Exhibitions in Manchester.**—Under the auspices of the proprietors of the “Engineering Review,” arrangements are being made for holding an Engineering and Machinery Exhibition in the City Exhibition Hall, Manchester, from Oct. 14 to Nov. 5 next. A Committee of twenty-seven, including representatives of some of the leading engineering firms in the country, are assisting the promoters in their endeavour to make this demonstration of machinery the finest that has ever been held in Lancashire. The Manager of the exhibition is Mr. Walter Cawood, who, it may be remembered, was the organizer of the successful Gas Exhibition held in Manchester in 1907. In the spring of next year, it is proposed to hold in the city a General Engineering and Allied Trades Exhibitions to be organized by the International Trade Exhibitions, Limited. The building is in course of erection in Rusholme.

**Sulphate of Ammonia from Cyanamide.**—At the meeting of the Alby United Carbide Factories, Limited, last September, reference was made by the Chairman to the business of the North-Western Cyanamide Company, Limited, and to the conversion of this product into other forms of high-grade fertilizers, which it was thought would be an important factor in ensuring the success of the Alby Company. According to a statement published by the Secretary of the Company (Mr. H. A. M'Mahon), the negotiations which have been pending between the North-Western Company and an important firm of chemical manufacturers for converting a large quantity of cyanamide into sulphate of ammonia have been concluded. The firm are now installing at Vilvorde, in Belgium, extensive plant for this purpose, the first unit of which, capable of producing from 6000 to 7000 tons per annum, is expected to be completed in March. So soon as this plant has been successfully inaugurated, the firm will, it is stated, be prepared to increase its capacity up to about 40,000 tons per annum. Terms have also been agreed in principle for the supply of 6000 to 7000 tons of cyanamide per annum to one of the largest and oldest manufacturers of fertilizers in Europe, for conversion into sulphate or phosphate of ammonia, and negotiations are pending with other important chemical manufacturers in various parts of Europe for similarly large supplies.

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 196.)

THE Stock Exchange had a week full of incident and animation, swayed by varying currents and cross-currents; and the course of each market was impelled by its own special factors from day to day. The opening was calm on Monday; and the general tendency seemed to be to await election developments. Markets held pretty firm. Consols and other gilt-edged choices were rather better; Railways did nicely; the Foreign Market was firm; and the rest were not weak. Tuesday started firm; but later on was upset by a rumour, happily unconfirmed. Consols shrank a little, and, with the exception of Railways, the general tendency was weaker. On Wednesday, there was quite a lively outburst in the speculative quarters; some lines being decidedly animated. In more sedate departments, gilt-edged went rather heavily, but Railways were full of rise. On Thursday, the settlement (a fairly heavy one) was concluded. Fresh business was much restricted. Home Government issues were firmer; but Railways had a slight check. Americans were a weak spot. Friday opened dull and then brightened up, all the leading markets showing strength; but under New York influence, the Americans went from bad to worse. Saturday's tone was much the same. Consols rose  $\frac{5}{16}$ ; but Americans were still lower. In the Money Market, there was a superabundant supply, upon which the large demand for the Stock Exchange had very little effect, and discount rates eased away steadily. Business in the Gas Market was scarcely as voluminous as the week before; but there was no diminution in the steadily growing strength of issues in undertakings both at home and abroad. The chief advance of the week was in Liverpool “A.” In Gaslight and Coke issues, the ordinary had a further fractional improvement, and changed hands at figures ranging from  $103\frac{3}{4}$  to  $104\frac{1}{4}$ . The secured issues were more than usually active. The maximum realized from  $87\frac{3}{4}$  to 89, the preference from  $103\frac{1}{4}$  to 105, and the debenture  $81\frac{1}{4}$  and  $82\frac{3}{4}$ . South Metropolitan was not very active but quite firm, transactions being marked at  $120\frac{3}{4}$  to  $121\frac{3}{4}$ . The debenture made  $83\frac{3}{4}$  *cum div.* In Commercial, there were only a couple of deals each in the  $3\frac{1}{2}$  per cent. at  $104\frac{1}{4}$ , and in the debenture at  $81\frac{1}{4}$  and  $81\frac{1}{2}$ . Among the Suburban and Provincial group, Alliance and Dublin was done at  $86\frac{1}{2}$ , Brentford old at  $255\frac{1}{2}$ , ditto new at 191 (a rise of 1), Brighton original at 219, South Suburban at from 120 to 122, Tottenham “B” at  $112\frac{1}{2}$ , and Liverpool “B” at 167—a rise of 1. In the Continental companies, Imperial was quiet at from  $175\frac{1}{2}$  to  $176\frac{1}{2}$ , the debenture marked  $95\frac{1}{4}$ , Union 97, European fully-paid  $24\frac{15}{16}$ , and ditto part-paid  $18\frac{7}{8}$ . Among undertakings of the remoter world, Buenos Ayres changed hands at  $14\frac{3}{4}$  and  $14\frac{5}{16}$ , ditto debenture at from 99 to  $99\frac{3}{4}$ , Primitiva at from  $7\frac{1}{2}$  to  $7\frac{15}{16}$ , ditto preference at  $5\frac{1}{4}$  to  $5\frac{15}{16}$ , ditto debenture at 99, River Plate at from 17 to  $17\frac{1}{4}$ , ditto debenture at  $98\frac{1}{2}$  and  $99\frac{1}{4}$ , San Paulo at  $14\frac{3}{4}$ , and ditto preference at 12 and  $12\frac{1}{2}$ .

## ELECTRICITY SUPPLY MEMORANDA.

**The Line of New Effort—Eclipses—Anticipations and Realizations—How an Electrical Writer Meets a Challenge—On Water Heating, Heat Conservation, and Water-Pans.**

THE disappointing results of the past year's trading in the electric supply industry appears to be a common subject of conversation among electrical engineers and managers; and an attendant question is, as has been seen of late in the “Memoranda,” what must be done to develop the domestic business? There is almost general agreement in electrical circles that the only thing to be tried now, to escape duplicate wiring and meters, and to give a fillip to the use of electricity for domestic purposes other than lighting, is something on the line of the Norwich or “telephone” system, under which a fixed charge is made per annum with a low flat-rate charge per unit of electricity used, no matter the purpose. The system is being tentatively adopted in many places. The Electrical Engineer of Liverpool has suggested that an experiment with the Norwich system be made for a year on quarterly terms—that is to say, the occupiers of private houses of not less than £20 rateable value to have the option of a supply on a fixed quarterly payment of 3 per cent. on the rateable value of the house, and a charge of 1d. per unit on each unit metered. We hear much about trials of this kind, but very little about results. If the idea were tempting consumers in large number, the news would be smartly winged around. But there is little information; and so it may fairly be assumed that, as a business cultivator, the system is not having prolific effect. Some electricity companies have been making a bold bid for custom in the wiring of new houses in the neighbourhood of London having rentals of about £30 to £35; and supplying when desired shilling-in-the-slot meters. The response to this is free gas-piping, and certain fittings, with shilling-in-the-slot gas-meters. And we believe this is answering well; one advantage, in addition to more light at less cost, being that consumers can have the convenience of a gas cooker.

In our review of the affairs of the electrical industry during 1909, a list of the failures of supply of which note had been made was included. It is, in passing, observed that the uncertainty of service is not one of the features of the retrospective writings in the electrical papers. Perhaps it is too much to expect of them. But,



when a water turncock at Sunderland inadvertently misapplied a key and cut off the gas supply in a certain district of the town, a leaderette appeared in an electrical paper (let it be nameless now) headed, if memory serves correctly, "The Biter Bit," regardless of the fact that cessation of supply is not a failure to which gas is perpetually subject as is the case with electricity. There were, as remarked above, several failures of the latter recorded last year; and this year has started badly. The list published on Jan. 4 did not include the breakdown on Dec. 28 of the supply at Dublin—the second within a few weeks—when private consumers, shopkeepers, and street lamps were involved; the private users only for about ten minutes, but the street lamps for the whole night. Last Monday evening, the people of East Ham were the victims of the perfidy of the electric current. The supply failed repeatedly—streets, business establishments, and private houses electrically lighted being plunged in darkness for three successive periods of five to ten minutes in the course of an hour after 8.15 p.m. To give business to the electricity undertaking, the street lighting by electricity is extensive. It is not in the interests of the ratepayers that the bodies responsible for local government should have any but the most reliable method of illumination in the streets; but the public safety is counted an insignificant matter when set against the increasing of the load on the electricity station. The Paris correspondent of the "Daily Telegraph" writing on Monday night last week, stated that one of the liveliest quarters of Paris—the vicinity of the Avenue de Clichy—had been subject to a partial eclipse of the electric light, which caused strange scenes in some of the cafés and music-halls. A short-circuit occurred on one of the big cables supplying electric light, which was followed by half-a-dozen similar accidents in various streets, so that the Electricity Company were compelled to shut off the current for the greater part of the night. It happened to be just at the time when the cafés and small theatres were filling up with people. The cafés had to resort to the usual expedient of candles stuck in the necks of bottles and to Chinese lanterns. The streets where electric light alone is used were completely in the dark.

The little Kentish borough of Gillingham, we fear, does not stand alone in respect of the internal troubles of its electricity concern. The Local Government Board some time ago saw that the undertaking was suffering from conditions which it was impossible to shake off; and it was also seen that the Corporation were not fully alive to the real position. The Board therefore advised the local body to have an expert investigation made; and this has been done—the examiner being Mr. J. F. C. Snell. What he has found at Gillingham, there is no question, applies to numerous other places. In the time when municipal electricity adventure was in full flush, and before experience had accrued, local authorities in the smaller towns were grievously misled by electrical advisers regarding the prospects of, and the necessary initial capital expenditure for, electricity supply. There are several stations to-day that have upon them a load of unproductive capital expenditure, and plant that is growing through insufficient use obsolescent, though of its kind in good condition, but, as things go to-day, uneconomical in working. Mr. Snell, in his report, asserts that the troubles of the concern are heavy and unnecessary capital expenditure, and a system that is not the most economical for the district. From this latter cause, the loss is considerable, as evidenced by the fact that in 1909 the units sold represented only 60·6 per cent. of the units generated. Owing to the heavy capital expenditure that would be involved, Mr. Snell is not in a position to recommend any serious change of system; and indeed so grave is the condition of the capital account, that he urges that no more money be spent, except when absolutely necessary. He, however, recommends certain improvements and changes which will involve an expenditure of some £3000, in order to give the undertaking a chance of doing something in producing economies with a view to a better financial showing. When the undertaking was inaugurated ten or eleven years ago, electricity was no doubt extolled as the means of lighting *par excellence*, the works described as second to none in the kingdom, the local councillors rubbed their hands gleefully in anticipation of profits to spend, and the ratepayers were congratulated on the business acumen shown by their local rulers. And now—. But let us leave it there.

One of the most delectable parts of the work of keeping oneself abreast of electrical view is the reading periodically of certain of the editorial matter that appears in the "Industrial Supplement" of the "Electrician." Sometimes it is prophecy, mingled with warning to the gas industry to prepare to meet its doom. Sometimes the writer postulates at large on gas matters, but rarely comes down to concrete points in proof. Sometimes he falls into humorous vein, and then writes much without having advanced anything definite that has not been said before, but showing remarkable agility in escaping from tight corners by avoiding figures, or else by limiting reply to some commonplace remark. We asked him on Dec. 21 to indicate what he meant by the "expensiveness" of heating water by gas, by showing the cost and duty rendered in comparison with the "Therol" electric heater. In "reply" to this, he refers us to the paper read by Mr. T. V. Fenn before the London and Southern District Junior Gas Association last May, and says this answers the challenge without going into figures, "which can be made to prove anything." What an easy means of escape! Does he actually know the relative costs for a given duty—duty embracing both quantity of water heated and time expended in the operation? Surely the

writer of editorial matter in the "Industrial Supplement" of the "Electrician" ought not to have to rely solely on a paper read before a Junior Gas Association for support of such a dogmatic statement as that "it is expensive to employ this [gas] fuel for heating large quantities of water." Regarding his charge as to the unhealthiness of gas, we suggested to our friend that he should study the latest gas appliances and health and mortality statistics to see whether the year-by-year progress in the consumption of gas is having any real dire effect. And this is the puerility to which we are treated in reply: "We are requested to study mortality statistics as a proof that gas is healthy or is increasing in healthiness. There is, however, such a thing as slow poisoning; and while gas in the home may not be exactly deadly, it does not add to the general health of the household." That is why, we suppose, gas workers enjoy a longevity that is notable among industrial workers. Unless the "Industrial Supplement" writer finds pleasure in making himself the laughing-stock of his readers, he had better cease the writing of such ridiculous rubbish as this, and set himself seriously to work to positively answer questions put to him. Words only do not constitute argument.

It also now appears that the knowledge of the writer in the "Industrial Supplement" on the question of the "expensiveness" of gas for water heating—that is, gas at a straight price without any "scientifically" composed mode of charging—is extremely limited. He confesses the statement was not original, but was based on information given by Mr. Fenn in the before-mentioned paper read before the London Juniors. Our friend remarks that Mr. Fenn said that "except for one or two storey houses, gas heating of water was too expensive." That is not what Mr. Fenn said. What he did say was that "in large and *very* lofty houses, and where an *immense* amount of hot water is required, gas is too expensive"—that is to say, in comparison with coal-heated boilers, or preferably coke-heated circulators. Then, proceeding, Mr. Fenn observed: "Gas for the modern flat and a two-storey house, for hot-water circulation, is effective and economical, and should be pushed for all it is worth." There is a big difference between Mr. Fenn's actual statements and the interpretation the leader writer in the "Industrial Supplement" chose to put upon them; and it is seen now how little ground he had for his former assertion as to expensiveness. If he had only made inquiry of the Gaslight and Coke Company, or any other gas company, he would have found that the business in appliances for domestic water-heating has made remarkable strides of late; so much so that substantial undertakings have now to employ plumbers as well as gas-fitters. All this is being done without any scientific rules as to the use of the appliances or the prices charged for electricity. A case of the application of a gas circulator in a large house in the suburbs of London was only brought to our notice last week. The owner had found that in the winter time the heating of the water required in the place cost him for coal on an average 15d. a day; while in the past quarter, with a gas circulator in use, the expense only averaged 7d. a day. This is in a big house—one that cannot be described as a flat or a two-storey house—in which the bath-room has frequent use, and hot water is on tap often during the day.

Our journalistic friend, as we expected he would, while not denying that 6 cubic feet of gas contain as many thermal units as a unit of electricity, drags out that alleged mysterious property of electric ovens for usefully utilizing practically all the heat available from the electricity consumed, which is supposed to counterweigh the thermal difference between gas and electricity. Of course, the suggestion is that the oven can be cased in, and that there is no need for ventilation; and therefore there is no loss of heat—presumably not even through radiation. It is a pretty theory—for commercial purposes; but, in practice, we have not found a pennyworth of electricity go so far in useful heating effect as a pennyworth of gas. The "Industrial Supplement" leader writer obviously does not agree with what Mr. R. Borlase Matthews, the author of the book on "Electricity for Everybody," wrote in "Electrical Industries," that certain types of cooker failed to properly cook certain items. "It is," Mr. Matthews continued, "difficult to say why this is so; but it seems likely to be due to *lack of storage* of heat in the oven itself, and absence of deflected or reflected heat from the oven top." Of course, the writer in the "Electrician" "Industrial Supplement" knows much better than Mr. Matthews. Then as to the ventilation of electric ovens, "Maud" has written in the "Electrical Review": "The only fault I have to find is the entire absence of a ventilator in the oven. The want of this ventilator means that there is always, when cooking, a fair amount of steam in the oven; and this tends to take up some of the heat which should be given to the contents of the oven." These are matters that were referred to in the "JOURNAL" for Nov. 9 last; and they suggest that the theory of the electrical press in this respect does not harmonize with practical requirement. One other point. Our friend is behind the times. We do wish electrical critics would keep themselves up to date in respect of improvements in gas appliances; it might save them falling into stupid error. This one refers to the "unpleasant dryness" associated with gas heating, and asks us to tell him why practically every gas-stove user employs at the same time a pan of water to moisten the air. Now how does this writer who only knew about the "expensiveness" of water heating by gas through a paper before the London Junior Association, know that practically every gas-stove user employs a pan of water. Not very long since we referred to this writer's prescience; now we find he claims to be omniscient.



It is false that practically every gas-stove user employs a pan of water to moisten the air. There was a time when the fad in this direction was fairly common; there were cases in which confessedly through faulty construction of fire there was some effect upon the humidity of the atmosphere. But the defects that produced this have been discovered and remedied. The water-pan is now a rarity. And what is more, an ordinary gas-fire will cause the air of an apartment to change between five and six times an hour. Does the electric radiator do this? Is there any other information the leader writer in the "Industrial Supplement" of the "Electrician" would like that is not in the paper read before the Southern Junior Gas Association?

## GAS REFEREES' "NOTIFICATION" FOR 1910.

THE "Notification" of the Metropolitan Gas Referees for the current year, which was issued last week, contains a few alterations beyond the one that was noticed in the "JOURNAL" for the 21st ult. (p. 806).

At the end of the second paragraph, setting forth the duties of the Referees, the words "under section 39 of the Gaslight and Coke Company's Act, 1909," are added after "section 5 of the London Gas Act, 1905." In the instructions in regard to the service-pipes conveying the gas to the testing-places, the last sentence reads: "No testing for illuminating power or calorific power is to be made until after the lapse of an hour since the last washing-out." In the instructions as to the times and mode of testing for illuminating power, it is mentioned that "the gas supplied by the gas companies is required to have an illuminating power of 14 candles." The three Metropolitan Gas Companies are now on the same footing as regards illuminating power, by virtue of the Act obtained by the Gaslight and Coke Company last session.

The instructions as to the mode of testing the calorific power of gas now open with the following sentences:—

In the testing-places for the Gaslight and Coke Company, "one testing only for calorific power shall be made at each testing-place daily; but in the event of the calorific power being on any testing ascertained to be below 112½ calories, the Gas Examiner shall forthwith give notice thereof to the Gaslight Company, and a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at such testing-place on that day." (The Gaslight and Coke Company's Act, 1909, section 39 [2].)

In the testing-places for the South Metropolitan Gas Company and for the Commercial Gas Company, the testing of the calorific power of the gas shall be made on such days as the controlling authority shall direct. (London Gas Act, 1905, section 5 [5].)

The calorimeter used is to be one which has been examined and certified by the Referees; and a description of it is given in one of the appendices. In order to test the gas for calorific power, it is to pass first through a meter and an "efficient governor;" the words quoted taking the place of "a balance governor of the same construction as those on the photometer table," in the preceding notification. Then follow these sentences:

This may be a balance governor or a diaphragm governor of a pattern approved by the Gas Referees, and in the latter case the governor may conveniently be placed in the base of the calorimeter. When so placed, a non-conducting sleeve should be introduced into the burner-tube, to prevent the governor from being unduly warmed by conduction.

In the section on the aerorthometer, it is mentioned, in accordance with the intimation given by Professor Vernon Harcourt in the number of the "JOURNAL" above referred to, that a second form of instrument, which has the advantage of being attached to the meter, and of having its bulb inside the meter case, is proposed as a substitute for that now in use. An illustrated description of it, on the lines of Professor Harcourt's communication, is given in one of the appendices.

A dinner will be held at the Waldorf Hotel, to-morrow (Wednesday), to celebrate the amalgamation of the Society of Engineers (established 1854) and the Civil and Mechanical Engineers' Society (founded 1859). Many distinguished guests have already notified their intention of being present. In view of the unique character of the event, and the fact that ladies may be present, a good attendance is anticipated—especially as this is the inaugural function in connection with the new Society which has been formed by the union of the two Societies mentioned as has already been referred to in our pages.

The Status Prize, consisting of books or instruments of the value of three guineas, will be awarded by the Society of Engineers each year for the four years ending 1913 for the best paper written by any person on the subject of "How to Improve the Status of Engineers and Engineering, with Special Reference to Consulting Engineers." The essays are to be of 4000 to 6000 words in length, and must be received by the Secretary (Mr. A. S. E. Ackerman, B.Sc.) on or before May 31 each year. All essays submitted will become the property of the Society; but the donor will have the right of publishing them or any part of them.

## DESSAU VERTICAL RETORTS AT SUNDERLAND.

### Results of the Guarantee Tests.

IN the "JOURNAL" for Nov. 23 last (p. 531), we published a photographic view of the installation of sixty 4-metre Dessau vertical retorts that have been completed at Sunderland; and referring back to July 6, a detailed description of the settings will be found. The bench has been at work now some five weeks under different conditions, to prove the best mode of working to meet the Sunderland requirements. But on the last days of the week ending the 8th inst., a test was made to prove the guarantees of the Dessau Vertical Gas-Retort Company; and the interesting results, as certified by the Engineer of the Gas Company (Mr. Chas. Drury), are presented hereunder. The figures, as Mr. Drury points out, fully satisfy the conditions of the Dessau Company's guarantees:

### AYRES QUAY GAS-WORKS—SUNDERLAND.

#### Result of Guarantee Test of Four-Metre Dessau Vertical Retorts.

Duration of test (10 a.m. Jan. 6 to 10 a.m. Jan. 8)	48 hours.
Number of retorts at work	60
Duration of charge (no steaming)	11 hours.
Coal carbonized (Holmside—Durham)	124'11 tons.
Gas made at 30'43" bar. and 48'7° Fahr.	1,430,000 c.
" corrected to 30" bar. and 60° Fahr.	1,492,900 c.f.
" " per retort	12,441 c.f.
" " per ton coal carbonized	12,028 c.f.
Illuminating power (No. 2 Metropolitan burner)	17'55 candles.
Calorific power (gross)	635'4 B.Th.U.
" " (net)	568'9 "
Coke used for fuel (dry)	17'33 tons.
" " per ton of coal carbonized	13'96 per cent.

NOTE.—The figures given above for barometer, thermometer, illuminating power, and calorific power are the averages of observations taken hourly during the test. The gas was purified by oxide of iron only; and no air was admitted for revivification purposes.

I certify that I have checked the above results, and find them correct, and that they satisfy the conditions of the Dessau Company's guarantees.

Jan. 10, 1910.

(Signed) CHAS. DRURY, Engineer.

### Breaking-Down the Gas.

Mr. Drury informs us that, since completing the guarantee tests, the retorts have been worked with twelve-hour charges, including one hour steaming; and the approximate results are as follows:

Number of retorts at work	60
Weight of average charge of coal	9½ cwt.
Gas made per ton (corrected)	about 12,400 c.f.
Illuminating power ("Metropolitan" No. 2)	about 15½ candles.
Calorific power (net)	about 550 B.Th.U.
Sulphur (CS <sub>2</sub> ) in purified gas (oxide of iron only)	per 100 c.f., about 20 grains.
Number of stokers employed	{ one man per eight-hour shift, with one fireman per day only.

(This does not include labour on coal and coke elevating plant, which is done by yard men.)

The above figures, as mentioned, are approximate only; and it is hoped that better results than these will be obtained with greater experience and more regular working.

## PROFESSOR DIXON ON FLAME.

LAST Wednesday afternoon, Professor Harold B. Dixon, F.R.S., delivered at the Royal Society of Arts the final lecture of his course, addressed to a juvenile audience, on "The Chemistry of Flame." After referring to the experiments of Boyle and Mayow, Priestley, Scheele, and Cavendish shown at the previous lecture (see ante, p. 98), by which it was demonstrated that part of the air—called "nitre air" or "fire air"—supported combustion, and that hydrogen united with this "fire air" produced water, the lecturer repeated some of the experiments of Lavoisier on the chemistry of oxygen, the name he gave to fire air. He showed that the oxygen existed in the steam and carbonic acid produced by burning a candle, and that it could be recovered again from the products of combustion. A flame was formed whenever one gas burnt in another; and air burns in coal gas just as coal gas burns in air. Then Sir Humphry Davy's experiments on the structure of a candle and a gas flame were shown; and Faraday's explanation of the light-giving part of the flame was proved to be not altogether correct. The effect of the mixture of air and of oxygen with hydrogen and coal gas was demonstrated, and the nature of detonation of gases and explosives was illustrated. It was pointed out that in each case a certain pressure must be reached in the combustion to make the mixture "detonate." Once detonation was set up, it continued at an absolutely uniform velocity, which could be predicted from the known constituents of the mixture. The enormously high temperature of a detonating mixture was shown by making an explosive mixture play on a lanthanum incandescent mantle.



## THE LIGHTING OF SKATING-RINKS

As Illustrated by the Sydenham and Forest Hill Skating-Rink



The Illuminated Sign and Sugg's Inverted Burner Lamps at the Entrance to the Rink.

[Taken by Gaslight.]

RINKING is the latest of English popular pastimes; the proper lighting of the rink is an art. The floor of a rink must be well lighted, and without shadows. The light must be steady and soft; and (this is a very important matter for consideration) not dazzling to the eyes of the rapidly moving skaters. A few high-power sources of illumination are therefore undesirable. Not only must the floor be illuminated without shadows, but the number of lights should be sufficient to ensure that there shall be no sharply defined shadows thrown by the skaters themselves. Dense moving shadows on the floor after one has had a few turns round a rink, spoil much of the enjoyment. The lighting, too, must be reliable and easily controlled. If these conditions are realized in the illumination of a rink, the pleasure of the exhilarating pastime is much intensified. Environment and prevailing conditions play a large part in the degree of one's pleasures. Amid the whirl and whir of the skaters, the writer was initiated into these points as to requirement in the illumination of skating-rinks, both from observation and in conversation with Mr. H. Baldry, the Distribution Superintendent of the South Suburban Gas Company, on, a few nights since, visiting the Sydenham and Forest Hill Skating-Rink to while away an hour or two; and he came away with information that may be useful to others who are considering the question of rink lighting.

The illumination of the place is excellent, the light is soft, there is an absence of irritating glare, the light is well diffused, and, as the merry throng were spinning round, it was noticed that there were no dense, sharply-defined shadows, such as are perpetually coming and going on a floor illuminated by high-power light centres, to worry the eyes and heads of the skaters. It is an excellent piece of lighting, demonstrating illumination propriety to purpose; and upon it Mr. Baldry, who (in consultation with his chief, Mr. S. Y. Shoubridge) was responsible for it, may be heartily congratulated. The installation was obtained by the South Suburban Gas Company in competition with the local Electric Supply Company; and the result is perfectly satisfactory to both the management of the rink and its patrons. The main part of the lighting is by Sugg's three-light inverted lamps, with domed reflectors. They are all on the low-pressure system; the supply being governed to 26-10ths. There is no missing the building at night time, as its position is marked in Silverdale, Sydenham, by three three-light Sugg "Regent" lamps, giving a combined illuminating power of 1500 candles. Over the entrance gate there is an illuminated gas-sign, the initial expense of which was borne by the Gas Company, in exchange for an advertisement; and on its face it bears the inscription: "Sydenham and Forest Hill Public Hall and Skating Rink, lighted and heated by the South Suburban Gas Company." Of course, the Skating Rink Company pay for the gas and maintenance. The maintenance, by the way, of the whole of the burners throughout the building is performed by the Gas Company. The sign (which is 12 feet long by 3 feet in height) was made for the latter by Mr. T. Pearce, of No. 274, New Cross Road; and the skating-rink management have in contemplation other gas illuminated signs—one in the main street, and one facing up Silverdale to the main street, directing to the rink. The outside lamps and sign are controlled by a main and bye-pass cock in a cupboard in the main entrance hall. Passing through, it is observed that over the front exit there is a single-light Sugg lamp (No. 1957) of 170-candle power. The entrance hall is lighted by two three-light inverted lamps of 500-candle power each; and the manager's office, by a 75-candle power inverted burner; and the pay office by a one three-light bijou lamp of 270-candle power. The entrance is, as is every nook and corner in the place, well lighted without eye-distressing glare.

We come to the central feature of the lighting—that is to say the rink itself. The maple wood floor is 158 ft. by 107 ft. in area. Here the major lighting is by forty of Sugg's (No. 1959) three-burner inverted lamps, with broad dome-shaped reflectors, to give a good downward illumination. Lengthwise of the building, the lamps are arranged in four rows of ten—the two outer rows being 14 feet from the floor, and the two inner ones 16 feet—thus giving an arch form to their suspension, and so removing the monotony of uniformity. The total illuminating power of the forty Sugg lamps is 20,000 candles; and, as the consumption of gas is 440 cubic feet per hour, the efficiency of the lamps may be taken to be about 45 candles per cubic foot of gas consumed. The gas-services to the lamps consist of four 1-inch main supplies and four ½-inch bye-pass supplies, which are reduced to ⅜-inch tubes on the down-pipes to the lamps. It is important that the lamps should be absolutely under control, in order that they may be rapidly lighted up and extinguished for scenic effects, when coloured lights are thrown from the corners of the rink by means of four electric arc lamps, which constitute the only use of electricity in the building. To get this rapid control of the gas-lamps, the whole of the cocks for the main supply are assembled in a small recessed cupboard immediately outside in the entrance hall; and there, by means of a single hand lever, the whole of the forty lamps can, with the greatest facility, be extinguished (leaving only the bye-passes) and then lighted up again. It would, we think (having witnessed the complete success of the quick extinction and equally smart lighting-up of the gas-lamps) be impossible to conceive of a better arrangement; and for the purpose—illumination without glare and heavy shadow—a better diffused light over the whole floor could not possibly be desired. Near the band-stand is an illuminated sign, giving instructions from time to time to the skaters. This is lighted by four Bray "C" upright burners, which are controlled by a pneumatic switch.

With regard to miscellaneous lighting, over the raised band-stand at one end of the rink, there are two three-light bijou lamps, with an aggregate illuminating power of 540 candles. Over the exits are four "Nico" inverted lamps, giving together 300-candle power; and at a special exit six flat-flame burners are fixed. The rink is built in the grounds of a large house, which forms part of the property of the Rink Company; and a portion of this house has been usefully brought into use in connection with the general attractions of the place. There is the refreshment room, which is lighted by two two-light Sugg (No. 1958) lamps, with a total illuminating power of 680 candles, and two inverted burners, giving together 150-candle power. Adjoining is a pretty winter garden, fitted with two three-light bijou gas-burners, giving together 540 candles. The cloak and retiring rooms are also mostly fitted with incandescent burners.

Regarding the heating of the building, this is accomplished by Davis's steamless gas radiators. There are sixteen ten-tube ones (39 inches high), in the rink, arranged five at each side, and three at either end. There are also four in the entrance hall, two in the refreshment room, and one in the ladies' toilet. In the house, gas-fires are fixed in the ladies' cloak rooms and in the billiard rooms. All the hot water required is supplied by gas-heated appliances. In the refreshment room, the provision for hot water is ample and up-to-date for all purposes and demands such as there is any likelihood of the rink having to meet. An interesting and really fine piece of work (supplied to the Gas Company by Messrs. W. M. Still and Sons, Limited) is Jones and Still's patent 12-inch boiling water apparatus, with nickel-plated coffee-making machine combined. It is fitted with a ⅜-inch gas supply, and a safety-valve to the water supply. Its delivering capacity is 150 pints of boiling water per hour, and yet the gas consumption is very small. On the opening day of the rink, the





The Illumination of the Rink Floor by Sugg's Three-Burner Inverted Gas-Lamps.

[Taken by Gaslight.]

machine had a severe test. The place was thrown open free, and afternoon tea was supplied free; and it is estimated that just over 2000 teas were served by the aid of this apparatus in little over an hour. It was only after the first hour that the machine failed to immediately respond to the demand for boiling water; and then merely a few minutes were required for it to recoup itself. Among other apparatus supplied and fixed by the Gas Company were a 1-gallon milk urn and a 1-gallon copper teapot. Over the sink in the refreshment room and in the retiring rooms, hot water is provided by a Wilson hot-water No. 1 circulator.

The whole of the work described was smartly installed by the Gas Company's men, under the direction of Mr. Baldry—six

fitters (with six labourers) accomplishing the work in eighteen working days. In the fitting-up of the place, exclusive of connecting-pieces, tees, bends, &c., no less than 5135 feet of piping were used, comprising 220 feet of 2-inch pipe, 428 feet of 1½-inch pipe, 1715 feet of 1-inch pipe, 838 feet of ¾-inch pipe, 1304 feet of ½-inch pipe, 216 feet of ⅜-inch pipe, 92 feet of ¼-inch pipe, and 322 feet of ⅓-inch pipe.

The result of the work is a fine demonstration of the illumination efficiency of low-pressure inverted gas-lights for the special purpose; and there is in the effect the testimony to completeness in scheming the arrangements.

## GAS BILLS FOR 1910.

### [THIRD ARTICLE.]

TO-DAY, four of the Bills promoted by Statutory Gas Companies for extended powers are reviewed.

The first Bill is that of the Ammanford Gas Company, who were incorporated last year, and obtained parliamentary powers, with a capital of £18,000, and authorization to supply gas in Ammanford and Llandeibie in the County of Carmarthen. The preamble of the present Bill carries the history of the concern a few steps beyond where it was left at the time of the passing of the Act last year. The Company were to take over the undertaking of the Amman Valley Gas Company, Limited—one of the Eaton group of promotions—on arbitration terms; the arbitrator appointed for the purpose (on the nomination of the Board of Trade) being Mr. Charles Carpenter. In the copy of the Bill before us, the amount of his award has not been filled in. The new Company, however, are now supplying gas. But they are living under the baneful influence of their predecessors' reputation; for we read in the preamble: "Whereas the circumstances connected with the promotion and history of the Limited Company have brought the said undertaking into discredit in the locality of Ammanford, with the result that it is impossible for an immediate issue of the capital of the Company to be made upon reasonable terms . . . it is expedient therefore that the purchase price should be discharged by the issue of debenture stock redeemable at the end of five years." It also appears that "the Company are unable to obtain satisfactory information as to the amounts of certain debentures issued by the Limited Company and the debts secured thereby, and the consideration received by the Limited Company for the issue thereof; and it is expedient therefore that special provision should be made as in this Act contained for distributing the debenture stock to be issued

by the Company as aforesaid, and for ascertaining the amount thereof proper to be issued in respect of the debentures of the Limited Company." Further, "an action has been instituted in the Chancery Division of the High Court of Justice for the purpose of enforcing the security of the holders of debentures charged on the undertaking and property of the Limited Company, and in the said action R. & A. Main, Limited, are the plaintiffs and the Limited Company are the defendants." Mr. A. C. Hutchins has been appointed by the Court, and is acting as Receiver in the action. It is found, too, that the Limited Company only possessed a limited interest in the site of the existing works; and therefore the new Company want to acquire by compulsion or agreement scheduled lands. That is, as divulged in the preamble, the further history of the undertaking. Examining the clauses of the Bill in detail, provision is found in respect of certain of the matters referred to. It is asked that the area of supply may be extended so as to include Llanedy and a defined part of the parish of Bettws. Power is requested for the constructing, maintaining, and working of a railway siding at Tirydail, communicating between the Great Western Railway and the gas-works. Provision is included for the creation of a special class of stock, to be known as "purchase debenture stock," for a total amount equal to the price of the undertaking of the Limited Company; the stock to carry interest at the rate of 4 per cent. per annum—this constituting a first charge on the undertaking. A condition attaches, entitling the Company to redeem all or any of the purchase debenture stock by payment to the holder of the amount of principal and interest secured thereby, or by purchasing it from the holder by agreement at a price below par; the Company being bound to redeem at par the whole of the purchase stock outstanding at the expiration of five years from the date of issue, unless the holders agree with the Company in writing for the postponement of the redemption to a later date. This scheme, it is proposed, shall not affect the borrowing powers under the 1909 Act. The promoters also ask for authority to



require from the Receiver the production of reasonable evidence to prove the amount of principal and interest duly owing for proper consideration in respect of debts of the Company secured by the issue of the debentures of the Limited Company; and the Company, if they are dissatisfied with the evidence produced, desire to be allowed to require that the amount owing shall be determined by the Court on a summons to be taken out by the Receiver in the action pending by R. & A. Main, Limited. [Parliamentary Agents: Messrs. Baker and Co.]

The preamble of the Brighton and Hove Gas Company's Bill is a modest one; and several of the clauses in it are of ordinary form. Among other matters, they take power to enter into agreements with proprietors of navigations, &c., within the limits of supply. Power is taken to create reserve, special purposes, and capital redemption funds—the last named at the discretion of the Directors by half-yearly appropriations as part of the expenditure on revenue account of any sum not exceeding an amount equal to  $\frac{1}{2}$  per cent. on the paid-up capital, including premiums, and all money borrowed or raised on capital account. The section is not to operate in respect of any half year immediately succeeding any period of twelve months ending either on Dec. 31 or June 30, during which the gas sold by the Company has exceeded the rate of 1 million cubic feet for each £500 of the paid-up capital for the time being of the Company, including premiums thereon and all moneys borrowed or raised on capital account and at the time outstanding. The amount of the carry-forward is limited to the equivalent of a year's dividends. There is a proposed amendment of section 17 of the Company's Act of 1881, referring to the Directors' fees. The alteration contemplates the reading and effect of the section to be as if the sum of £2250 had been inserted instead of £1500. A further amendment of former Acts, intends that the sections in view shall be read and construed as if the months of February or March and of August or September were substituted for the times prescribed by the former Acts for the holding of the half-yearly general meetings of the Company. From Jan. 1, 1911, the standard price of gas to be charged by the Company for gas supplied by them in Brighton, Hove, Preston, and Aldrington (the inner area), it is intended, shall be 3s. 3d. per 1000 cubic feet, with the sliding-scale operating half-yearly. But in the outer area, the price it is proposed shall not exceed that charged in the inner area by more than the following amounts: In Portslade, Southwick, Kingston, New Shoreham, and Patcham, and in part of Rottingdean as defined, 6d. per 1000 cubic feet; in Old Shoreham, Lancing, and Ovingdean, and in the remainder of the parish of Rottingdean, 1s. per 1000 cubic feet; and in any other parish or place within the outer area, 1s. 3d. per 1000 cubic feet. Notwithstanding, the Company provide that they may charge in any one or more of the parishes comprising the outer area, a price or prices less than those they are authorized to charge, subject to the reduced prices not being at any time less than the price charged during the same time within the inner area. The prepayment clause is inserted, but is varied by the provision that the charge for the hire of a prepayment meter without fittings shall not exceed the rate of  $17\frac{1}{2}$  per cent. per annum on the cost of the meter and its fixing. It is proposed that the prescribed illuminating power of the gas supplied shall be 15 candles, as tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Sherwood and Co.]

In the main, the Bill of the Bristol Gas Company is for money purposes. The Company request power to raise additional capital not exceeding in the whole £400,000 by the creation and issue of general capital stock. It is asked that the amount the Company may raise on mortgage, and in respect of which they may create and issue debenture stock in accordance with the provisions of the Acts of 1891 and 1899, may be increased by one-fourth part of the amount the Company may have actually raised by the issue of general capital stock under the powers of this Act. Authorization to the creation of a special reserve fund is desired. The promoters seek to be empowered, by agreement with the holders of debenture stock created and issued by the Company under the Act of 1873, to at any time redeem or purchase the same or any portion thereof. To the extent of the nominal amount of such debenture stock so redeemed or purchased, the power of creating and issuing debenture stock under this Act, it is proposed, shall be deemed to be increased. The object of this is to secure that the whole of the debenture stock of the Company shall rank *pari passu*. The Company are asking for the repeal of so much of section 21 of the Act of 1873, as relates to sulphur other than sulphuretted hydrogen, and to remove from them any liability to penalty or forfeiture by reason of the presence in the gas of sulphur impurities other than sulphuretted hydrogen. In the Act of 1873, the illuminating power of the gas was prescribed at  $13\frac{1}{2}$  candles; the testing-place being at the Corporation offices. It was then stipulated that, in the event of the testing-place being removed to the Company's works, the prescribed illuminating power should be 14 candles. These provisions were altered in 1891 by the substitution of  $14\frac{1}{2}$  candles for  $13\frac{1}{2}$  candles, and 15 candles for 14 candles. It is now proposed that the prescribed illuminating power of the gas be 14 candles, tested by the "Metropolitan" No. 2 burner—the illuminating power to be ascertained by taking an average of three consecutive testings on each day at intervals of not less than an hour. If on any day, the illuminating power is less to an extent not exceeding 1 candle than it ought to be, the Company (it is proposed) shall not be liable to penalty or forfeiture; but the illuminating power shall be deemed to be represented by the average of the illumi-

nating power of the gas supplied on that day and on each of the two next following days, with no liability to penalty unless the average illuminating power be less than that prescribed. Sunday testing is excluded. The Company are asking for power to deal with escapes of gas on consumers' pipes or fittings, by cutting off the supply if the escape is not remedied in twenty-four hours after the service of a notice by the Company. They further desire power to require the alteration of the position of a meter in certain cases. As to the exercise of the powers of section 22 of the Gas-Works Clauses Act, 1871, in regard to unoccupied premises, the Company ask—where they are unable, after due and reasonable inquiry, to ascertain the name and address of the owner or lessee of such premises or of the agent—for the right to enter the premises for the purposes of the section without giving the notice thereby required. Obligations in regard to the supply of gas are amended by this provision: "Notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give, from any main, a supply of gas for any purpose other than lighting in any case where the capacity of the main is insufficient for such purpose, or if and so long as any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes." Stand-by supplies are also dealt with—the Company asking that, where a consumer has a separate service, he shall not be entitled to demand a supply from the Company's mains, unless he has previously agreed to pay such minimum annual sum as will give a reasonable return on the capital expenditure and standing charges incurred to meet the possible maximum demand for the premises. The following provisions refer to the appointment of a Managing-Director of the Company:

The Directors of the Company may appoint any one of their body to be Managing-Director of the Company either for a fixed term, or without any limitation as to time, and may remove or dismiss him from office, and appoint another in his place.

A Managing-Director shall not, while holding that office, be subject to retirement by rotation, and shall not be taken into account in determining the rotation of retirement of Directors; but if he ceases to hold the office of Director from any other cause, he shall *ipso facto* immediately cease to be a Managing-Director.

The remuneration of a Managing-Director shall from time to time be fixed by the Directors, and may be by way of salary or commission or participation in profits or by any or all of those modes.

The Directors may entrust to, and confer on, any Managing-Director such of the powers exercisable by the Directors, and subject to such conditions, as they may think fit, and may from time to time revoke, withdraw, alter, or vary, all or some of such powers. Provided that the Directors shall be responsible for the acts of any Managing-Director acting under the powers of this section.

The Directors also take power to determine the salary paid to the Secretary. [Parliamentary Agents: Messrs. Dyson and Co.]

The East Grinstead Gas and Water Bill is chiefly concerned with water supply, in which respect the provisions will be noticed in due course when dealing with the water measures. Sanction to the raising of additional capital to the amount of £40,000 is asked, on which the dividend is to be limited to 7 per cent. The new auction clauses are to be adopted. Borrowing powers to the amount of one-fourth are requested. [Parliamentary Agents: Messrs. Rees and Freres.]

## WORKMEN'S COMPENSATION STATISTICS.

In the course of an article in Saturday's "Pall Mall Gazette," Mr. G. A. Macdonald deals with some unexpected results of the extended liability of employers which was brought about by the Workmen's Compensation Act of 1906; and he points out that it is under pressure exercised by the Insurance Companies that the working classes are feeling the disastrous effects of the Act. They are, he says, insisting upon certain physical standards on the part of workmen before they will undertake the risks laid on employers by the Act; and the pressure under this head will increase, for insurance rates are rising, and the conditions of policies get more severe as the scope and working of the Act become clear. Employers report that, notwithstanding all expedients for minimizing risks, the average disbursements for compensation rise steadily; and the insurance premium is now a serious addition to establishment charges. We are, he thinks, approaching the time when a strict medical examination will be necessary before the responsibility of engaging a workman can be undertaken; and he asks, "Will the leaders of the Labour Party in this country ever learn that the laws which govern the economic relationships of men are not as club rules, to be abrogated at will?"

In view of these uncompromising expressions of opinion, it may perhaps not be out of place to give some official figures from the most recent Home Office statistics (for 1908) of compensation and of proceedings under the Workmen's Compensation Act, 1906, and the Employers' Liability Act, 1880. This Blue-Book is of special interest on the present occasion, inasmuch as the period dealt with is the first complete year in which the 1906 Compensation Act was in force—it having become operative in July, 1907. Under section 12 of the new Act, the Secretary of State is empowered to require employers in any industry specified by him to furnish annually information as to the number of cases of compensation, the amounts paid, &c. The earlier Acts contained no



provision for the making of returns to show the working of the systems of compensation which they established; and the sources from which official statistics could be obtained were therefore limited to those cases in regard to which some sort of proceedings ensued—the great majority of cases (those in which a settlement was arrived at by agreement) being perforce left out of consideration. Thus the present volume commences a new series of statistics. Previously, seven groups to which the Acts applied were included—railways, factories, mines, quarries, engineering work, building, and agriculture. Under section 12 of the new Act, however, the Secretary of State directed that returns should be made for mines, quarries, railways, factories, harbours, docks, &c., constructional work, and shipping (excluding sailing vessels in the sea-fishing service); these being the industries which, by reason of their being subject to regulations under other Acts, or of their concentrated character, afforded a possibility of obtaining returns sufficiently complete and accurate to be of value. In addition, however, to the statistics of compensation cases in the industries included in the order of the Secretary of State, general particulars, similar to those published in previous years, are given in regard to the administration of the Acts. A few figures from Part I. (statistics of compensation cases in certain industries) are set forth here; reserving Part II. (administration of the Acts) for future consideration.

The information asked for by the Secretary of State was the number of fatal cases in which compensation was paid during the year and the amount—distinguishing cases where persons wholly dependent, cases where persons partly dependent, and cases where no dependants were left; the number of disablement cases in which compensation was paid during the year and the amount—distinguishing cases continued from previous years and cases in which the first payment was made during the year; the duration of the compensation in disablement cases; and the settlement of disablement cases by lump sum payments. The returns were of two kinds—collective returns supplied by insurance companies, employers' associations, and others; and returns direct from individual employers. Of the latter 34,659 were received—no less than 31,416 being to the effect that there had been no cases of payment of compensation under the Act of 1906, to which, of course, the powers contained in section 12 are confined. Contracting-out schemes, payments under the earlier Acts, and damages under the Employers' Liability Act, are not included. The figures do not, therefore, it must be remembered, represent the total charge upon the different industries in connection with the payment of compensation to persons employed in respect of injuries received. The gross total of compensation paid in the seven groups of industries named during 1908 under the Act, as shown by the returns, was £2,080,672, and represented 3473 cases of death and 325,484 cases of disablement. The gross total of the persons employed in the seven groups of industries is shown by the returns to be about 7½ millions; but it is thought that the figures for some of the groups of factory industries are possibly overstated. As was only to be expected, during the first year, difficulties were experienced in collecting the returns; the number of undertakings to be dealt with being between 130,000 and 140,000. The Act, it may be pointed out, gives power to prosecute employers failing to make the required returns.

Coming to the separate industries, the first dealt with is shipping. In 371 fatal cases, the compensation paid was £61,333—an average of £165 per case; and in 5877 accidents involving disablement, the compensation was £51,519—showing an average of £8 15s. per case. The total number of seamen returned as being within the Compensation Act was 235,001; and the compensation paid in the year works out at 9s. 7d. per head. In considering the figures relating to this industry, however, there are numerous special conditions to be borne in mind. For instance, no compensation is payable under the Act in cases of disablement in respect of the period during which the owner is liable under the Merchant Shipping Acts to defray the expenses of maintenance of injured seamen.

The next returns are in respect of industries carried on in factories to which the Factory and Workshop Act, 1901, applies. Workshops under the same Act are not included. The classification is under ten groups: Textile—Cotton; wool, worsted, shoddy; and other textiles. Non-textile—Wood; extraction, founding, and galvanizing of metals, including conversion; marine, locomotive, and motor engineering, and shipbuilding; manufacture of machines, appliances, conveyances, and tools; paper, printing, stationery, &c.; china and earthenware; and miscellaneous. The returns indicate that the number of fatal accidents in which compensation was paid in the year was 951, with £130,506—or an average of £137; while the number of disablement cases was 136,357, with £660,301 compensation—an average of £4 17s. per case. The number of persons employed amounts to 5½ millions. Both the number of cases in which compensation was paid and the persons employed are in excess of the corresponding figures reported under the Factory Act; but the compensation statistics cover a somewhat wider field, as they include outside as well as inside hands. On a rough estimate, the number of accidents that disabled for more than seven days would seem not to have exceeded 100,000. Compensation for industrial disease was paid in 24 fatal cases to the amount of £3620—an average of £151; and in 542 disablement cases to the amount of £7617—an average of £14. The total charge for compensation under the heading of factories was £802,044; and it works out, on the number of employees returned, at 1s. 6d. per

head in the cotton industry, 9d. in the wool, 6s. 3d. in the metal, and 12s. in the engine and shipbuilding industries. On a rough calculation, the charge comes out approximately at 3s. 5d. per £100 of wages for the cotton trade, 2s. 2d. for the woollen trade, and 2s. 2d. for the other textile trades.

In connection with docks, the compensation for 156 fatal accidents was £21,254—an average of £136. There were 10,591 disablement cases, with compensation amounting to £65,220—an average of £6 3s. Compensation was paid for industrial disease to the extent of £254, making the total compensation £86,728. On a total number of employees of 67,929, the compensation works out at £1 5s. per head.

The returns in respect of the mining industry appear to have been fairly complete. The approximate average number of persons employed to whom the Act applies is 1,047,862. The compensation paid in respect of 1301 fatal accidents was £226,226—an average of £174; and in 137,622 non-fatal cases, £601,848—an average of £4 8s. A sum of £13,382 was paid in connection with diseases, making the total charge £841,456, the great bulk of which naturally fell upon the coal industry. At the coal mines, there were 1285 fatal accidents, out of 1345 reported under the Mines Act as the total number of deaths by accident in 1908. The charge of the Compensation Act on coal-producing mines is about 0·7d. per ton raised. The number of persons employed in coal mines during the year, both above and below ground, was 972,232, so that the compensation that was paid amounts to not quite 17s. per head.

During 1908, there were 6938 quarries over 20 feet deep at work, in addition to a number of shallow open workings. For 88 fatal accidents there was paid £11,501—an average of £131; and for 5284 disablement cases, £23,056—an average of £4 7s. The amount of compensation paid in respect of industrial disease was £241, making a total charge of £34,798. Taking the figures of persons employed as returned to the Inspectors of Mines (85,475), this represents a charge of only about 8s. per head.

Under the head of constructional work, the returns can only be regarded as approximate. The intention was to cover as nearly as possible the large body of men engaged on what are known as engineering works—buildings (except when forming part of an engineering work) being excluded. The number of fatal accidents reported was 119, with total compensation £13,551—an average of £114; and of disablement cases 6805, with £38,269 compensation—an average of £5 12s. Compensation was paid to the amount of £108 in respect of industrial disease, making the total charge £51,928, or 8s. 2d. per head on the number of employees returned.

From the railway companies there is a prominent omission—the Great Eastern, who have a contracting-out scheme. Among the clerical staffs, only 3 fatal accidents and 39 disablement cases were returned, in respect of 54,508 employees, with total compensation of £355. In connection with the 396,884 other railway workers, there were 458 fatal accidents, with £67,515 compensation—an average of £147; and 20,649 disablement cases, with £82,924 compensation—an average of £4. Some of the latter were payments continued from the previous year. The compensation paid for disease was £72. During the year, the total compensation paid for railway servants (other than clerical staffs) works out at 7s. 7d. per head of the number employed. Taking the Board of Trade figures as to average weekly earnings of railway servants, and excluding the clerical staffs from the total of persons employed, the compensation charge for the year works out at about 14s. 6d. per £100 of wages paid.

One table shows the duration of compensation for disablement; and in regard to this it is remarked that the high proportion of cases lasting over two weeks and less than three, is striking. This group accounts for 27 per cent. of the whole number of cases in all the industries, and in mining as much as 31 per cent. Under the Act, cases where the incapacity lasts less than two weeks receive compensation only for the days of incapacity in the second week; whereas cases which last at least a fortnight receive compensation for the first week of incapacity as well.

## THE HAMBURG GASHOLDER DISASTER.

By F. S. CRIPPS, Assoc.M.Inst.C.E.

GASHOLDERS of the vaulted tank type have many weak spots; but, above all, it is necessary that the water level inside the holder should never fall below the level of the roof of the tank. The roof should always be covered with a film of water, otherwise the slightest leak in the roof allows of the gas escaping into the vault below. The gas, being at a higher pressure than the air, forces its way downwards through any leak, displacing and mixing with the air below, thereby causing an explosive mixture.

The moral of this is that at least two water-level gauges or indicators should be fixed, to show the exact depth of water covering the roof of the vault. Two gauges are required in case one should get out of order or blocked. The water-gauge must not be open to the atmosphere, but in connection with the gas pressure inside the holder, as well as the water, or the water-level will vary in the gauge just as it does in the tank outside the holder. A water-level recorder should also be fixed, so that the engineer of the



works may know that the water has been kept at its proper level at all times. Unless some such precaution as this is taken, the risk is very great indeed.

Observation of the water level in the annular tank outside the holder is apt to be misleading, owing to the fact that the levels inside and outside do not agree. Although outside the holder the levels vary according to the number of lifts in suspension, the level inside remains practically stationary after the holder has once been fully inflated, unless the tank leaks. Of course, common sense demands that a watchful eye should be kept on these gauges. Indeed, the same care should be exercised as is called for in countless other similar ways on a gas-works, and which form part of the ordinary routine of a gas manager's duties. As an extra precaution, it would not be difficult to arrange for an alarm bell to ring inside the vault, as well as in other parts of the works, immediately the water level becomes lower than the normal.

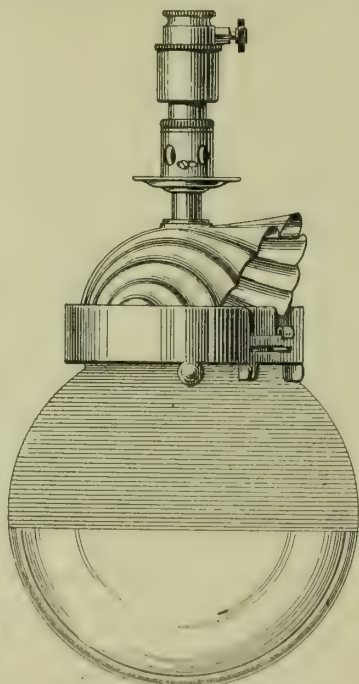
It is obvious that if water always covers the top of the tank, gas cannot possibly enter the vault from the holder; so that, providing the structure is strong enough to resist the forces acting upon it—that is does not collapse under the load, &c.—no explosion can occur in the vault by reason of gas escaping from the gasholder itself. Explosions may occur therein from other causes, just as they may in a private house; but they could not be attributed to any leakage from the gasholder itself.

It may be asked, What should be done to avoid an accident if the water level is shown to be falling? If the lowering of the water level should be caused simply by evaporation, it would only be necessary to put more water in the tank, and to keep it constantly replenished. If, however, it should be due to leakage, or, in any case, if the top of the vault became unsealed, all lights and fires inside the tank and in the immediate vicinity of the holder should be extinguished at once. No time must then be lost in making good the water level and emptying the holder of gas, so that the defects, whatever they may be, can be made good with safety.

As an outcome of the disaster at Hamburg, it should be made compulsory that gauges and recorders should be fixed in connection with all gasholder tanks of the over-ground vaulted type.

## AN INVERTED BURNER ANTI-VIBRATOR.

ATTENTION has been drawn to another one of those useful little contrivances which assist in increasing the efficiency of the inverted burner as a lighting medium. This time it is an anti-vibrator, which Messrs. J. & W. B. Smith, of the Farringdon Road, are putting upon the market. The accompanying illustration shows the appliance fitted to one of the firm's "Shell" burners; but, unless any doubt should be raised on this head, it may at once be mentioned that it can be supplied with a screw thread to fit any burner of whatever make. The anti-vibrator is so compact in construction (besides being enclosed in a brass casing) that at a first glance one might almost be pardoned for altogether overlooking it. On a careful scrutiny, however, it will be noticed that it is fixed between the gas adjuster and the air adjuster; the length of the burner connection by its addition being increased not more than about one inch. When the casing is unscrewed, it is seen that the anti-vibrator consists of a coil spring which, though small, is amply sufficient to perform the duty that is required of it. Being so simple, the cost of the anti-vibrator is exceedingly moderate; and this should assist in securing a wide demand for it.



A "Shell" Burner, showing Anti-Vibrator Fitted.

**Masonic.**—Last Thursday Bro. William Langford, of Longton, was installed W.M. of the "Etruscan Lodge," No. 546. The ceremony took place in the Masonic Hall, Caroline Street, Longton, and was attended by a large number of Grand Officers of the Provinces of Staffordshire, Lancashire, and Yorkshire. There were several interesting features in connection with the working in the lodge. First, the united ages (in Masonry) of the Past Masters occupying the Wardens chairs and the Inner Guard, amounted to 135 years, or an average of 45 years each. Secondly, the incoming Master was honoured by the presence of the D.C. of the Grand Lodge of England as the D.C. of the lodge, in the person of W. Bro. G. C. Kent, the Town Clerk of Longton.

## STRASBURG GAS-WORKS AND SUPPLY.

[CONCLUDING ARTICLE.]

As intimated at the close of the second article on Strasburg, in the "JOURNAL" last week (p. 93), the concluding article on M. Gaston Kern's interesting book on the gas supply of the city will be devoted mainly to the public lighting.

M. Kern appropriately opens this portion of his subject with a notice of the life and work of Dr. Auer von Welsbach, and then tells us something about the adoption of the incandescent system of gas lighting in Strasburg. The first appearance of Welsbach burners in the city was in 1886; but their high price was a bar to their general adoption. It was not until 1890 that the burner was brought within the reach of ordinary consumers, and that its economy as a light-giver rendered it popular. The then Mayor (M. Back) was desirous that Strasburg should, as soon as possible, enjoy the advantages afforded by Dr. Auer's invention; and after a trial of the system, extending over two years, in the Place Broglie, the Municipality, on Jan. 19, 1900, concluded an agreement with the Union des Gaz Company for the general introduction of Welsbach burners for the public lighting. By the 1st of October in the same year the change to the new system had been duly effected. This was a complete victory over electric lighting, for, under the terms of the Company's concession, the Municipality had the right to make a trial of the electric light in one-fiftieth of the area within the fortifications. They availed themselves of it from 1890 to 1894, and lighted the Place Broglie and some neighbouring streets. The installation cost 45,000 marks (£2250), and the price charged for current was so high that the scheme was abandoned in 1898 in favour of gas. It is scarcely necessary to say that the Company did not fail to fully maintain their supremacy. They accordingly offered the Municipality two very fine five-branch standards in the Place Impériale, each branch supporting a five-burner lamp. Each standard projected from a height of about 20 feet an amount of illumination equal to 2500 candles, and compared very favourably indeed with the electric arc lamps. The electric lighting in the railway station square, which had been in use for about ten years, gave place to Welsbach burners when these were generally introduced in 1900. The firm of Himmel, of Tübingen, undertook the installation of six monumental three-branch standards, each lantern containing five 100-candle Welsbach burners. One of these is shown in the accompanying illustration and a two-branch standard by the same firm is shown in fig. 3. In this installation Herr Himmel brought into use for the first time his patent arrangement for lowering and raising the lanterns (see fig. 2). With the exception of being rather expensive to keep up, these lamps have for a number of years given entire satisfaction. A very fine wrought-iron standard, carrying three lamps, erected in the Place Gutenberg, is shown in fig. 4; and a single-lamp pillar, on the Pont de la Poste, in fig. 5. Various other installations of less importance, using inverted burners and high-pressure gas, have been put up; and the system of distance lighting has now been introduced in the extra-mural quarters of the city, to which there was little prospect of electric lighting being extended, and where the control of the lamplighters gave some trouble. The occupation of these functionaries, however, will soon be gone.

On the 30th of April, 1908, there were in use 5624 public lamps. While for these the upright mantle has, with very few exceptions, been retained, the private consumers generally prefer the inverted type of burner. M. Kern thinks that this burner would not have sufficed to enable the Company to meet the competition of electricity if distance lighting had not come to its aid; and Strasburg was one of the first cities in Europe to adopt it on a large scale. Preliminary studies led to the abandonment of all flash-light arrangements, and the adoption of the "Multiplex" electric system, devised by Herr von Mohrstein, of Berlin, which has given entire satisfaction for a period of six years. Of the 140,000 gas-burners in use in the Company's area of supply, about half of them are upright and one-fourth inverted incandescents, and the remainder are open-flame jets. Up to the time of the preparation of the book, the Company had been entrusted with the maintenance of about 3000 Welsbach burners, all fitted with "Multiplex" lighters. The greater number of these are in restaurants and beershops; but some are employed in large warehouses. The system has proved a powerful corrective of the infatuation of the public for the electric light; and in many cases it has led to the return of some of the Company's lost customers.

These improvements in lighting, however, are not the only means employed by the Company to maintain and strengthen their position. They offer special inducements, in the way of gratuitous installations, to consumers to take a supply of gas, which is charged at a reduced price if used for heating or cooking; while rebates are allowed for large quantities. Meters, stoves, and fittings are let on hire on the most reasonable terms. The hiring department is in a special part of the works, and has a staff to renovate all appliances returned from consumers. Those which are too worn or are out of date are sold, in order to avoid accumulations of old goods. In 1908, there were sent out 4080 meters and 4222 stoves; while 2544 of the former and 6585 of the latter were returned, consequent principally on change of abode. The Company vary from year to year their methods of increasing the use of gas by means of advertisements, literature, lantern pictures, and posters. In 1892, they invited the artists of



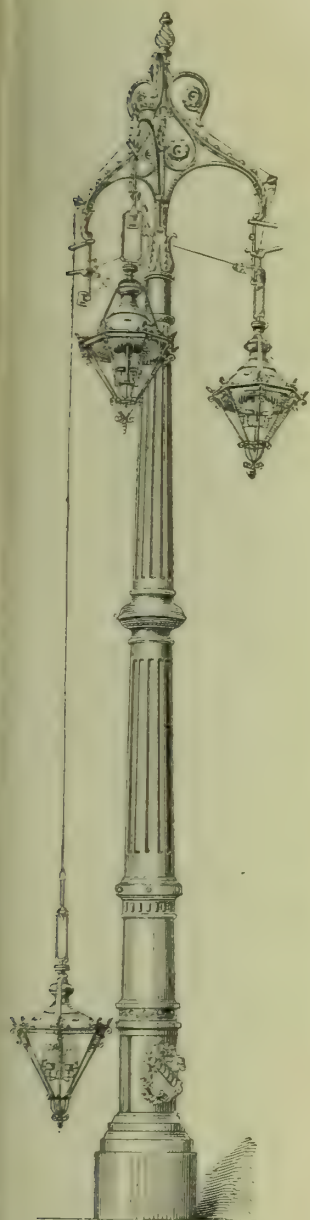


Fig. 1.

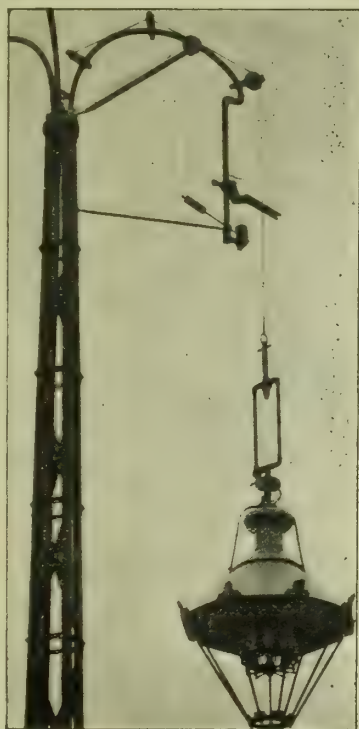


Fig. 2.

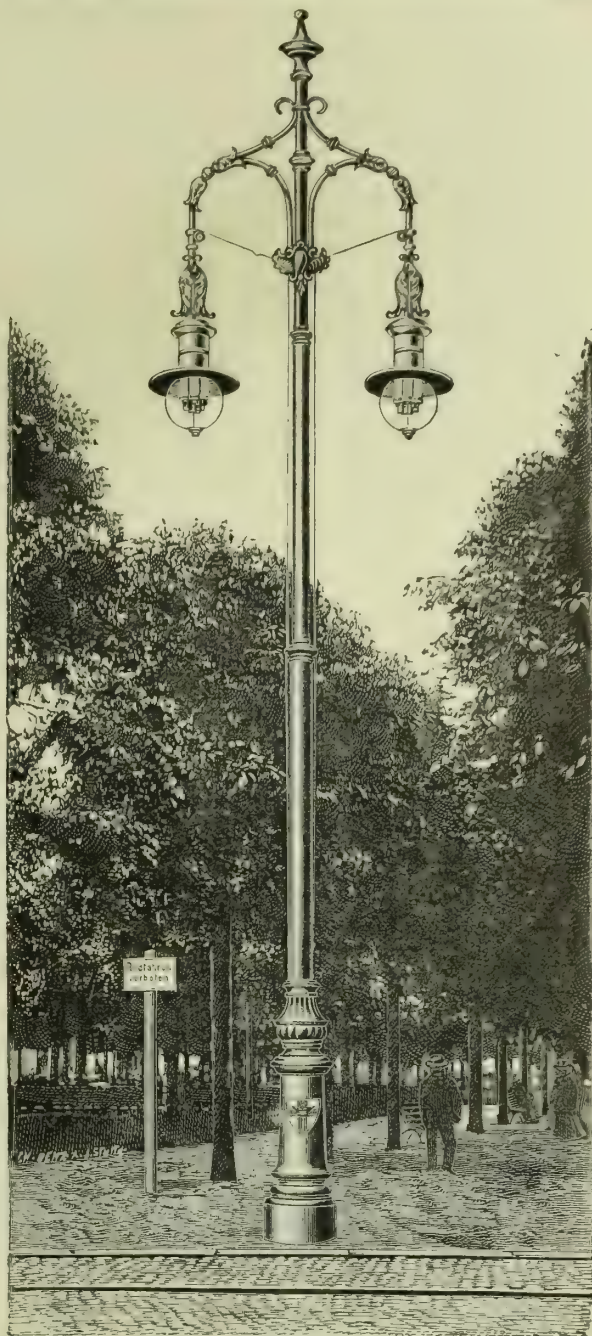


Fig. 3.



Fig. 4.



Fig. 5.

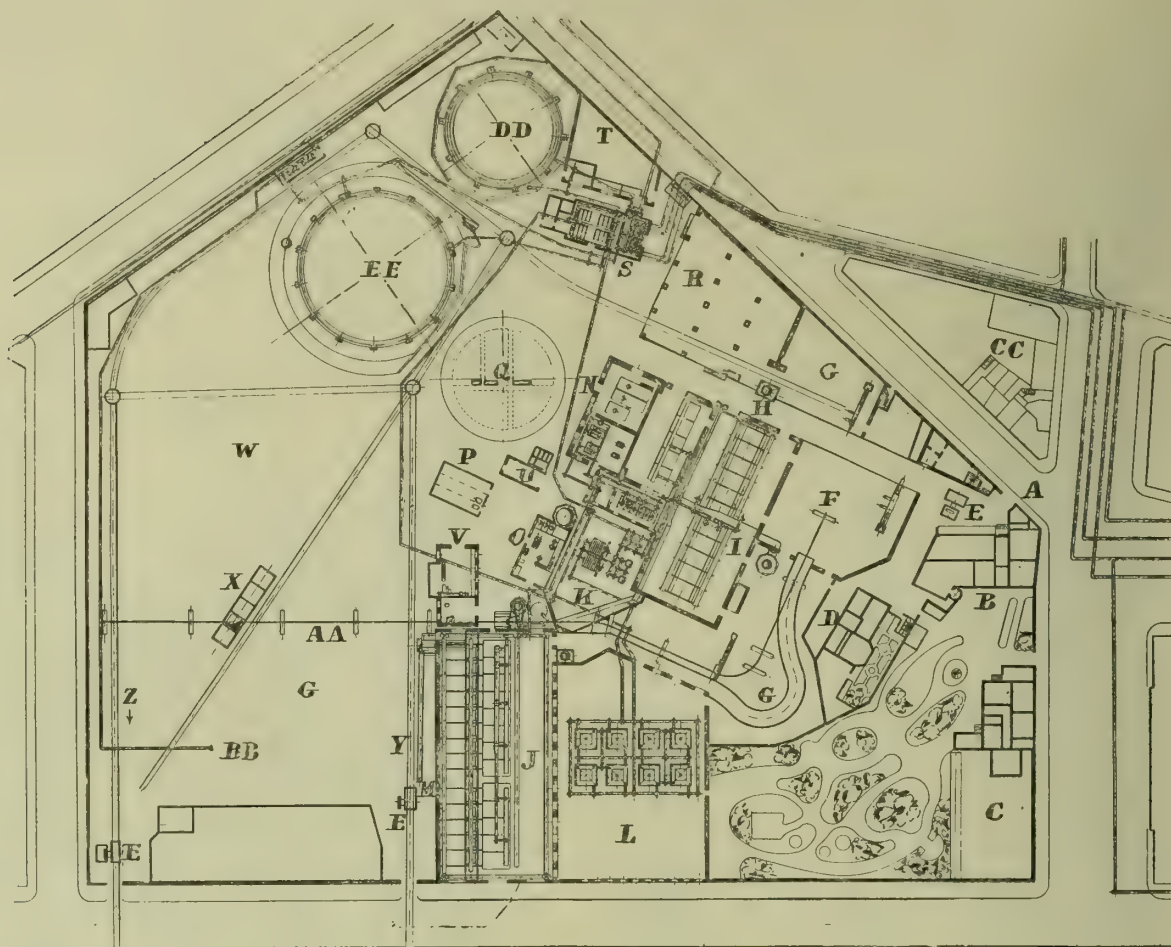
250 frs., 125 frs., and 75 frs. The picture was 20 in. by 28 in. The Queen of Night was the title of the one submitted by M. Eugène Moeckler, of Strasburg; and a very effective coloured reproduction (7 in. by 10 in.) appears in M. Kern's book. The picture was so good that it was hung in the halls of hotels, restaurants, and beershops, and was even admitted into the ante-rooms of the Government and municipal establishments.

From the year 1900 onwards, several contracts were entered into by the Company for increasing their business. In 1901, the Treaty concluded with the important commune of Schiltigheim in 1866 was prolonged; in 1902, the commune of Hœnheim, lying to the north of this place, was added to the area; and in 1904 the commune of Lingolsheim, on the east of the city, was taken in. In the same year, the Municipality submitted to the Company a scheme for extending the public lighting all over the outskirts, partly lighted by oil and partly unlighted. It was a question of putting down about 15 miles of mains; and it necessitated entering into a fresh agreement, which was concluded on June 13, 1904. The most important extension undertaken by the Company was the acquisition in 1905 of the gas-works at Kehl, a small Baden town of about 4000 inhabitants, which was rebuilt to a large extent after the bombardment of Strasburg. The idea of enlarging the gas-works in the city by an annex erected outside had been for a long time entertained; and the situation of the works at Kehl appeared to meet all the requirements. These works were constructed in 1861; and in 1905 they occupied an area of about 4320 square yards, and were producing about  $3\frac{1}{2}$  million cubic feet of gas per annum. After having acquired some 22,000 square yards of land to round-up the property, the Company proceeded in 1908 to construct new works capable of producing from 500,000 to 700,000 cubic feet of gas per day. They are situated at the extremity of the Company's mains, and are connected with Strasburg by two 6-inch pipes laid in the north pavement of the bridge crossing the Rhine. The new station is intended to furnish an auxiliary supply of gas to the extent of 10 per cent. of the requirements of the consumers; and a special agreement was entered

Strasburg to compete for prizes for an effective pictorial advertisement. The subject given was a bird's-eye view of the city by night, lighted by incandescent burners. The three prizes were



STRASBURG GAS-WORKS IN 1908.



- A. Entrance.  
B. Offices.  
C. Manager's House.  
D. Carbonizing Foreman's House.  
E. Weighbridges.  
F. Coke Shed.  
G. Coke Ground.  
H. Coke-Quenching Tower.  
I. Old Retort-House.  
J. New Retort-House.  
K. Condensors and Washers.

L. Purifier House.  
M. Conveyor.  
N. Exhausters and Boilers.  
O. Sulphate House.  
P. Tar Tanks.  
Q. Liquor Wells.  
R. Coal Store (Workmen's Rooms above).  
S. Meter and Governor House.  
T. Stores.  
U. Smithy.

V. Workshops.  
W. Coal Ground.  
X. Coke Sorting Shed.  
Y. Entrance for Waggons.  
Z. Exit for Waggons.  
AA. Overhead Railway.  
BB. Pipe for Filling Balloons.  
CC. Laboratory.  
DD. Three-Lift Holder (318,000 c.ft. Capacity)  
EE. Four-Lift Holder (876,000 c.ft. Capacity).

PLAN.

into to this effect with the Strasburg Municipality on Dec. 25, 1908. The gas is sent under a pressure of 40 inches of water from the farther side of the bridge by means of a rotary pump of American make. At a certain point, where the pipe divides into two branches which run into the city, there has been fitted up a governor which reduces the pressure throughout the district to the normal.

In order to present in a concise form the results of all the Company's efforts to extend their business, M. Kern gives a table showing the consumption of gas for various purposes in a period of nineteen years; and some of the figures, in cubic metres (1 cubic metre = 35.3 cubic feet), are reproduced in the following table:—

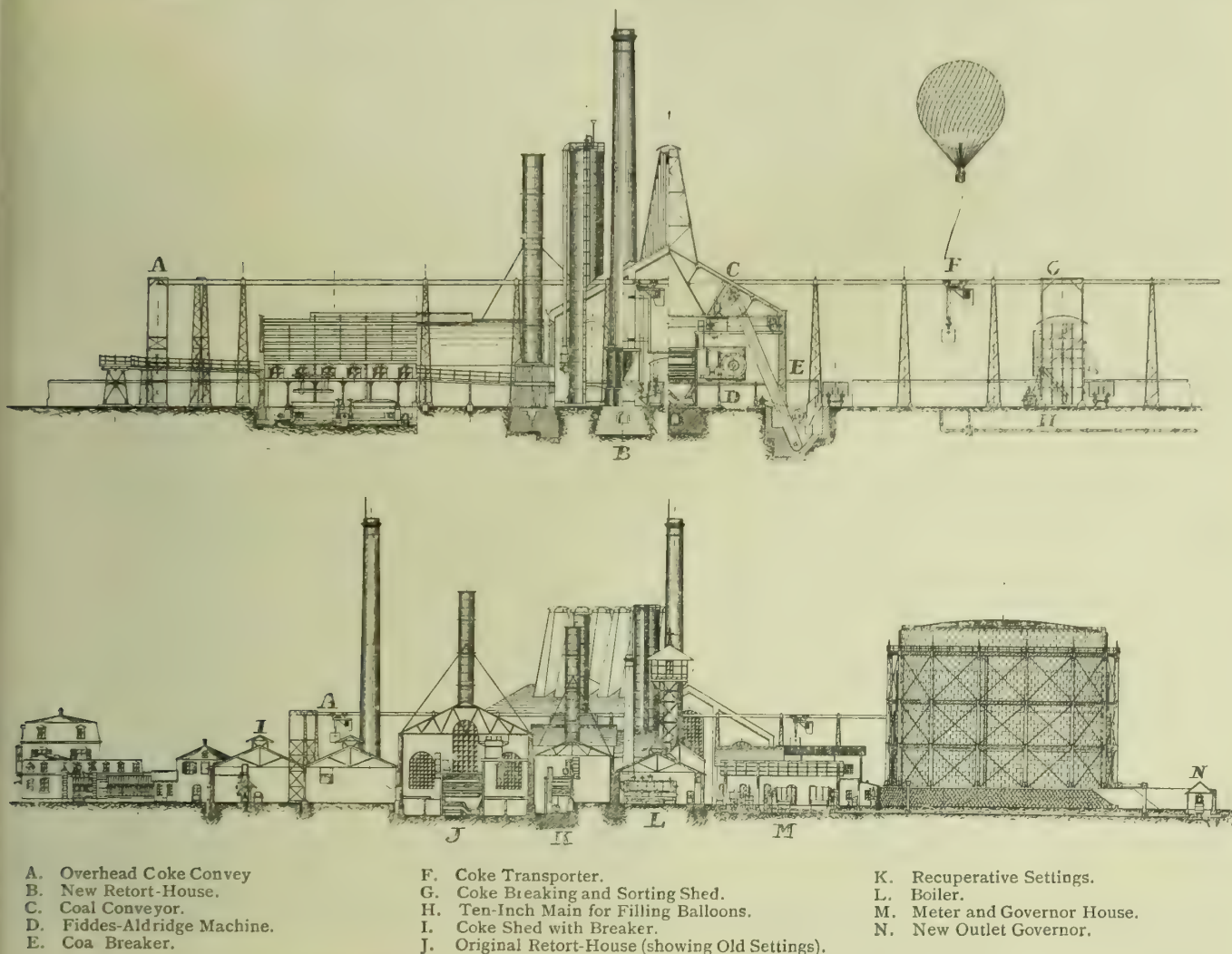
Years.	Private Lighting.	Heating and Cooking.	Motive Power.	Public Lighting.	Total Production.
1889-90	3,482,560	28,591	249,057	816,842	5,585,970
1894-95	3,517,328	395,851	705,317	1,035,694	7,079,780
1899-00	3,786,970	3,480,294	568,209	1,550,087	11,329,750
1900-01	3,967,924	4,133,038	546,907	1,623,462	12,117,590
1901-02	3,618,062	4,919,715	476,128	1,411,853	12,453,710
1902-03	3,549,786	5,360,394	440,985	1,412,889	12,875,900
1903-04	3,469,849	5,826,930	393,203	1,461,543	13,082,090
1904-05	3,553,899	6,446,939	332,327	1,525,653	14,144,660
1905-06	3,681,203	7,159,686	346,881	1,687,817	15,291,644
1906-07	3,584,034	7,902,693	293,730	1,836,470	16,298,794
1907-08	3,391,489	8,674,441	257,038	1,883,005	17,094,795

These figures show that the use of gas for heating and cooking purposes has extended in a most unexpected manner; while gas has kept its position as an illuminant, notwithstanding the occurrence of certain circumstances which were calculated to adversely affect it. For instance, in 1892, Berlin time was adopted throughout the empire. This retarded the lighting-up time by half-an-hour in Alsace, and consequently was detrimental to the consumption of gas. On the 100,000 burners in use by the consumers, this loss may be estimated at close upon 90,000 cubic feet. In 1895, a law came into force under which shops were closed after

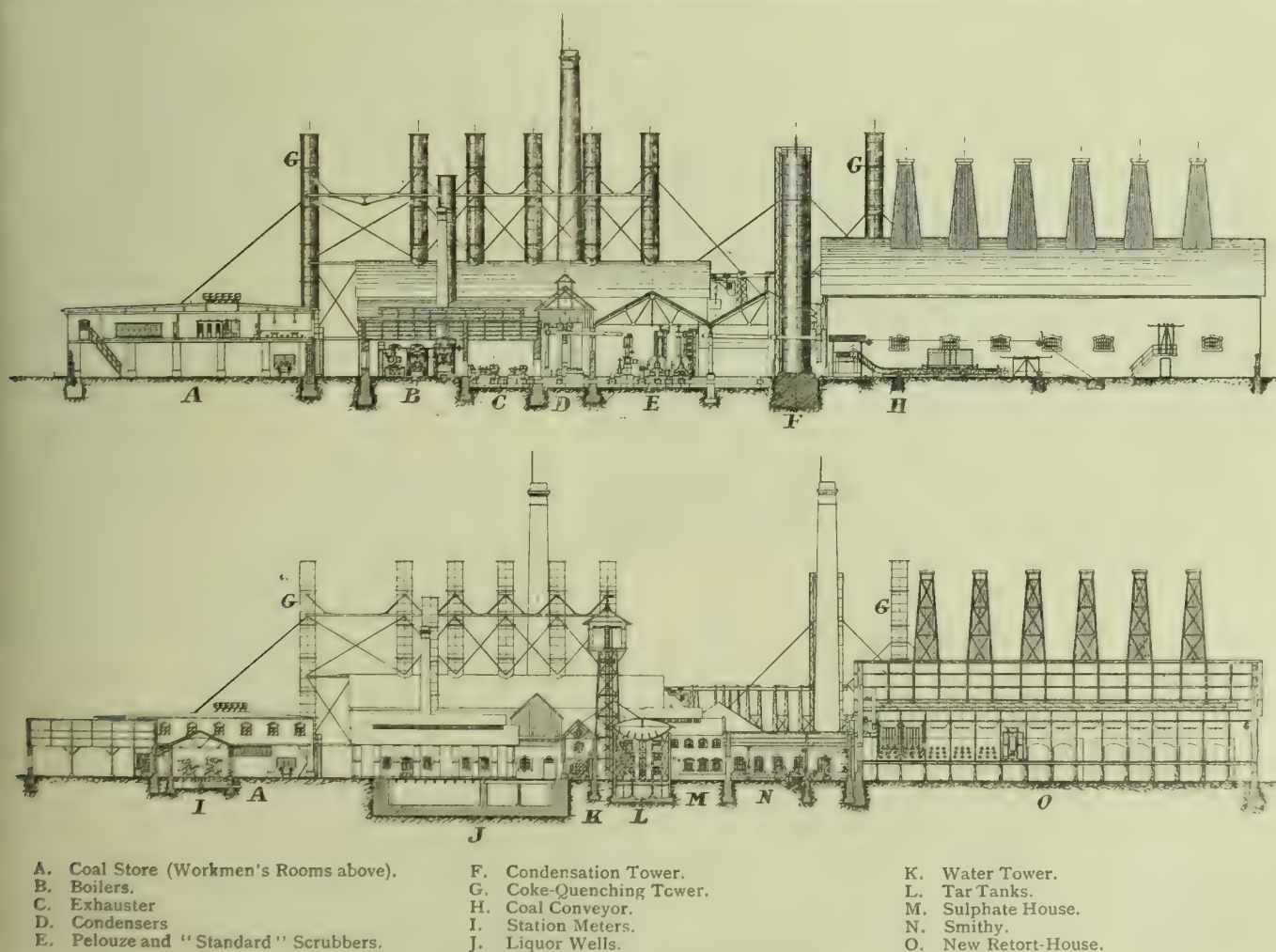
midday on Sundays. This had the effect of cutting out sixty days' gas consumption by the shopkeepers of the city. The introduction of the Welsbach burner for both public and private lighting in 1900 should have resulted, owing to its economy, in a reduction of 50 per cent. in the consumption of gas for lighting; but this is not apparent from the figures in the table. The falling off was doubtless compensated for by the extension of lighting installations brought about by the superiority of the incandescent over the old system. Reduced to the consumption per private burner, however, the difference is seen at once. From 1880 to 1895, the average consumption per burner was 2600 cubic feet per annum; in 1897, 3650 cubic feet; in 1899, 4275 cubic feet; in 1900, 4000 cubic feet; but in 1901, only 2330 cubic feet. Finally, in 1906, most of the shopkeepers agreed to close at eight o'clock at night. However, notwithstanding these unexpected occurrences, no very serious effect was produced upon the consumption of gas; nor is any feared in the future. Gas has so many uses, and is adaptable to so many requirements, that it will continue to prosper, to the great benefit of humanity.

It now only remains to say of M. Gaston Kern's interesting book, that its two closing chapters are devoted to the arrangements made by the Company for the comfort and welfare of the employees, and for providing for their needs in sickness and old age; and to those for furnishing the gas needed by the aeronauts. In the latter connection, it may be mentioned that one of the 48 ascents which took place in 1908 was made on Sept. 24 by Captain Lohmüller, accompanied by schoolboys—Adolphe and Raoul Kern, respectively sixteen and fourteen years of age—with the object of taking a bird's-eye photograph of the works. The weather was favourable, and a good picture was the result, as testified by the reproduction which appears on the last page but one of the book. In the "JOURNAL" for the 4th inst., we gave plans of the Strasburg gas-works as they were from 1858 to 1861, and from the latter year to 1870. We now supplement them by reproducing a plan, on a larger scale, showing the works in practically their present condition, and also four sectional drawings of the buildings and plant.





LONGITUDINAL SECTIONS THROUGH THE WORKS—SOUTH TO NORTH.



SECTIONS THROUGH THE WORKS—EAST TO WEST.



## A VISIT TO COTTAGE LANE METER WORKS

By the London and Southern District Junior Gas Association.

The members of the Association last week had an opportunity—of which a large number availed themselves—of visiting the old-established meter works in Cottage Lane, City Road, E.C., with which the name of Parkinson has for very many years been connected. Some time ago, Messrs. Parkinson and Co. joined forces with Messrs. W. & B. Cowan; and since then the style of the firm has been Messrs. Parkinson and W. & B. Cowan, Limited. To avoid any chance of overcrowding, and consequent missing of points by the visitors, it was arranged that the inspection should be made by two parties, on Wednesday and Thursday afternoon respectively. On the former day the attendance was about 25, which number was increased to some 35 on the Thursday. The President of the Association (Mr. W. J. Liberty) was present on both days.

Before proceeding to give an indication of the works as they are now, it will be of interest to say a few words about the early history of the firm. The business was established in the year 1812 by two brothers, Samuel and John Crosley; and with them was associated Mr. Clegg, the original inventor of the wet meter. The meter, however, as Mr. Clegg invented it was not practical until it was taken in hand by Mr. Samuel Crosley, who turned it into a commercial success. The two brothers Crosley died in 1847; and Mr. W. Parkinson (the father of Mr. W. C. Parkinson, the present head of the business) succeeded them. Mr. W. Parkinson died in 1854; but his son was not then of age, and so did not take possession until 1862. There was thus an interregnum of eight years, during which time there were one or two managers, who kept the business going without any break. Mr. W. C. Parkinson himself carried on the works until about ten years ago, when the firm joined Messrs. W. & B. Cowan, and formed the present Company, of which Mr. W. C. Parkinson's son, Mr. W. W. Parkinson, is now a Director with him. It will thus be seen that Cottage Lane is the original home of the wet gas-meter. About twenty years back, it should be mentioned, Mr. Parkinson acquired a Birmingham factory by purchasing Bent and Son's business.



Engineers' Shop.

From small beginnings, the Cottage Lane Works have steadily progressed, until now they cover a very large ground space, and give employment to no less than 300 men, one at least of whom has been in the service of the firm for a period of no less than 48 years. In fact, it is, in these days, when so much is made of the young man, extremely pleasing to enter a works where so many old servants are employed as is the case at Cottage Lane. In the large new brass shop—of which more anon—the statement was made by the genial foreman that nearly every man there had been married while with the firm—that is, they had been brought in as lads and had stayed on as men. Some of them even have now their sons engaged in the shop. Everywhere order, thoroughness, and a high personal standard are to be observed in the men. In certain desirable respects firm supervision is exercised, from which the employees have no doubt derived great benefit. Gambling is absolutely forbidden; and so is money-lending—one of the greatest possible curses, where it exists, in workshops. Any

political talk is as far as possible prevented. From good men and good machinery, good work would naturally be expected; and an inspection of the works (apart from the firm's world-wide reputation) is sufficient to convince one that the two conditions are present, and that the result which would be looked for from them is actually attained.

On arrival, the visitors were promptly taken in hand by Messrs. W. C. Parkinson, W. W. Parkinson, and W. Cheshire (Directors), who, in conducting the party round the factory, were assisted by Messrs. A. E. Hayes, W. J. Wright, W. E. Toynnton, and P. G. Parkinson, Mr. F. R. Smith being away from England on a short holiday. The inspection was commenced at the engineer's and erecting shop—the latter a very high building about 50 feet long and 30 feet wide, excellently lighted by glass in the roof. The members were fortunate in being able to see in course of construction various parts of a 100,000 cubic feet per hour square station meter. Cylindrical meters were also seen finished and in



Tinsmiths' Shops.

parts, as well as retort-house governors and other of the firm's specialities. The machinery in the engineer's shop is driven by a 50 H.P. steam-engine, and includes a very large (one of the biggest in the country, it is said) side-planing or edge-planing machine. There is also an original type of edge-turning and facing machine, which was made by the firm themselves to do work that was previously performed by hand. With the machine, it is possible to do in a few hours what used to take two men several days to accomplish far less efficiently. It has been said that this useful appliance was "home made;" and this, it may be added, is a feature of many of the machines about the factory—which shows both the ingenuity possessed by the firm and their employees and the wide range of work that can be carried out in the shops. There are in the works three power tin-stamping machines. Before leaving the engineer's shop, the foreman pointed with pardonable pride to the Babcock and Wilcox boiler, which has been installed since 1897, and has never yet drawn forth a bad report from the inspector.

Passing through the tin-plate store, the cutting out and stamping shop was reached; and here, among the numerous appliances at work, was seen a circle cutting and edging machine, made by one of the firm's own men some forty or fifty years ago. Most of the brass castings required are made on the works; and there are in the foundry two furnaces. They also make all their own solder; the mixture of tin and lead being run into open moulds. Hereabouts a demonstration was given of the working of an ingenious little machine for the casting

of valve-gratings under pressure. On the top floor of one of the buildings is the corner where the Persian sheepskins—the only leather used—are first cut out, and examined for the absence of holes in a dark room; and close by the leathers are fitted to the diaphragm rims.

The three tin shops—the top, middle, and bottom tin shops, respectively—were next visited. These are very roomy and excellently lighted shops. In the first of them, the repair work is carried out. All meters when they come in are tested; and, in fact, the work entailed in repairing a meter seems to be almost as much as that which is involved in making a new one. For all the tinmen's fires, it may be noted, gas is used. The ordinary gas supply is governed down to a pressure of 1½ inches; and at the point of ignition air under a pressure of 20 inches is admitted. One of the reasons why gas is employed in this connection is that about twelve years ago there was a fire in the works which was put down to the charcoal furnaces that were then used. And, in



addition to this danger, charcoal is, of course, a dirty heating medium as compared with gas. In the portion of the factory devoted to new work, a feature of interest was a table which had been laid out with automatic meters in various stages of construction. First all the parts were shown; and in succeeding sections meters were seen with gradually more and more parts fitted, and in each case the remaining parts lying in front. To the uninitiated, it was perhaps somewhat surprising to learn that an ordinary dry meter is made up of about 54 separately named parts, and that, as many of these are duplicated, there are over a hundred parts in a finished meter of this type. In a slot-meter, of course, there would be many more. All the meters being made at the time of the visit were of the dry pattern; large numbers of wet meters in both tin and cast iron cases being made at their Birmingham factory. The bottom tin shop is utilized for the carrying out of large work. For raising and lowering goods to and from the different floors, there is both a hydraulic and a hand lift.



Where the Large Work is Done.

An important branch of the works is the testing of meters; and for this elaborate provision is made. Preliminary proving of the meters is accomplished with gas; a pressure of not more than about 1 inch being employed before the meter is boxed up. With reference to the finished meters, it has of late years been found necessary to increase the pressure of gas for soundness. Formerly, about 6 inches was regarded as sufficient; but since the introduction of the prepayment meter, it has been thought better to make doubly sure by raising the pressure to a maximum of (say) 18 inches. The final air-test is carried out with air under a pressure of 5-10ths. The explanation given by Mr. Donald Cheshire of the action of the Beasley recording gas calorimeter (which was described and illustrated in the "JOURNALS," for Sept. 21, 1909, Oct. 27, 1908, and July 30, 1907) was followed with great interest by members. They subsequently visited the paint shop and stores, the packing shed, the water-meter testing shop (the firm have their special make of water-meter, it may be remarked, as well as of gas-meters), and the carpenter's shop. On the way, they learnt that the japanning required is done on the premises in a gas-heated oven 5 feet by 4 feet.

This brought the party to the final shop, to which reference was made at the commencement of our notice—namely, the brass work and index shop. This is a big building which was only put up a few months ago, and for the accommodation of which several cottages had to be demolished. Previously, the work which is done here was carried out under far less satisfactory conditions in another part of the factory. The new roof-lighted shop contains at least forty machine tools, and provides work for some sixty employees, all of whom are on piece-work with the exception of three boys. Many of the machines are of an intricate nature; and one of them at least is quite automatic in its action. It merely needs attention at the start and at the finish of its operation—which is the cutting of sixty teeth on twenty-four wheels at the same time. Thus a man who has a machine of his own to look after can also give the trifling attention to this one which it requires. Other of the machines are but little less automatic in their action than this. Members were able to see screw-cutting being done by hand—a useful craft which seems, however, destined to drop gradually out of use owing to increased introduction of machines. The machinery in this shop includes a Keith compressor used for the high-pressure gas with which the place is supplied for lighting, blowpipes, &c. There are 60 Keith inverted 100-candle power gas-lamps on this system; but lights off the ordinary gas-main are also provided, in case

of the high-pressure plant being at any time brought to a standstill. The Keith installation is, it was generally admitted, an admirable illustration of what the lighting of a factory should be. In addition to the high-pressure gas soldering stoves, there is a lacquering stove connected to the same system; and in the foreman's office and store there is an effective little high-pressure heating stove. The parts made in the shop are stored in hundreds of small iron bins, and handed to the tin-shop men as required. Much interest was displayed in a Crosley rain-gauge which was seen working (with the aid of a jug of water) in the store.

At the close of the inspection, the party repaired to the offices, where they sat down to meat tea, on the invitation of the firm—the chair being occupied by Mr. W. C. Parkinson. At the conclusion of this welcome item of the programme, on Thursday,

The PRESIDENT (Mr. W. J. Liberty) said it was an extreme pleasure to him to find himself at these works that day, as he had known Mr. Parkinson for many years. Some fourteen years ago, he was there with the original London Junior Gas Association, when the visit was paid under the presidency of Mr. G. P. Lewis, then of the Crystal Palace Gas Company; but he did not think he would now recognize the works. The firm were gradually absorbing the whole of the north side of Cottage Lane. The cottages were disappearing; and the works were growing. They must attribute this greatly to the introduction of the slot-meter. At the time of the previous visit, this appliance was being very much talked about, but not much used. At the present day, however, it was a most important branch of manufacture. Perhaps there was nothing much more interesting than meter making. It reminded them of clock making, when they came to look at the numerous parts which had to be so carefully and accurately made to avoid the possibility of any mistake. Once upon a time there were no meters; and it was to that great and indefatigable man Clegg, the Engineer of the Chartered Gas Company, that they owed the gas-meter. Most of those present had had experience of what was called the "rental department." The origin of this was that, there being no meter on which to base the charge to the consumer, the rates for gas were fixed upon a rental per burner. He quoted the charges made in 1820 and 1821 in Wandsworth and Bodmin. The rates in Wandsworth were, per annum, for a No. 1 argand: Dusk till 9 p.m., £2 10s.; till 10 p.m., £2 16s.; till 11 p.m., £3 4s.; all night, £4 8s. If burnt on Sundays, a sixth extra. One jet for hall



Interior of the Brasswork and Index Shop.

or passages, 4-inch flame, £1 10s. At Bodmin, the prices from dusk till 9 p.m. ranged from £1 for a single jet to £3 10s. for a 16-hole argand, with later consumptions in proportion; one hour extra being allowed on Saturday nights, and a reduction on £2 2s. lights and over being made for four lights and upwards. There was also the same stipulation as to one-sixth extra charge being made in the event of gas being used on Sundays; and there were various other conditions. About 1820, he continued, Clegg was trying to lift the gas industry out of the rut into which it had fallen, after the enthusiasm engendered by Winsor and Murdock had died down. He was the Livesey of those early days, and, with untiring energy and pluck, came forward to put an end to this peculiar condition of things. He invented, among other things, two kinds of useful mechanism in connection with the gas industry. One was a tap for automatically shutting off the gas when a flame became accidentally extinguished; and the second was an instrument which was called "Clegg's self-acting gauge,"



by the introduction of which justice was done to both consumer and seller. This machine, it was stated, "measured and registered, in the absence of the observer, the quantity of gas delivered by any pipe connected with the gas-light main." It occupied a space of about 2 feet by 1 foot. This was really the first gas-meter; but though it was made a scientific success, it was not a commercial success. It was left to Mr. Clegg to come down to Cottage Lane, the home of the gas-meter industry, and submit the instrument to Mr. Samuel Crosley, who put it on the market, and secured its adoption by the gas companies. This it was that made their visit that day so peculiarly interesting. He felt they were right in the midst of the home of the gas-meter industry. If they looked down the list of their patrons, they would find the honoured name of Charles Hunt. When Mr. Hunt went from Yarmouth to London, he came to Cottage Lane, where he worked for three years. Then he went to the old London Company, and from there to Birmingham. Thus the place where they were assembled had a good record, having been in touch with the leaders of the industry. The visitors had been much engrossed in the various things on view. They had seen many appliances besides gas-meters, which showed that the premises were so well equipped with plant that they could turn out a great variety of goods. One point he had noticed about the works was a Suggestion Box, which held out inducement, in the shape of rewards, for useful thought. Payments of 5s. to £5 were made according to the value of the suggestion; and the firm had in this way paid many sums to the workmen. This showed the nice relationship that existed between the employees and the heads of the establishment. Well, he hoped he might be alive in another fourteen years' time to pay a further visit to the works. If so, he would expect to see the whole of the north side of Cottage Lane absorbed by the firm. The members greatly appreciated the kindness that had been shown them on this occasion.

Mr. E. G. STEWART (Fulham) proposed a hearty vote of thanks to Mr. Parkinson and the other gentlemen who had shown them round, and to the firm for the invitation to visit the works and the hospitality they had extended to the members. He remarked that he was surprised at the number of men employed, and had been much struck with the order and cleanliness everywhere exhibited. It was evident the greatest sympathy existed between the Directors and the employees.

Mr. F. CAULDWELL (Kilburn) seconded, and expressed admiration for the ingenuity displayed upon the works. Specially admirable features were, he considered, the lighting and machinery in the brass shop.

The resolution having been put and carried with applause,

Mr. W. C. PARKINSON returned thanks on behalf of himself and his co-Directors, Mr. W. Cheshire and Mr. W. W. Parkinson. He said he was glad to find that the members of the Association had appreciated and understood a good deal of what they had seen that afternoon, and also that they had been pleased with what he might term the "finale" in connection with it. This was not a function that very often took place at the works. There was a tradition that something of the sort was done when the first square station meter was constructed; but as this was years even before he had anything to do with the factory, it might or might not be a fact, for all he could say. Seeing that he had been connected with the place for over fifty years, he could look back a long time. The gas industry seemed to be about a hundred years old. Things were rather indefinite with respect to that time; but he believed it was just over a hundred years ago that Mr. Clegg put up the first complete installation to supply gas—not to sell it to the public, but to furnish it to a mill in Yorkshire. It was very soon after this—about the year 1812, he thought—that the old Chartered Gas Company started with their Brick Lane and Curtain Road Works, within half-a-mile of where they were now assembled. Things were very different now; and work which evidently passed well at that time (though there was some good work done even then) would not do to-day. As they had seen, it was necessary to do everything with an extreme amount of precision and accuracy, in order that the public might have confidence in the apparatus for measuring gas, and that the gas suppliers should be satisfied that they were getting a proper instrument for the work they required to be done. A great stimulus was given to this scientific accuracy of working by the passing of the Sales of Gas Act—now some forty or fifty years ago. It was one of the earliest Acts with which he had anything to do; and it was rather a curious enactment for the testing of gas-meters. Probably they knew very well that there were hundreds and thousands of meters that could not be tested in exact accordance with the terms of the Sales of Gas Act. This, however, did not matter. They were tested in a manner that the gas suppliers and consumers found satisfactory. The Act established a basis of scientific accuracy that had gone on increasing ever since. Mr. Crosley, the originator of the Cottage Lane business, had a great deal to do with the construction of the earliest gas-meters; although Mr. Clegg no doubt was the original inventor. Mr. Crosley put the thing into such a shape that it was able to be sold as a useful commercial instrument. He, however, seemed to have had some curious ideas about the gas industry, because on one occasion when he was urged to rebuild some of the workshops which were in a dilapidated condition, he said: "I do not see that there is any need to do it. I think the public will soon have as many gas-meters as they want." Thus he did not feel inclined to spend money on improving or extending the works. However, as years had passed, they had gone on, he ventured to

say, improving all round. At any rate, this was what they desired to do. His own early education at an engineer's establishment, put it in his mind that this business ought to be conducted on a really scientific basis, and that the rule-of-thumb which prevailed fifty or sixty years ago should be altered. When he first came to the works, there was no steam-engine installed; and instead of a shop with sixty men working at lathes, he thought there were only about two lathes in the place. They had reached a better position now; and they had to look forward to still further advances in the future. The calorimeter which they had seen was an instance of new requirements, for gas nowadays was not nearly so much used for lighting in flat-flame burners as it used to be. Therefore engineers required to know the calorific value of their gas, and not merely the illuminating power. For incandescent lighting, as well as for stoves, it was heat that was wanted. This being so, the firm were endeavouring to provide the requisite instruments for ascertaining and for recording the heating value of gas. As he had already remarked, the business had grown from fairly small things to a rather large size. It was only about ten years ago that they joined Messrs. W. & B. Cowan in the formation of a big Company; and now their ramifications extended practically all over the world. They had factories in connection with their Company, not only in London (including large new works at Kennington), but in Birmingham (two), in Edinburgh, in Belfast, in Manchester, and even in Australia. He was very glad indeed to think that the members had been entertained by their visit, and that they had seen something of what was possible in the way of machinery for doing this class of work. He believed that they had not by a long way reached perfection, either in the direction of accuracy or of machinery for carrying on the work; and if the suggestion of the President came true, and the Association paid the works another visit in fourteen years' time, the firm would be able to show them what they had done in the meantime. He hoped they would have made as much advance as had been the case in the last fourteen years.

Among the papers to be read at the Surveyors' Institution during the session is one by Mr. Baldwin-Wiseman, on "The Conservation of our Water Resources."

At the meeting of the Manchester City Council on the 5th inst., the recommendation by the Finance Committee, that Mr. John Williams should be appointed City Treasurer, as notified in the "JOURNAL" for the 4th inst. (p. 22), was adopted.

The "Pacific Gas and Electric Magazine" for November, which lately came to hand, contains the paper contributed to the American Gas Institute, at the last annual meeting, by Mr. E. C. Jones, the Engineer of the Gas Department of the Pacific Gas and Electric Company of San Francisco, who are the publishers of the magazine, on the subject of "The Development of Oil Gas in California." The plant is described and illustrated, and the process of making the gas explained. The author concludes that the future of oil gas depends largely upon the price of oil and the practice of economy in manufacture. He says the former may be regulated by a gas company owning their own source of supply of oil; while the latter rests in the hands of every conscientious worker in the gas industry. The contents of the magazine, which are of a varied character, include a biographical sketch of Mr. W. R. Eckard, the Consulting Engineer of the Pacific Company.

A lecture, on "The Circulation of Water in the Earth," was recently given by Professor Boyd Dawkins at Manchester University. He said there were in Nature two definite systems of water circulation—one above ground, due to the heat of the sun; and the other below ground, due to the heat of the earth. To the circulation of water below ground might be attributed some important effects, notably the equable flow of many rivers. A safe estimate of the amount of rainfall which found its way through the ground was about 10 inches in 35. Thus there were a number of wells in and around Manchester, some of which yielded as much as 600,000 gallons a day. They drew their supply from the water which percolated through the superficial gravel and sand in surrounding districts. Professor Dawkins outlined the water-bearing qualities of the various geological formations, and explained the difficulties presented by limestone and the advantages offered by chalk to those desirous of sinking a well.

According to the "Chemical Trade Journal," the Council of South Russian Iron-Works are agitating for Government protection of bye-products of the South Russian coking operations in the form of protective tariffs against foreign imports, and for special low railway freights for home products. At present the production of coke and recovery of the bye-products are carried on at various works in South Russia. Their total production of 25 per cent. ammoniacal liquor is about 350,000 poods (5645 tons), and of liquid coal tar about 850,000 poods (13,713 tons). Besides this, a certain quantity is obtained by the distillation of coal at some of the gas-works. Hitherto most of the liquor has been taken by the soda factories of South Russia; but there is now an excess in the supply, and the price has very seriously declined. Russia has few chemical factories capable of absorbing it, and they are rather in the Baltic district—i.e., about 1500 versts (1000 miles) distant. Therefore, says the writer of the report accompanying the application for the Government aid, it would be better to utilize the ammoniacal liquor in the production of sulphate of ammonia for manure. Its price prevents its general use.



## A STERILE BORING IN THE INFERIOR OOLITE.

By WILLIAM PHELPS.

[Extracts from a Paper read before the Association of Water Engineers.]

The Wincanton Rural District Council, after being satisfied, on the advice of experts, that success was probable, commenced in April, 1908, to sink a boring for water at Stowell (Somersetshire), with a view to supplying the town of Templecombe, which, though small, has an important railway junction on the South-Western Railway.

The boring is executed entirely in the Lower Jurassic formation, commencing in the Upper Fuller's-earth clay, and passing downwards successively through the Fuller's-earth rock, Lower Fuller's-earth clay, and Inferior Oolite, into the Midford sands.

The author's report, which formed the principal basis of an application to the Local Government Board for a loan, advised as follows.

(1) That while the Fuller's-earth rock would probably yield some water, it was not to be relied upon for the permanent supply which he expected to obtain from the Inferior Oolite, or, failing this, the Midford sands.

(2) That the thickness of the Fuller's-earth and Oolite would probably be found to considerably exceed that estimated for the locality by various observers, and recorded in the Memoirs of the Geological Survey, and that the Oolite would probably show 180 feet thickness as against 100 feet so recorded.

The results were as follows: A dug well was sunk 89 feet through very hard clay, and lined with 6-inch radial well bricks laid from the top on a sinking curb of cast iron. At this depth (89 feet) a trickle of water was met with, and owing chiefly to the very slow progress, and the almost impossible task of excavating the hard material by hand wedges, it was eventually decided to resort to boring. The boring proceeded through the remainder of the hard upper clay until the layers of Fuller's-earth rock were reached. As it was now unnecessary to keep the well dry, the water gradually rose; and after a few days of boring it was standing within 25 feet of the surface, several beds of rock being cut in the interval.

The probability of some water being obtained from these rock beds had always been anticipated; but it had been decided that a permanent supply from this depth was not to be relied on. It was nevertheless thought advisable at this point to roughly test the quantity of water then being yielded by the Fuller's-earth rock. After some hours' pumping, the water-level in the well was lowered to 70 feet from the surface; and as the pump, which was then throwing 650 gallons per hour, would not further lower the level, the test was abandoned for the time being—an actual yield of 15,000 gallons per day having been considered as proved, while the author reported to the Council that, in his opinion, a yield of at least 25,000 gallons a day could be obtained from this source, if necessary.

Boring was then resumed, and proceeded until the contract depth of 350 feet had been reached; the only fact of note being that, instead of the Inferior Oolite rock being encountered at 245 feet as expected, the cores showed hard clay very similar to the Fuller's-earth clay, but gradually lightening in colour, and much streaked with veins of calcite up to 332 feet.

At 290 feet a thin bed of laminated calcite was cut; the clay for 2 feet below this being soft and wet, but gradually resuming its normal hard marly nature. With a view to prevent trouble from the slipping of this soft clay, and also with a view to separate the upper water from any which might now be obtained at the lower levels, 8½-inch butt-jointed steel tubes were fixed in the boring, without any trouble, to 305 feet; and boring was continued through the tubes (8 inches in diameter) to 350 feet.

At this point, the contract depth having been reached, it was decided to test the yield of the boring, although the standing water-level in the tubes showed little promise of a successful result. A tube pump was fixed and started to work; but a few minutes' pumping sufficed to show that the yield was practically nil. It was then decided to proceed a further 100 feet, to 450 feet (at about which point it was hoped that the Midford sands would be struck). This was done. The whole of the cutting to this point was in hard Oolite rock, which, however, showed encouraging signs of fissures or joints. But the rest-level observations still indi-

cated absence of yield; and after some hesitation the Committee were induced to sanction further boring to 550 feet before testing was again carried out. After proceeding for a further 5 feet, to 455 feet, the cores showed obvious signs of a change to sands, which change was hailed by all concerned as the probable harbinger of a successful termination to the enterprise. At 460 feet the rest-level test showed promise of a small yield of water, which further elevated probability almost to certainty; the sand now being so friable that several feet of cores were lost by grinding-up in the process of gripping. From 470 feet, however, beds of stone varying from 6 to 15 inches thick were interstratified with hard sand, and the latter gradually assumed a marly character; the rest-level showing no improvement to the end.

It was realized that, although the standing pressure in the tube might not be sufficient to force out the *débris* which, under the shot-drilling system of boring, must of necessity be forced into the pores of the strata surrounding a boring, it was still possible that if the water were lowered in the boring so as to create an external head of some 300 to 400 feet, a good yield might possibly be induced by continuous pumping. The tube pump was therefore lowered to 350 feet from the surface and pumping commenced; but a short period sufficed to show that the immediate yield was less than 100 gallons per hour. After pumping continuously for 34 hours without apparent increase, it was decided that the boring should be abandoned, as showing too little promise to warrant any further outlay. The yield of the Fuller's-earth rock was afterwards proved at 25,000 gallons per day; but it was eventually decided that its use would not be justified in the circumstances, for various reasons.

[An appendix to the paper contained some geological and ethnological notes by Mr. John Pringle on the boring referred to by the author.]

### Discussion.

Mr. WILLIAM WHITAKER (Croydon) said this was a case where the adviser had been justified in recommending the work. He (Mr. Whitaker) would probably have recommended it himself if he had been consulted. It was a most likely thing that water would have been obtained by sinking a well, on the particular site chosen, to the water-bearing beds. But all knew that Nature was an uncertain kind of party. She would show one a long line of outcrop beds that looked extremely porous and helpful from a water engineer's point of view; and then in their underground course, where they could not be seen for a few miles, the beds would change their character, either by the weight of the superincumbent formation or by lithological change. Fine sands became finer, and fine clays became more compact; and where one might have expected to obtain a good supply, only a small one was got. Something of this sort seemed to have happened here, from what Mr. Phelps had told them: Certain beds that were not clay in one part changed, and became clay. He was afraid this was the only explanation he could see—that some change occurred in the character of the beds in their course underground from the escarpment. He noticed that the latter part of the work was done by boring, owing to some difficulties in sinking the shaft. It occurred to him that if these difficulties had been got over, and the shaft could have been taken deeper, better results might have followed. Again they must not let failures overpower them, because, although there was failure in this one particular spot, it was possible enough that not so very far off, a boring in a somewhat similar position might give a successful result. He hoped this boring would not be closed up, but that it would be open for inspection for some little time.

Mr. HENRY PRESTON, F.G.S. (Grantham), said this was a most interesting case of a boring which had failed to yield water; but he was rather disposed to think there were means of explaining the failure, although possibly if one had been asked before the boring had been made, an opinion would have been given favourable to a supply. If the boring had been in Lincolnshire, he would have said at once that the position was not sufficiently removed from the outcrop for there to be much chance of water. The limestone rocks in the author's case were porous, and the quantity of water entering them was so small that it would all get away towards the east. Hence he should not expect to find a good supply of water in the Oolite at the boring. Even if the limestone had received the whole of the water falling on the outcrop, it would probably have passed through the rock, and into the Midford Sands beneath. In Lincolnshire, they had similar



rocks, of similar age, and similarly deposited—that was, the water-bearing rock of Lincolnshire limestone, which overlies the beds of Northampton Sands, and which rested on the Upper Lias clay. Above the limestone rock were dense clays again, just in similar manner to what they had in the case described by the author. In Lincolnshire, these rocks dipped, and thinned out slowly as they were proved eastward; and, as they got under deeper and deeper cover, they also got denser. Consequently, when they wished to put down a boring, in the east of the county, it was often necessary to go right through the limestone rocks, and into the Lias clay. Sometimes even then they failed to find water; and he had generally come to the conclusion that it was due to the density of the strata, and the tool having failed to find a fissure in the rocks. Several cases of a striking character had come to his notice within the last eighteen months; and he gave particulars of them.

Mr. A. B. E. BLACKBURN (Sunderland and South Shields Water Company) said he thought Mr. Preston had hit on the real reason for the failure of the boring. It ought to have been on the west side of the fault. There was such a small outcrop of the Midford Sands on the east side of the fault that he did not see how the author could have expected to obtain any quantity of water from a boring put down at the place selected for it. He would like to ask whether Mr. Phelps had full knowledge of this fault and of its throw before he started the boring. Also how far he bored into the sands, and the total thickness of the sands. From what he (Mr. Blackburn) could see, the surface of the sands was simply scratched—the author did not go nearly to the bottom of them; and then, again, the pumps were only lowered 310 feet, whereas the borehole was nearly 350 feet in depth. He did not see how the borehole could be expected to yield any quantity of water when the pumps were not lowered down anywhere near the sands, which presumably would be the water-bearing strata.

Mr. HARRY W. TAYLOR (Newcastle-on-Tyne) said he quite agreed with Mr. Whitaker—that it called for considerable courage on the part of an engineer to bring a failure before the members of an Association. Nevertheless failures were frequently very instructive. An instance to which he might refer was somewhat similar to the one dealt with in the paper. Mr. Blackburn pointed out that he thought the valley on the west would probably prevent the flow of the water underground to the borehole, and that was the cause, to a certain extent, of the failure in the instance with which he was connected, near the Forest of Dean, Gloucestershire. But in that case it was not caused by a fault, but by an anti-cline—the boring having a large gathering-ground on the west of a porous stratum into which the rain soaked. Their boring was unfortunately on the east side of the anti-cline, just as Mr. Phelps's boring was on the east side of the fault. The result was abandonment. He should like to add that it showed the necessity, before a borehole was commenced, of a most exhaustive examination being made of the neighbourhood, and more particularly of the ground lying between the outcrop and the site of the proposed boring. Money spent in obtaining the advice of a thoroughly competent geologist was, he was certain, money well spent.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company) said one point that had not been referred to was the distance from the outcrop. It was about four miles. The boring, as had been pointed out, was more clay than rock; and the conditions showed that it was very doubtful whether much water could be obtained there. He did not know about this outlying rock. One forgot, when not working in this formation, whether it was of a dense character or very porous. As had been pointed out, it was a pity the borehole had been stopped in water-bearing strata. He (Mr. Hill) always, as Mr. Preston did, went down into the impervious strata. When he made a boring (say) 500 or 600 feet, he took care to continue it through the pervious into the impervious strata.

Mr. PERCY GRIFFITH (Westminster) said he should like, having shared Mr. Phelps's experience of a boring which proved a failure, to say a word upon this point, and to carry the argument a little farther than it had been carried by previous speakers. His own impression was, with regard to borings involving a geological, and therefore somewhat speculative, element, that it was the duty of engineers to exchange their experience and views. He thought, moreover, that they ought to exchange their experiences of failures more definitely and more regularly even than experiences of their successes, not only because by this means they

might, and probably would, save other engineers from experiencing similar failures, but in the public interest, because it was their duty, as engineers, to protect the interests of their employers and clients, and to prevent them wasting money unnecessarily. Therefore, on these two grounds, he urged that it was their duty to make a point of revealing cases of failures of this character. Of course, it was unlikely that anyone present would meet with exactly the same conditions that Mr. Phelps had described. But one never knew when one might have some problem to solve in which the data supplied by the author might come in very useful; and, in such an event, the paper and the discussion would no doubt be of great value. From this point of view, they owed Mr. Phelps gratitude for the facts that he had stated, though for the moment they were not able to make full use of them.

Dr. H. LAPWORTH (Derwent Valley Water-Works) said the author stated in his paper that he found the rock as exposed on the outcrop—the Inferior Oolite rock—more sandy than was shown in the boring; but if one examined the section of the boring submitted by the author, the rock looked so hopeless as a water-bearing material that it would have been very interesting if he had given them more detailed particulars of the exposures of these actual beds that he made on the ground. Another point—touched upon by Mr. Preston—was the course of the springs. When they had got a set of springs appearing on the outcrop, it should have been a warning that the rock was not very porous, or that there was some phenomenon intercepting the water on its way to the well. This led him at once to the obvious point that the Midford Sands seemed to be the only promising material. But here again—as Mr. Preston and Mr. Blackburn said—they had the outcrop cut off by a fault, so that there was the merest narrow strip exposed as a catchment area just below the escarpment. Another point threw some doubt upon the plan shown. At the left-hand side, they had the Lower Fuller's-earth clay, at the left was the fault; and if the outcrop of this bed was followed from the bottom towards the middle of the plan, it would be found that it cropped over the Inferior Oolite until it met the fault, where it was actually in contact with the Midford Sands. This phenomenon was only possible under two explanations—one was that there was much unconformity between the Lower Fuller's-earth clay and the sands, an unconformity in which they had the whole of the Oolite rock cut out in that short distance; or there was a fault running between the Inferior Oolite and the Midford Sands. Whichever it was, it showed that the main outcrop of the Midford Sands to the west of the plan was at a very low level—a level which made it impossible to feed the well with water.

Mr. PHELPS, in reply, said he almost expected every speaker to grasp the fault, as ground for criticism. But there was a fact he ought to have mentioned. Where they saw a leg of Inferior Oolite running away to the north-west, not only the Inferior Oolite but the sands were exposed with a considerable outcrop at an elevation of 500 feet above Ordnance datum, or about 200 feet above the surface level of the boring. Had he plotted the section from the site of the well right through to the leg in the north-west, they would have seen no fault, and no valley on the west. They might have got a little depression, but very little, and they would have the section right up to that point, with almost a smooth inclination. It was perfectly obvious that he did not want to hide anything; if he had desired to do so, he should have drawn his section differently. He considered, independently of this, that the Inferior Oolite lying between the fault and the Fuller's-earth clay should have gathered quite enough water to produce all they wanted. With regard to continuing the shaft farther down instead of boring, it was intended to go down into the Fuller's-earth rock with the shaft; but as the upper clay got so hard that they could scarcely move it with wedges, the Contractor begged to be allowed to start boring, and the Committee sanctioned it. They even now looked upon the Fuller's-earth rock as a possible source of supply. Mr. Preston had referred to the water draining away east. As the bottom of the borehole was 200 feet below Ordnance datum, he did not see how the water could possibly pass the borehole as suggested. The Oolite rock was cut just above Ordnance datum, and where they got sands they were below Ordnance datum; so that he did not see how the water could have passed it. The discussion had confirmed his original idea as to the cause of the failure—that the lithological changes in the strata were responsible. Dr. Lapworth said he would like to have



more details of the exposure. He (Mr. Phelps) examined the whole of the outcrop. They had Oolite rock which on the surface was always more or less fissured right away through the outcrop. On the surface there was quite a big thickness of open fissured rock which looked encouraging. But there was not the same opportunity of examining the Midford Sands; he had to rely very much on the Oolitic rock. When they got down to this formation in the boring, they found they had about 100 feet of clay where they would naturally have expected rock. Mr. Blackburn thought they only "scratched" the sands. They went into them 100 feet; and he had explained why they did not go farther. Mr. Ashton Hill had spoken about a distance of four miles from the boring to the outcrop. There was a little misapprehension. It was about one mile from the boring to the beginning of the Inferior Oolite outcrop.

## GLARE: ITS CAUSES AND EFFECTS.

By Dr. J. HERBERT PARSONS, F.R.C.S.

The following are extracts from a paper read at the Meeting of the Illuminating Engineering Society, at the Royal Society of Arts, on Tuesday last.

It is perhaps scarcely necessary to define what is meant by "glare." Every one is familiar with the uncomfortable sensation experienced when a bright light shines directly into the eyes; and we may accept this example as sufficient indication of the meaning of the term. It is only when we begin to analyze the conditions physical and physiological which give rise to the discomfort that we fully realize the complexity of the task we have undertaken. Before discussing the conditions causing glare in employing artificial methods of illumination, the author reminded his hearers of familiar examples under natural circumstances.

Proceeding, he said: Under artificial conditions, glare is experienced in an acute form when a bright light is almost in the line of vision between the eye and the object observed. Since glare is essentially an uncomfortable sensation, it is clear that the fundamental point in the problem before us is physiological. The eye shows a marvellous adaptability to extremes of intensity of illumination. Under favourable conditions, small print may be read easily by the feeble light of a farthing dip or in the brilliant blaze of a southern sun. Experiment has shown that the sensitiveness of the retina to impressions is enormously increased by protecting the eye from all light. If the eyes are lightly bandaged so that no pressure is exerted, but light is effectually excluded, in the course of about half-an-hour the retina reaches its maximum sensibility. It is then possible to perceive a glimmer of light which is quite invisible under any other conditions. Exposure to light, on the other hand, causes diminution of retinal sensibility, so that a much greater degree of change of intensity of illumination is necessary to produce a conscious impression than in the former circumstances. This constant variation in the sensitiveness of the retina, which obviously subserves so useful a purpose in every-day life, is called retinal adaptation. We have seen that in dark adaptation, when the retina is extremely sensitive, bright light causes an uncomfortable or even painful sensation—in other words, glare. We must conclude, therefore, that the condition of adaptation of the retina is one of the most important factors, if not the most important in the production of glare. It is not, however, the only cause, for glare may be induced by less rapid and less extreme variations in illumination than those adduced as examples.

It will have been noticed that, in most of the examples of the occurrence of glare in natural circumstances, it is caused by strong light reflected upwards into the eyes from the surface of the sea or ground. It would appear, therefore, that light entering the eye in such a direction is particularly prone to initiate the symptoms. In most circumstances only relatively feeble diffuse light enters the eye; for the sun or other source of light is high above the observer, and the eye is protected from the direct rays by the overhanging brow and lids, to which is often added some form of artificial head-gear. Light strongly reflected from below is for the most part worse than useless for visual purposes.

It might be argued that glare is often caused by excess of contrast, as in the familiar examples of the intensely bright beams of light from a lighthouse or the acetylene lamp of a motor at night. Analysis of the conditions will, however, show, I think, that the same causes are at work here, augmented by an unusual degree of dark adaptation of the retina.

Owing to the inherent defects of the optical apparatus of the eye, no retinal image is absolutely sharp. There is, therefore, a natural tendency to diffuseness of the image, no matter how perfect the eye, and spatial induction is apparently devised specially to counteract this irradiation, as it is called. Anything, therefore, which interferes with spatial induction must seriously interfere with clear vision.

The eye possesses an automatic protective mechanism against the influence of bright light in the iris. This acts as a diaphragm, which contracts concentrically—thus diminishing the size of the pupillary aperture, when the incident light is increased. By diminishing the aperture, it also reduces spherical aberration and

tends to eliminate irradiation. The range of the apparatus is not sufficiently great to abolish the evil results of intensely high illumination. Hence the very *intensity* of the incident light may cause glare and even worse consequences by producing grosser changes in the retina than those which we have been considering. We may conjecture that profound chemical changes occur in the visual purple and even in the structural elements, leading to their destruction and loss of function. If the conjecture has any basis, we are naturally led on to inquire whether it is the mere *intensity* of the light which is the *causa causans*, or whether it is some particular form of energy in the incident rays which brings about the disastrous result.

Since the ultra-violet rays are known to be specially potent in effecting chemical change, attention would naturally be directed first to them. The eye, however, has a very efficient protective mechanism against them—at any rate, so far as the retina is concerned; for they are absorbed for the most part by the crystalline lens. As you are aware, much attention is being directed to these rays at the present time; and since it is not probable that they are more than a subsidiary element at most in the causation of glare, it may be well to neglect them in this connection. More to the point is the question whether colour or luminosity are pre-potent in causing glare. Instances culled from Nature and artifice alike point to the fact that colour is if anything beneficial in reducing the tendency to glare. The natural adaptation of the retina to red has, however, to be taken into account. In mathematical phraseology, I am inclined to think that, so far as the physical side is concerned, glare is a fraction of luminosity rather than of colour. On the physiological side, I opine that temporal induction (retinal adaptation) and spatial induction are the pre-potent factors; the latter specifically invalidated by the direction of incidence of a superfluity of extraneous rays.

In the milder form of glare, the discomfort experienced scarcely amounts to pain. It is difficult or impossible to define where one ends and the other commences. Prolonged discomfort—not in itself painful—will undoubtedly induce pain. Here the psychological factor becomes important. The discomfort of even moderate glare causes screwing up of the eyes and puckering of the brows; and this prolonged muscular contraction is in itself painful. In the more acute forms of glare, however, pain is experienced at the outset. We have no evidence to show that any stimulus, however powerful, can produce pain through the purely visual nerve tracts. Pain is regarded as invariably due to the stimulation of certain different nerves—the nerves of common sensation. The question arises, therefore, whether the pain of glare is not due to stimulation of other nerves than the retina and visual paths. Is it possible that the pain of intense glare is due to over-stimulation of the nerve-endings? We may leave these rather esoteric conjectures and confine our attention to the more probable explanation already adduced, which at any rate accounts for the visual manifestations of glare and emphasizes most clearly the conditions to be avoided.

### Discussion.

The discussion did not go far in matters of interest to the practical illuminating engineer; it being confined on this occasion to the physiological and pathological aspects of the question. In his introductory remarks, the President (Professor Silvanus P. Thompson, D.Sc., F.R.S.) announced that the engineers would have ample opportunity of discussing at a future meeting questions concerning the excitation of the eye by lights of different kinds; but on this occasion, it would be his business to rule out of order any discussion which went beyond the physiological aspect of the matter. What was wanted was that the subject should be discussed on a thoroughly scientific basis, and for elementary principles to be laid down for guidance. It was desired that a good lead should be given on known and well-ascertained physiological facts. The line struck out by Dr. Parsons in his communication would be very helpful; and the facts had been shown in a way they were not likely to forget.

Then Mr. Dow read a *précis* he had prepared of a number of communications received from foreign members. We asked for a copy of this for publication. It has not been granted, which appears to illustrate one of the drawbacks, in the matter of publicity, of a Society of the kind having an "official organ" conducted by the promoters. Summing up the points of the correspondents' communications, Mr. Dow said it would seem that it was generally recognized that brilliancy was the main point, and that colour might be responsible for considerable effects on eye accommodation. But by glare, people seemed to understand either extreme brilliancy of the source itself, or some contrast effect which was undesirably sharp.

Following, Dr. Green pointed out that this was a subject that bristled with difficulties of exact definition, and in openings for future work. One point which struck him with regard to glare was this, that what was glare to one person was not glare to another. He had found in different cases that the eye was very sensitive to certain lights. To him the mercury light was most irritating; while he knew of men who worked day after day under the mercury light without similar trouble. In their cases, however, he had found a considerable shortening of the violet end of the spectrum; while in his (Dr. Green's) own case, the violet end of the spectrum was longer than that of most people. He also found that among those who worked in photometry at the National Physical Laboratory, no one could see so far as he could into the ultra-violet region. It appeared to be a bright light to him when



it did not seem to be so to any other person. The same with the red end of the spectrum. When the red was seen, it appeared to be the most irritating of all colours. In his opinion, the questions of both luminosity and intensity would have to be taken seriously into consideration. But there was the great difficulty that what might be glare to one person, another would find quite comfortable. There was also the question of the rapidity or otherwise of light adaptation of the eye. One person's eyes became easily and quickly adapted to bright light; while another person's might be very slow. And a light that might seem comparatively bright to one person might be very poor indeed when measured photometrically.

Snow blindness formed a text for Dr. Ganz. Dr. Kerr, the Medical Officer of the London County Council, commented on the largeness of the subject, and of the necessity of separating it up into several parts. There was the glare of incandescent light—gas or electric; the glare being due to the intensity of the illuminating surface, which might be quite small. Then there was the glare which occurred from windows, and particularly from those in which prismatic glass was used. There were also the varying effects at different parts of the day. Dr. Ettles defined glare as light in excess of the ordinary needs of the situation. Dr. Legge, of the Factory Department of the Home Office, referred to the subject of glassworkers' cataract; and then, alluding to the ninth question of a series that had been suggested for the purpose of discussion—viz., What is the best intrinsic brilliancy for illuminated signs and advertisements?—said he should be sorry if the Society adopted any compromise towards such disfigurements of the streets.

The speakers delivered themselves at considerable length; but at the close, the President said he was afraid they had not got far with the definition of glare. He also referred to the different effects of the same light at different parts of the day. Certain glow lamps in his house, if looked at by him in the evening, gave a very unpleasant glare; but looking at the same lamps in the daytime, they did not have the same effect. They gave him glare under one set of circumstances, but not under another. It did not seem satisfactory that they should not arrive at a consensus of opinion as to the definition of the simple word "glare."

The discussion was then adjourned to Feb. 15.

### Presentation to Mr. G. F. L. Foulger.

Those of our readers who are acquainted with Mr. G. F. L. Foulger, formerly the Chief Distributing Engineer of the Gaslight and Coke Company, will doubtless be interested to learn that he made a welcome reappearance at the offices in Horseferry Road last Thursday evening, for the first time since the sad misfortune which befel him in October, 1908. The occasion was a presentation, on his retirement, from the chief officials of the Company with whom he had been associated in the course of his long period of service—44 years. The gift, a silver rose-water salver, was a beautiful specimen of silversmiths' work in *repoussé*, designed and executed by Mr. Nelson Dawson, the well-known artist, and bore the following inscription:—

Presented to G. F. L. Foulger, Esq., with the Good Wishes of his Colleagues, the Heads of Departments, on the Occasion of his Retirement from the Service of the Gaslight and Coke Company.

The presentation was made by Mr. D. Milne Watson, the General Manager, supported by Mr. T. Goulden, the Chief Engineer, in the presence of all the subscribers. We are pleased to learn—and we are sure a large number of our readers will share the pleasure—that, despite the ordeal which led to his retirement, Mr. Foulger is apparently in the best of health and spirits.

**Modern Coking Practice.**—We have received from Messrs. Crosby Lockwood and Son a work bearing the above title, by Messrs. T. H. Byrom and J. E. Christopher. It embodies, with some amplifications, a series of lectures given by the latter gentleman, at the Wigan Technical College, to men engaged on coke-ovens; but the authors trust it may be appreciated by students generally, as well as by many who are engaged in the manufacture of coke, or who contemplate laying down bye-products plant. The matter is arranged in seventeen chapters; and it is amply illustrated. Pending a fuller notice of the work to be given in a future issue, we may say that the aim of the authors in its compilation has been, as they state in the preface, to produce a book "of use and benefit to those who are associated with, or interested in, the modern developments of the industry."

**Decrease in the Number of Private Bills.**—A correspondent of "The Times" has called attention to the fall in the number of Private Bills introduced into Parliament; and gives figures for the ten years 1901-10. In the first-named year, there were 243; in 1906, 208; last year, 139; now 112. The Bills of 1906 were deposited before the General Election. After the first session of the present Government, the number fell from 208 to 152—a drop of 56. The fall has continued until now, when the number is less by 96 than it was in 1906. The correspondent of our contemporary thinks the figures of 1910 must be largely attributed to the general feeling of insecurity caused in financial quarters by the Budget and the policy of the Government. It used to be reckoned that the amount of capital and loans for works sought to be sanctioned by Parliament in a single session was about 50 to 60 millions. The capital asked for this year does not amount to 12 millions.

## STEAM IN GAS-PRODUCERS.

A paper by Herr J. Voigt from the "Allgemeinen Ingenieur-Zeitung" is reproduced in three recent numbers of the "Zeitschrift des Vereines der Gas-und Wasserfachmänner in Oesterreich-Ungarn" in which the author deals with the question of the influence of steam and of the loss of heat in the gas-making zone on the gasification of solid fuels in gas-producers. The article treats to a great extent the theoretical questions involved in the production of producer gas and water gas which are already treated in modern text-books on gas manufacture. It is therefore unnecessary to give the detailed formulæ and calculations of the author; but his general argument and his conclusions are indicated in the following epitome of the contents of his communication.

After referring to recent work by Herr J. Körting and Dr. F. Fischer and of other German authorities on gas-producers, which the author says does not touch the question of the dependence of the efficiency of the gas-making process on the admission of steam and loss of heat in the gas-making zone, he goes on to quote a report of investigations made by Dr. Wendt which support his own work and conclusions. The questions which he sets himself to answer by means of calculations based on the results of carefully conducted trials are as follows:

- 1.—How is the composition of the gaseous mixture altered when steam is introduced into the gas-making zone in increasing quantity up to a limit to be defined later? How are the calorific power of the resultant gaseous mixture and the temperature obtained by its combustion affected, and in what manner is the efficiency of the gas-making changed? Finally, how is the quantity of air necessary for gas-making altered, and what is the yield of gas in each case from the gasification of a given weight of solid carbon?
- 2.—How is the admission of steam to be conducted in order to secure the highest possible degree of efficiency of gasification and the highest possible temperature of combustion of the cold gas?
- 3.—What effect have the radiation and conduction of heat from the gas-making zone on the efficiency of gasification, and to what extent must the admission of steam be altered in order to secure the highest possible degree of efficiency of gasification and the highest temperature of combustion of the cold gas when there is a given loss of heat from the gas-making zone?

The author next proceeds to calculate the volume of gas relatively to the weight of carbon and of steam on the basis of the following data—viz., that the molecular volume of all gases at 0° C. and 760 m.m. pressure is 22.4; that the calorific power of 1 lb. of carbon is 14,580 B.Th.U.; that the calorific power of 1 cubic foot of carbonic oxide at 60° Fahr., 30 inches, and saturated, is 318.6 B.Th.U.; that the calorific power of 1 cubic foot of hydrogen at 60° Fahr., 30 inches, and saturated, when the resultant steam is cooled to 0° C., is 269.5 B.Th.U., or, if the resultant steam is cooled only to 100° C., 265.7 B.Th.U. The values for the mean specific heat of the gases at the temperatures in question are taken according to Dr. Langen's formulæ. Of the total carbon in the fuel charged into the producer, only the solid carbon resulting from the coking of the fuel is taken into account in all the calculations. The specific heat of the solid carbon for different temperatures is taken according to a formulæ of Kunze, which is as follows:—

$$C_0^t = 0.2143 + 0.1436 \frac{t}{10^3} - 0.1975 \frac{t^2}{10^8}$$

Dr. Wendt in his investigations used a producer provided with horizontal passages for the removal of the gas at regular distances from the point at which air was admitted; and through these passages he observed the temperature and analyzed the gas corresponding to different heights above the base of the bed of fuel. It appears from his researches that the reduction of carbonic acid and the decomposition of steam by carbon do not proceed to any considerable extent below the temperature of 925° C., and that the lower limit for the gas-making zone in the producer is reached with that temperature of the bed of fuel. The gas must therefore leave the gas-making zone at 925° C., and its sensible heat, corresponding to the range of temperature from 0° to 925°, is lost, and must be deducted from the heat available from the carbon for gas-making. This heat, when 1 lb. of carbon is consumed with the theoretically necessary quantity of air for the production of a mixture of carbonic oxide and nitrogen (ideal producer gas), amounts, according to the author, to 4329 B.Th.U.; while the heat represented by the sensible heat of the resulting gases at 925° C. is 2826 B.Th.U. Hence there remains available for utilization in the gas-making zone  $4329 - 2826 = 1503$  B.Th.U.

The dissociation of the steam likewise takes place at 925° C., and the resultant gases escape from the gas-making zone at this temperature. The quantity of heat withdrawn by them from the gas-making zone consequently comprises both the heat of decomposition and the sensible heat of the gases. If the steam is decomposed so that the resultant gas is a mixture of equal volumes of hydrogen and carbonic oxide (ideal water gas), then the heat required for decomposition amounts to 65,543 B.Th.U. per 1000



ubic feet of this gas. The sensible heat corresponding to the range of temperature from 0° to 925° C. for this volume of these ases amounts to 30,551 B.Th.U. Hence the total consumption of heat in the production of 1000 cubic feet of ideal water gas at 0 inches, 60° Fahr., and saturated, amounts to 65,543 + 30,551 = 96,094 B.Th.U.

The mean specific heat of the gases constituting either ideal producer gas or ideal water gas for the range of temperature 0° to 925° C. is taken at 0.316. But when the steam is decomposed so that the resultant gas is a mixture of two volumes of hydrogen and one volume of carbonic acid and the mean specific heat of the carbonic acid for the range of temperature 0° to 925° C. is taken at 0.442, the total heat required for the production of 1000

cubic feet of the mixture at 30 inches, 60° Fahr., and saturated, amounts to 60,578 B.Th.U., of which 26,042 B.Th.U. is the heat of decomposition and 34,536 B.Th.U. the sensible heat of the gases leaving the gas-making zone at 925° C. Adopting the figures thus found—viz., that 1 lb. of carbon in the production of ideal producer gas renders available for utilization in the decomposition of steam 1503 B.Th.U., and that 1000 cubic feet of the gas resulting from the decomposition of steam by carbon utilize 96,094 B.Th.U. or 60,578 B.Th.U. according as the resultant gas is a mixture of carbonic oxide and hydrogen (ideal water gas) or a mixture of carbonic acid and hydrogen—the author tabulates the values corresponding to the gasification of 1 lb. of carbon when the proportion of steam used varies from *nil* to 0.612 lb.

TABLE I.

No.	Steam per Pound of Carbon.	Composition of the Gas in Volumes Per Cent.				Calorific Power of the Gas per Cubic Foot, at 60° Fahr. and 30 in. Bar. and Saturated.	Temperature of Combustion.	Steam per 1000 Cubic Feet of Air, at 60° Fahr. and 30 in. Bar. and Saturated.	Efficiency of Gasification Per Cent.		Air Consumed per Pound of Carbon, at 60° Fahr. and 30 in. Bar. and Saturated.	Yield of Gas per Pound of Carbon, at 60° Fahr. and 30 in. Bar. and Saturated.
		Carbonic Acid.	Carbonic Oxide.	Hydrogen.	Nitrogen.				E <sub>1</sub>	E <sub>2</sub>		
I.	Lbs.					B.Th.U.	Deg. C.	Lbs.			Cubic Feet.	Cubic Feet.
II.	0.100	..	34.7	..	65.3	110.5	1472	..	70.2	70.2	76.7	92.7
III.	0.200	..	35.5	2.4	62.1	119.6	1515	1.41	74.6	73.6	71.5	90.8
IV.	0.294	..	36.3	4.8	58.9	128.6	1550	3.06	78.3	76.1	66.3	88.9
V.	0.400	2.5	37.0	7.2	55.8	137.2	1584	4.83	82.0	78.9	61.5	87.0
VI.	0.508	4.9	33.6	9.6	54.3	132.9	1551	6.60	81.3	77.2	61.3	89.1
VII.	0.612	7.0	30.4	11.9	52.8	128.8	1522	8.42	80.8	75.6	61.2	91.3
			27.4	14.1	51.5	125.2	1495	16.08	80.5	74.5	61.0	93.6

In this table, the efficiency E<sub>1</sub> is calculated on the assumption that the steam required for decomposition is produced by the sensible heat of the escaping gas, whereas the efficiency E<sub>2</sub> is based on the steam being produced in a separate boiler plant with its own furnace. The temperatures of combustion given in the table are calculated on the assumption that 1½ times the theoretically requisite quantity of air for the combustion of the gas is used. The calorific powers given are for the combustion of the hydrogen to steam at 0° C. The first set of figures in the table refers to the gasification of carbon without the use of steam; with the formation of carbonic oxide to the exclusion of carbonic acid. The fourth set of figures assumes that the whole of the heat liberated by such gasification is applied to the decomposition of steam for the formation of equal volumes of hydrogen and carbonic oxide to the exclusion of carbonic acid. For the second set of figures, it is assumed that 0.1 lb. of steam is employed to 1 lb. of carbon, and is decomposed wholly to equal volumes of hydrogen and carbonic oxide. In the third set of figures, the steam is taken at 0.2 lb. per pound of carbon for the same reaction.

If the steam is increased above the proportion used in the fourth set of figures, its decomposition must take place partly with formation of carbonic acid; and the fifth set of figures is calculated on the assumption that two-thirds of the available heat is applied in decomposing steam to form only hydrogen and carbonic oxide, and the remaining third of the available heat to the decomposition of steam to form only hydrogen and carbonic acid. The sixth set of figures is based on a reversal of these proportions—i.e., only one-third of the available heat is applied to the decomposition of steam to form hydrogen and carbonic oxide, and the remainder to form hydrogen and carbonic acid. Finally, in the seventh set of figures, it is assumed that the steam is decomposed wholly to form hydrogen and carbonic acid. It will be seen that the highest efficiency of gasification and the highest temperature of combustion of the resultant gas coincide with the highest proportion of carbonic oxide in the gas. This highest proportion results when steam is introduced to such an extent that the whole of the heat liberated in the formation of ideal producer gas is utilized in producing from the steam ideal water gas—i.e., when the conditions are those shown in the fourth set of figures in the table.

In the seventh set of figures, the highest proportion of steam which can be completely decomposed with the formation of hydrogen and carbonic acid by the utilization of the whole of the available heat from the ideal producer gas reaction, is taken. Any further increase in the amount of steam decomposed must draw upon the heat of reduction of the carbonic acid which is produced in the preliminary stage of the formation of the carbonic oxide of ideal producer gas—that is to say, the reduction of the carbonic acid will be restricted and the degree of efficiency of gasification correspondingly affected. For instance, if instead of regarding 1 lb. of carbon as being wholly consumed to form ideal producer gas, we regard a portion of the carbon as forming carbonic acid with the oxygen of the air, and the additional heat thus rendered available as being utilized for the decomposition of steam by the remaining portion of the carbon with the formation of carbonic acid and hydrogen only, the resultant gas will, according to the author's calculations, have the following percentage composition: 27.12 per cent. of hydrogen, 26.22 per cent. of carbonic acid, 46.66 per cent. of nitrogen. But if the reduction of the carbonic acid to carbonic oxide is prevented by decomposition of steam in this manner, there is a loss in the gas produced of the energy represented in the carbon gasified amounting to 1872 B.Th.U. per pound of carbon employed. If the amount of steam introduced is not sufficient entirely to suppress the reduction of carbonic acid, the loss will, of course, be correspondingly diminished; but it follows that if there is even the smallest interference

with the complete reduction of the carbonic acid, resulting as an intermediate product in the first stage of the gasification of carbon by air, there must be a loss of energy. Consequently, any steam admitted in excess of the proportion indicated in Set VII. of the conditions shown in Table I. will result in a falling off in the efficiency of gasification below the values shown in the table.

Hitherto the complete decomposition of the steam introduced has been tacitly assumed; but, as a fact, the decomposition is only complete in comparatively few instances. Theoretically, if the whole of the heat derived from the gasification of carbon by air with the formation of carbonic acid were applied for the complete decomposition of steam in excess, the resultant gas should consist of only carbonic acid, hydrogen, and nitrogen, with an admixture of undecomposed steam. But in reality considerable quantities of undecomposed steam occur in gaseous mixtures which contain a considerable amount of carbonic oxide. Mond gas may be quoted in illustration of this fact. In the Mond process, large quantities of steam are introduced into the producer in order to lower the temperature of the bed of fuel and thus cause a high yield of ammonia. In a Mond gas plant, about 3.7 lbs. of steam are blown into the producer for every pound of carbon gasified, or 1 lb. of steam for every 16 cubic feet of air. About 73 per cent. of the steam leaves the producer undecomposed. The analysis of the resultant Mond gas is shown below alongside the analysis quoted by Dr. F. Fischer of a gas which was made in a producer of a different type, consuming anthracite instead of bituminous coal, but worked with a considerable excess of steam:—

	Mond Gas.		Anthracite Gas (Fischer).	
Carbonic acid . . . per cent.	16	..	15	..
Carbonic oxide . . . . .	11	..	9	..
Hydrogen . . . . .	29	..	21	..
Methane . . . . .	2	..	1	..
Nitrogen . . . . .	42	..	54	..

The author proceeds to state that systematic investigations on the effect of undecomposed steam with varying steam supplies on the loss of heat from the gas-making zone, have not been carried out. A knowledge of the amount of this loss is requisite for calculating exactly the effect of an ample supply of steam on gas making. Even assuming that the steam which passes through the producer undecomposed leaves it at the full temperature of the gas-making zone (which is improbable), the author calculates that the loss of heat consequent on the undecomposed steam can have only a small effect on the efficiency E<sub>1</sub>, but will reduce to a somewhat greater extent the efficiency E<sub>2</sub>, owing to the expenditure of heat in the production of the undecomposed steam. It has already been shown that the admission of more steam than that indicated in Set VII. of the conditions indicated in Table I. reduces the efficiency below the values shown for that set. The decrease of efficiency is still further enhanced by increasing the incomplete decomposition of the steam. Having regard to these facts and the data given in Table I., the following conclusions may be drawn as to the utilization of the heat of the fuel in gas-producers: (1) For the attainment of the highest efficiency of gas making and the highest temperature of combustion of the resultant gas, the whole of the heat liberated by the complete gasification of the carbon by means of air with the formation of carbonic oxide and nitrogen must be utilized for the decomposition of steam by carbon, with the formation of hydrogen and carbonic oxide; (2) for the attainment of the maximum utilization of the fuel gasified, the amount of steam admitted to the producer must be so fixed that the proportion of carbonic oxide in the gas is a maximum.

The loss by radiation from the gas-making zone has hitherto been assumed to be neutralized by the sensible heat of the previously heated carbon. As a fact, this is rarely the case; and



TABLE II.

Series.	Specific Loss of Heat from the Gas-Making Zone.	Loss of Heat from the Gas-Making Zone. Percentage of the Heat of the Carbon Gasified.	Heat Liberated by the Gasification of 1 lb. of Carbon to Ideal Producer Gas.	Heat Expended in Making 1 Cubic Foot of Hydrogen Simultaneously with	
				Carbonic Oxide.	Carbonic Acid.
	B.Th.U.		B.Th.U.	B.Th.U.	B.Th.U.
A . . . . .	..	..	2079	174	82
B . . . . .	270	1'9	1809	183	86
C . . . . .	576	4'0	1503	192	91
D . . . . .	1080	7'4	999	208	99
E . . . . .	1620	11'1	459	214	107
F . . . . .	2079	14'3	..	239	114

hence it is desirable to investigate the effect of the loss of heat from the gas-making zone on the gasification of the fuel. Taking the sensible heat of 1 lb. of carbon, which has been raised to the gas-making temperature of 925° C., as equal to 576 B.Th.U., the author inserts different values for the loss of heat by radiation and conduction from the gas-making zone per pound of fuel gasified in the equation showing the thermal effect of the gasification of carbon by means of air with the production of only carbonic oxide and nitrogen. The results of his calculations are shown in Table II.

In series C of the above table, the specific loss of heat is taken as equal to the sensible heat of 1 lb. of carbon at 925° C., and, consequently, the values in the last three columns of this line of the table correspond with the figures adopted for the calculation of Table I. For any other series of Table II. a corresponding set of values for Table I. could be calculated from the figures in the last three columns of Table II. For the construction of gas-producers, it is specially important to ascertain the quantity of steam which should be admitted in order to secure the maximum utilization of the heat of the fuel without increasing the loss of heat from the gas-making zone. It has been already shown that the maximum utilization of the heat of the fuel is secured when the heat resulting from the gasification of the carbon to form, with the oxygen of the air, carbonic oxide is applied to produce hydrogen and carbonic oxide by the decomposition of steam with carbon. The highest attainable efficiency is calculated on this basis for each series of Table II.; and Table I. is also based on this amount of steam being admitted. By plotting out corresponding curves on a diagram, it will be found that the result of increasing the supply of steam above the values shown will result in carbonic acid being produced in the gas and in the efficiency of the working and the temperature of combustion of the gas produced being diminished.

The specific value of the gas-making zone depends partly on the construction of that zone of the producer. It is also partly affected by the specific gas-making power of the producer—i.e., by the weight of solid carbon gasified per hour per square foot of the average internal cross sectional area of the gas-making zone. The specific loss of heat is in inverse proportion to the specific gas-making power. While the amount of gas made varies with the load on the producer, the heat radiated and conducted *ceteris paribus* is the same, and is distributed over the fluctuating quantities of carbon gasified. Thus, for the same producer, the supply of steam per pound of carbon remaining the same, a rise in the specific gas-making power is accompanied by a decrease in the specific loss of heat from the gas-making zone, and *vice versa*. According to determinations by the author, the specific gas-making power varies with ordinary producers between 4'8 and 16'4 lbs. of carbon per square foot of cross sectional area at the gas-making zone. A certain proportion of the heat is, however, lost so far as gas-making is concerned in the water-pan beneath the grate. Producers which are water-jacketed round the gas-making zone undoubtedly lose more heat through the vigorous conduction. There is also more loss with most inclined or other special grates, which generally are placed outside the part of the walls of the producer protected by non-conducting material.

The most favourable proportion of steam for introduction in any producer must be determined experimentally for the particular apparatus, as the types of construction vary considerably. For instance, a trial may be made first with about 4½ lbs. of steam per 1000 cubic feet of air, and the steam then gradually reduced until the proportion of carbonic oxide in the gas reaches a maximum, which condition connotes the maximum utilization of the fuel gasified. The calculations so far have presupposed that the steam used is dry, which is a condition often unfulfilled in practice. Water contained in the steam must be vaporized in the gas-making zone, and will therefore withdraw from the latter a certain amount of heat. The heat required for decomposing wet steam is greater than that required for decomposing the same weight of dry steam; and the practical effect of the use of wet steam is that the quantity of steam decomposed, or of hydrogen formed, is reduced, and the efficiency of gas-making falls below the values stated in the tables.

Every natural fuel contains a certain amount of moisture—generally speaking, in inverse ratio to the geological age of the fuel. Thus anthracite contains the least, and lignite the most, water. The moisture of the fuel is vaporized during the preliminary warming of the fuel by the sensible heat of the gas from the gas-making zone. But as the proportion of moisture rises, the carbon in the fuel diminishes, and with it falls off the heat available for the evaporation of water. It may happen that the

sensible heat of the gas which leaves the gas-making zone at 925° C. may not suffice for the complete evaporation of the water contained in the fuel. The author calculates that when the percentage of moisture in a fuel amounts to 30 per cent., it must contain at least 31 per cent. of solid carbon, in order that the moisture of the fuel may be completely evaporated in the gas-making zone and that the maximum utilization of the heat may be attained by the admission and decomposition of the necessary quantity of steam.

The amount of moisture in anthracite, coal, and the coke and briquettes made from them, as well as in coke made from lignite, is always below 30 per cent., and the amount of carbon is always above 31 per cent. Brown coal or lignite briquettes also contain 30 to 35 per cent. of solid carbon, and rarely as much as 30 per cent. of moisture; so that they may be gasified in producers with a maximum utilization of the heat. On the other hand, the moisture in lignite itself (and in peat) often exceeds 30 per cent. of its weight; while the proportion of solid carbon is often less than 31 per cent. With such fuels the amount of steam admitted must be reduced, and, if the moisture exceeds (say) 45 per cent., suppressed altogether. As the heat liberated by the gasification of carbon by the oxygen of the air which is not consumed in decomposing steam raises the temperature of the gas produced above 925° C., the corresponding increase of sensible heat in the gas serves to evaporate the water in the fuel which otherwise would not be evaporated. Therefore, the utilization of the heat of the solid fuel in the producer is reduced below the figures shown for the attainable efficiency and temperatures of combustion in the tables.

The introduction of steam into the producer increases the durability of the lining in the gas-making zone, and in many cases facilitates the choice of apparatus. The foregoing observations on the effect of steam on the utilization of fuel and working considerations lead to the conclusion that a large admission of steam is advantageous in producers. For example, Herr J. Körting has suggested that 1 lb. of steam to 1 lb. of carbon is a proper proportion. Dr. F. Fischer holds a similar view, and states that 17½ lbs. of steam per 1000 cubic feet of air supplied is most advantageous. On the other hand, the present investigation indicates that for the most favourable utilization of the heat of the fuel in the producer about 0'3 lb. of steam only should be introduced per pound of solid carbon, or about 5 lbs. of steam per 1000 cubic feet of air, provided the losses of heat from the gas-making zone are kept low by proper construction of the substructure of the generator and proper jacketing of the generator itself. The heat liberated by the gasification of the carbon by the oxygen of the air to carbonic oxide is completely consumed in the decomposition of this small quantity of steam. It follows, therefore, that there is a reduction of the temperature of the gas-making zone as compared with the gasification of carbon without admission of steam—an important consideration in regard to the durability of the lining, and in most cases to the ease with which the clinker may be removed. The second important result of this investigation is that it establishes the remarkable effect that high losses by radiation from the gas-making zone exert on the amount of steam most suitable, and on the efficiency which may be attained in the gas-making process referred to.

The Birmingham City Council have unanimously passed a resolution increasing the salary of Mr. F. W. Macaulay, the Elan Supply Resident Engineer, from £800 to £1000 per annum; and the salary of Mr. William Gray, the Local Engineer, from £500 to £600 per annum; the increases to take effect as to one-half from the 1st inst., and as to the other half from Jan. 1 next. In bringing forward the proposition, Alderman Beale said Mr. Macaulay had a very wide field of operations to cover. He had carried through a great deal of constructive work which would have had to be done by Consulting Engineers if they had not had such a skilled Engineer in their own service. His duties had considerably increased since his appointment; and he had always carried them out most admirably. As demonstrating his enthusiasm in his work, Alderman Beale mentioned that Mr. Macaulay had only recently utilized his holidays to investigate methods of filtration in foreign countries, because he thought they were not getting the best results on the Birmingham system. As the outcome, they hoped to experiment on lines which would reduce the charges at their filtration works. Mr. Gray, the indefatigable official in charge of the distribution mains in Birmingham, had also discharged his duties in such a way as to entitle him to the increase in salary recommended by the Water Committee.



## MANCHESTER JUNIOR GAS ASSOCIATION.

Members of the Association met on Saturday at the Victoria University—Mr. JAMES TAYLOR, the President, in the chair. Two papers were read.

The first was by Mr. A. L. HOLTON, and was as follows:—

### NOTES ON THE MANUFACTURE OF SULPHATE OF AMMONIA.

The Technical Press of late has contained many descriptions of special sulphate of ammonia plants, and the working of same; and of special pieces of apparatus as an auxiliary to a sulphate plant. Therefore, rather than give a description of the plant now in my charge, I purpose considering the question of obtaining the best results out of the plant that it is our fortune, or misfortune, to be called upon to supervise, and to give some hints on the choice of new plant.

#### STILLS.

Intermittent stills are now almost a thing of the past; and my observations will apply mainly to the apparatus and working of the continuous type of still. The ammoniacal liquor should be delivered to the stills in a continuous and constant feed, and, to ensure this, may be fed to the superheater either direct by liquor pump, fitted with a relief valve and connections from pump delivery to suction (the relief valve being set to a definite, and not too high, pressure), or from a high-level tank connected by a tap and pipe-line to a small intercepting tank fitted with a ball-cock, and fixed a few feet above the still-head. Either method will be found reliable; the choice depending upon the local conditions. Avoid, if possible, fixing liquor pipe-lines below ground; so that any leaks may be immediately detected and made good.

It is economically important that the liquor be raised to as near boiling point as possible prior to entering the distillation column; a thermometer being fixed on the inlet-pipe and noted from time to time. Since all sulphate plants have a source of heat for this purpose, in either the waste saturator gases or the waste liquor, it is only a matter of arranging a suitable superheater to be fed by either of these, or, on small plants, possibly a combination of both, to secure a high temperature to the ingoing liquor. The continuous stills are varied in their design; but the principle of either blowing steam through the ammoniacal liquor or causing the liquor to flow over the hot surface of plates or other material, is applied in nearly all cases. Possibly a still constructed on the principle of the Feld washer, in which rising steam and ammonia gases are made to pass through a spray of liquor in each successive tray, may come in due course.

The fixed or liming portions of a still get coated with calcium salts, tarry matters, &c., that call for easy facilities for cleaning purposes—a point too often lost sight of in their design. I have had experience with six different makes of stills, and in nearly every case the need for having to clean them out seems to have been either lost sight of or adequate arrangements have not been provided. Fortunately, the newer forms of stills provide against this drawback. The small cleaning doors often arranged allow of only a partial cleaning out, and at times the still must perforce be taken to pieces to make a satisfactory job. Where such conditions exist, and the still is in one column, I would advise that the free and fixed portion of the still be placed on separate bases, with some suitable arrangement for taking the fixed portion easily to pieces.

The so-called free portion of the still rarely gets clogged, and needs but little cleaning; hence the advisability of making it a separate column, and thus avoiding the expense of having to take it to pieces every time the fixed portion requires attention. The usual serrated caps or hoods for the distribution of steam and ammonia gases in each successive tray must be securely held in position, and yet readily liberated for cleaning purposes. Once allow free movement, and the efficiency of the still is impaired to a serious extent, and may even stop its working. Let one hood be removed from its place, and the steam and gases will escape to the next tray without doing their intended work. Where holes take the place of serrations, the sum of their area in each tray should be greatly in excess of the main gas-way from each tray, to allow for the extra friction and variations in the supply of steam. The length of run between the times for cleaning may be extended by increasing the diameter of the holes in the bubbling hoods, especially in the fixed portion of the still.

The serrated hoods are to be preferred, for they adapt themselves better to all variations in volume; and in the fixed portion the hoods should be raised a few inches from the bottom of the tray, to allow for a little sediment to accumulate before it clogs the teeth of the bubbling hood—another point conducive to the length of a run. The liquor-overflow from tray to tray should be of large area, especially in the liming portion of the still. Ten times the area of the liquor feed-pipe will be found a convenient size; and in rebuilding a still, this is a point easily remedied if those already fitted are below this figure. Steam is usually admitted at two points—viz., at the bottom section of the still and in the section where the lime enters; and here open-ended pipes are to be preferred to closed pipes with small holes in same, immersed in the liquor, for during stoppages the lime sediment is drawn back into the pipes, with its attendant evils.

All stills should be provided with a relief pipe or valve and pressure-gauge. A very simple and efficient one is that fitted by the Chemical Engineering Company to their plant. It consists

of a small cast-iron box connected by a 2-inch pipe to the bottom of the still. On the top of this box is fixed a length of 2-inch wrought-iron tubing to three-quarters the height of the still. A second length of 2-inch wrought-iron tubing is also fixed, and runs up alongside the former pipe, but only half its height—it being extended the other half by a length of glass tubing. The height of the liquor in the glass varying with the pressure of the stills, the effect of any alteration in the flow of either liquor or steam is instantly noted.

In experimenting to ascertain the best working conditions of a still, this is indeed a valuable help. To regulate the outflow of the still, and to ensure that no steam shall escape, is a matter of first importance. Regulation by means of a cock with a head on the waste-liquor pipe is by no means satisfactory, and requires constant attention. The Company just mentioned provide their stills with a very efficient float-valve fitted with a sight-gauge, which can, of course, be attached to any type of still. At first we experienced difficulty in getting the joints of the floats to stand for any length of time; but now we have them welded by the oxygen-acetylene flame, with very satisfactory results.

It is quite a common thing to find stills fitted without any catch-box on the outlet gas-pipe; and often where a catch-box is fitted, the pipe leading away the condensed vapours is directly connected up to the still. If one considers for a moment the violent action that is going on in the stills, and the tendency the globules of liquor enveloping particles of gases have to be carried forward, the importance of fixing a catch-box on the outlet-pipe will be realized. Some makers rely on making the top segment of a still of much greater depth than the lower one. No doubt this serves a useful purpose; but when the still does boil or froth over, as there is always a liability of its doing, it is surely wiser to fix a trap to prevent the liquor entering the saturator.

The catch-box should be fitted with one or more baffle-plates, and the condensed liquors carried away by a 5-foot seal-pipe (emptying into a funnel and pipe) to the liquor tank. It is necessary to have a tap on the seal-pipe just below the catch-box; for should a sudden rush of liquor come, through irregular working, the seal is broken through the large rush of gas following, and the tap must be closed for a minute or two to allow sufficient liquor to collect to fill the seal-pipe. In ordinary working, the amount of liquor from the baffle-box will be only a very thin stream; but directly the still is either holding up or frothing violently, the volume is greatly increased, and the steam and liquor reduced to remedy it. Where the condensed liquors are carried directly to the still, it is an impossibility to know of any variations in volume passing over until an increased volume in the saturator both tells its tale and leaves its trade mark—a batch of blue salt.

The extent to which various ammoniacal liquors froth varies considerably, even under similar conditions as to steam and the amount of liquor distilled, and will occasionally present difficulties in distillation. Four years ago, this was a source of continual worry to us; and after several experiments, I found that the tarry matters from the "devil's-water" well will, when added to the ingoing liquor in very small quantities and at long intervals, stop the frothing action immediately. We have therefore fixed a pipe to the bottom of the "devil's-water" well, and can pump into the still small quantities of these tarry matters should it be required.

#### LIMING OF STILLS.

The capacity of the plant use should determine the system of liming; regularity of feed being sought. The small amount of lime needed on the lesser makes per day precludes regular pumping, or even a syphon system; and the lime is admitted in such cases at frequent intervals. In these conditions, the tray or compartment where the liquor and lime first mix in the still should hold sufficient lime solution to meet the needs of the liquor during these intervals. For medium-sized plants, the lime solution may be fed by gravity, with a floating syphon from a high-level tank; while for larger makes, regular pumping is usually adopted. The Chemical Engineering Company make a special automatic liming apparatus, two of which we have used for seven years.

The common practice is to make the lime solution with water; but I strongly urge the use of the waste liquor for this purpose. It has the advantage of reducing the amount of mother liquor. Less steam is used in the mixing-tank; and, should the stills be working short of either lime or steam, the ammonia set free in the lime-pan gives immediate warning. Where regular tests are not taken of the waste liquor for  $\text{NH}_3$ , this will prove a valuable tell-tale; and in such cases, the mixing-pan should be so placed that the ammonia vapours given off when the plant is not receiving proper attention become a nuisance to the workmen.

#### SATURATORS.

Three kinds of saturators—the hand-fishing or piano type, the bottom discharge, and the closed saturator fitted with a Wilton type of ejector—are, no doubt, familiar to all. For small makes, the piano type will be found the best, as it requires less additional plant; and the amount of time required to fish one or two tons of salt is so small that there is ample opportunity for the other duties of a plant requiring the attention of one man.

The bottom discharge saturator requires a high and low level mother-liquor tank, and either an injector or some other means of raising the mother liquor from one to the other. This is necessitated by the fact that a large quantity of mother liquor is discharged along with the salt at each opening of the valve. This



type of saturator is applicable to all makes of sulphate per day; but there are certainly more parts to get out of order than with the simple hand-fishing type. When such a make is reached per day that the attendant has not sufficient time to spare from his fishing operations to attend to the other part of the work, then is the time to take this type of saturator into consideration.

The closed saturator, with the Wilton ejector, has these advantages over the other—there is no valve to get out of order, and the mother liquor returns at once by gravity to the saturator from the discharge or settling box. The ejector is of simple construction, depending on the lightening of the column in the discharge pipes to eject the salt. We are now making our ejector pipes of 3-inch copper tubing, with phosphor-bronze flanges.

The position of the store will be one guiding factor in the choice of a bottom discharge or closed saturator with a Wilton ejector; for with the latter the salt is ready for removal to the store at a higher level than with the former, and, consequently, less labour is required in stacking. It is a great mistake to have saturators too big for their work; a good boil being an essential. Therefore, avoid this drawback in all new plants. A saturator having a working acid-bath capacity of 30 cubic feet will make 2 tons of salt per 24 hours in the hand-fishing type. The Wilton saturator at the Bradford Road works of the Manchester Corporation has a working acid-bath capacity of 125 cubic feet, and makes 24 tons of sulphate per day without any difficulty.

An examination should be made of the ammonia distribution or cracker pipe, to ascertain if the gases are being distributed throughout its entire length; and should there appear no sign of wear on the end holes of the pipe, it will be advisable to block up a few of them near the entrance of the gas delivery. Local alkalinity may take place if there is not a good boil on the saturator, and the still gases are mainly passing through the bath in one place. A short length of  $\frac{1}{2}$ -inch pipe should be screwed into the inlet and outlet gas-pipes to facilitate washing the gasways with water, and for opening when stopping the plant—using wood plugs to close them up.

Every saturator should be fitted with an efficient baffle-box. An enlarged lead pipe, fitted with a perforated lead hood through which the waste saturator gases are made to pass, will answer the purpose. This, too, will require an occasional washdown with hot water, to keep it from making-up. Many a leaky condenser is caused by the acid mist from the saturator being carried forward and acting on the iron pipes.

The preliminary drying of the salt is always done near the saturator; and the arrangement for so doing forms one of the saturator fittings. With the hand-fishing operation, the well-known lead-lined draining table, with a good fall towards, and connected to, the saturator, is hard to beat. Where centrifugal drying is not resorted to, both the bottom-discharge and closed types of saturators should have their salt collected in a lead-lined box; and I would strongly advise it to be so made and fixed that, when full of the salt and mother liquor, it can be tilted and the liquor poured off in this manner. Such a procedure is better, and gives a dryer salt in a given time than when allowing the liquor to drain off from the bottom of the box. Small tilting tubes running on a mono-rail form a convenient arrangement for removing the sulphate to the store heap; and if the saturator and collecting box be placed on a high level, the cost of labour in stacking the sulphate will be but a very small item. For large makes of sulphate—say, about 20 tons per day—drying by centrifugal force and mechanical conveyors will be found the cheapest.

#### CONDENSING PLANT.

The waste saturator gases, after leaving the lead baffle-box, are connected by cast-iron pipes to one or more superheaters and condensers; and in this part of the plant especially, ready means of finding any leakage and repairing it should be the point to aim at. The gases are of a highly poisonous nature, containing about 30 per cent. of sulphuretted hydrogen; and it will be wise to fix all examination plugs in such a position that if a workman was overcome with the gas he would fall clear of the issuing stream of gas. Especially should this be the case in plants worked by one man; and when two or more men are employed, a stringent rule should be enforced "that all repairs and cleaning done on the waste gas-pipes and plants should be performed by one or more men with an attendant in readiness for any possible emergency."

There need be no occasion to fix any waste-gas pipe less than 3 feet above ground-level, except just where it enters the purifiers; and under no circumstance should this part of the plant be placed inside a building or in a confined space. The superheaters and condensers I prefer are of the battery type, fixed in a horizontal position with the end plates free from any fittings. A leaky condenser tube can then easily be stopped by any workman by simply taking off the two end-plates and driving in a wood plug, and a proper repair done when two or three tubes need replacing or at the general overhauling of the plant in the summer. Pressure-gauges should be fixed on the inlet to condensers.

The products of condensation from the waste gases, usually termed "devil's water," should be collected in a tank and returned again to the distillation still along with the gas liquor—thus disposing of a very obnoxious liquid and at the same time recovering any ammonia that may have passed the saturators during irregular working.

#### TREATMENT OF WASTE GASES.

The waste saturator gases must be purified of sulphuretted hydrogen prior to discharging into the atmosphere; and the most

general scheme is by the usual oxide purification. An efficient and cheap arrangement is a heap of oxide placed on and around grids raised about 6 inches above a brick floor. Two such heaps should be provided, and the connections made by pipe-line and water-sealed valves. The practice of passing the waste gases to the gas-works purification plant is not to be recommended.

Where a little more skilled supervision is available, the waste saturator gases may be burned in a special furnace and the  $\text{SO}_2$  formed neutralized by passing the gases, after cooling, through scrubbing towers packed with hard limestone. The gases may also be burned in a Claus kiln and the sulphur recovered.

Where a sulphuric acid plant is working, the best and most remunerative method of dealing with these gases is to burn them in a special furnace, and pass the  $\text{SO}_2$  formed to the nitre ovens and then forward to the Glover tower. The choice of process depends largely on the size of plant and the skill of the labour employed. A common feature to all of them is the importance of cooling the gas thoroughly and having it in a dry condition; ammonia and tarry vapours being carefully eliminated.

#### TREATMENT OF WASTE LIQUOR.

The disposal of the waste liquor from the stills is getting a very serious problem, and will become more so as the treatment of sewage on bacteriological lines is adopted. The stringent requirements that are being enforced by rivers and sewage authorities make this question one of urgent importance. The waste liquor possesses the power to absorb a large amount of oxygen, due mainly to the amount of phenols and sulphocyanides it contains. Dr. F. W. Skirrow, in his paper before the Society of Chemical Industry, in December, 1907, gives an analysis of waste liquor and the relative oxygen absorption properties. Any process adopted cannot hope to secure much remuneration towards the cost of treatment in the way of recovered products. Mr. John Radcliffe, of East Burnett, has patented a process, the details of which have recently been published in the Technical Press; and it would be of interest to know the oxygen absorption properties of his treated effluent. Dr. Grossmann has also done considerable work on this question, and aims at using the treated waste liquor for steam-raising purposes.

For some years past, Dr. Fowler has been experimenting on the direct biological purification of ammonia recovery liquors on percolating filters. For this to be possible, dilution of the liquor is necessary; the amount of dilution depending on the strength of the liquor. Where diluting water is not easily procurable, the purified effluent may be used for diluting purposes. Under Dr. Fowler's directions, experiments have been carried out on these lines at the Bradford Road works over a period of about five years; and the results are such that plans are under consideration for a considerable extension of the filtration plant. Experimental filters have also been recently started at other works—one being for the purification of the waste liquor from coke-ovens. As it is Dr. Fowler's intention to deal with the subject at length before the Society of Chemical Industry, it is at present inopportune to go into further details.

Waste liquor is also used for the partial absorption of the  $\text{SO}_2$  produced in the burning of the waste gases, as already described. In such a process, previous settling of the lime sludge is not resorted to; the waste liquor being passed directly down brick wash-towers, up which ascend the gases from the sulphuretted hydrogen furnace. The waste liquors leaving the towers is of light green or blue colour, and contains a little lime in suspension, which is removed by the usual settlement. At some gas-works, part is used for quenching the hot coke as drawn from the retorts, and part is evaporated in the ash-pans.

#### GENERAL WORKING.

The steam pressure should be reduced to at least 20 lbs., though with smaller plants I should advocate it being much lower, to admit of finer steam adjustment. It has already been noted that there are two points on a still at which steam is to be admitted. The one at the bottom of the still must receive the main amount, and that at the first liming section only just sufficient to keep the lime from settling. Tests should be made at the second tray above the liming section, and should contain not more than 0.10 per cent. of free  $\text{NH}_3$ ;  $\text{H}_2\text{S}$  and  $\text{CO}_2$  being absent, or only present in very slight traces—the steam being adjusted to meet these requirements. Having adjusted the steam, the lime should be added in such amounts that the waste liquor contains 0.01 per cent. of  $\text{NH}_3$ . A better method for controlling the liming operations, however, is to test the waste liquor for total and free lime, and to work with 15 per cent. of free lime in the total found. Thus, a test recently made gave 0.540 per cent. total CaO and 0.102 per cent. free CaO; giving 18.88 per cent. of free lime in the total found.

Many sulphate makers will only use the best pan acid for feeding the saturator, and, of course, pay accordingly. Tower acid made from spent oxide is quite good enough for the purpose, with a small saving in cost. There are two ways of working a saturator. First, to fill it up with a charge of acid and mother liquor or water, and then allow it to gradually work down to the adopted salting strength—preferably 58° Twaddell, when acid is gradually added to keep it to this strength during the time fishing operations are in progress, and then fill up again as before. The other method is to keep the strength to as near the adopted salting strength as possible by running in the acid in a continual stream through a small gauge-box. For one-man plants, the former method is



undoubtedly best, and the second method where the man's whole time is taken up by saturator and still duties.

Blue sulphate is a constant source of anxiety to the sulphate maker, and is mainly due to the saturator liquors becoming totally or locally alkaline. This can be brought about in many ways, such as (a) the acid feed stopping; (b) syphoning-over of stills; (c) back-pressure on saturators through partial blockage in condenser system, or restricted areas in their first design—the seal of the cracker-pipe being thereby reduced; (d) the still gases escaping mainly at one portion of the cracker-pipe; (e) the building-up of the hard sulphate just in front of the cracker-pipe and stopping free circulation of the acid liquors. The precautions necessary to guard against these have already been dealt with.

The well-known intense blue colour does not appear until after the salt has been in the store for a few days, and oxidation taken place. Its presence, however, can readily be found by adding a little hydrogen peroxide to a small quantity of the freshly-made sulphate, when, if blue salt is being made, the well-known blue colour will be instantly formed.

#### COSTS.

It is not my intention to go into any details relating to the costs of manufacture, for every works must of necessity vary. In the description of the Bradford Road works of the Manchester Corporation, prepared and presented by my Chief, Mr. J. G. Newbigging, on the occasion of your visit, the total cost of manufacturing a ton of sulphate of ammonia is given—*i.e.*, £2 10s. 11d. This figure includes capital charges, acid, lime, fuel, wages, salaries, repairs and maintenance, rates and taxes, gas, water, and sundries. The cost of the acid per ton of sulphate, which is included in the above amount, is £1 2s. 1d.; leaving £1 8s. 10d. for all the other charges. It would be totally irrelevant to compare these costs on a make of 4200 tons per annum (say) with a works making a tenth this amount.

The process is purely a chemical one; and if the various stages are regulated by the indications and directions given, the amount of waste will be reduced to a minimum. Every works of whatever size should keep a separate account of its sulphate plant, and check its efficiency on the gallons of 10 oz. liquor (by distillation test) used per ton of sulphate produced; a balance-sheet being made up of the  $\text{NH}_3$  distilled and the  $\text{NH}_3$  sold as sulphate. It is a gross mistake to calculate its efficiency on the pounds of sulphate per ton of coal carbonized. The acid should be all accounted for in the sulphate made, as the amount lost by the waste gases carrying a little forward as mist is practically speaking *nil*.

The design and general arrangement of the plant is the controlling feature in the labour charges. For packing sulphate, one man and a youth, with a simple home-made bagging machine, should pack, weigh, and sew, at the least, 10 tons per day; and it is advisable to so arrange the work that the man in charge performs these duties during stoppages of the plant.

For methods of analysis of gas liquor, let me refer you to the published report on alkali works by the Chief Inspector for the year 1903.

A short discussion followed, during which the President and other speakers paid Mr. Holton a high compliment on the essentially practical paper he had given them. Several questions were put to, and answered by, the writer of the paper. These dealt with the proportion of waste liquor to be returned to the liming pan, the quality of the oxide obtained from the salt-purifier compared with the oxide from the gas-purifier, the temperature at the inlet of the liquor, and steam pressure. One important point raised was that of cost. Mr. Holton admitted that wages formed a big item—but said this was generally due to the frequent handlings that took place—this applying more particularly to small plants. He was convinced, however, that, with system and care, the cost under this head could be considerably reduced. The waste-liquor problem, Mr. Holton agreed, was becoming a serious one, and therefore there was all the more reason why they should give it their close attention. He detailed what was being now done in Manchester to solve it.

On the motion of Mr. R. B. Braddock, seconded by Mr. Mercer, a vote of thanks was accorded Mr. Holton for his able paper, which, as the President put it, though technical, was easy to understand.

#### COURSE OF UNIVERSITY LECTURES ON GAS.

At this stage, and before the adjournment for tea, the President announced that Professor Dixon, of Manchester University, had kindly consented to deliver another address to the members of the Association. Further, the Senate had agreed to a course of lectures on "Gas" at the University; and he thought they had reason to congratulate themselves on this fact. (Hear, hear.) Mr. Taylor drew attention to the return debate on the subject of "Gas v. Electricity for the Production of Heat and Power" between the members of their Association and the Manchester Students' Section of the Institution of Electrical Engineers. The date was Tuesday, Feb. 15; the place of meeting being the Manchester Municipal School of Technology. At the last debate, it was considered that the gas engineers had the best of it; and he understood that the students were making special efforts to retrieve their lost laurels.

On resuming after tea, Mr. S. CARTER read his paper on

#### SOME EXPERIENCES IN MANUFACTURING CARBURETTED WATER GAS AT THE GARSTON (LIVERPOOL) GAS-WORKS.

In introducing this subject, it would perhaps be as well if a brief outline were given of the special function of these works. They were one of the earliest installations in this country, and were erected by Mr. W. King, M.Inst.C.E., in 1894, as an auxiliary to the other five works to meet the increasing demands of the public. The plant consisted of four sets of Messrs. Humphreys and Glasgow's double superheater type (having a guaranteed capacity of 750,000 cubic feet per set per day), with the usual seals, scrubbers and water-tube condensers, atmospheric pipe condensers, relief gasholder, and eight water-lute purifiers, 40 ft. by 20 ft. by 5 ft. 6 in. During a period of about two years, pure carburetted water gas, of an illuminating power of 21 candles (tested in a flat-flame burner), was made and distributed from the works. But there were practical difficulties in the use of such a heavy gas (sp. gr. '640) in the ordinary burners, stoves, &c.; and therefore it was decided to make 24 to 25 candle carburetted water gas (free from carbon dioxide), and mix it with 15 to 16 candle coal gas (oxide purified), drawn regularly, in carefully measured quantities, from one of the other works of the Company. This arrangement enabled some saving to be effected in the use of canal, and a better quality of coke was obtained. The system still continues, and is found to be eminently satisfactory.

It will be seen that the two works are bound, to some extent, to co-operate, and regulate production to suit each other. Thus, excepting in cases of sudden emergency, the carburetted water-gas plant at Garston stands on a different footing from most similar plants, having to take its place throughout the year as a regular producer of a proportion of the gas needed for the city. This fact, coupled with the unique position of the Garston works as a carburetted water-gas factory purely and simply, has kept the working of the plant always baldly exposed to criticism, and at the same time the management has had no difficulty in constantly observing the exact degree of efficiency of every process. No doubt this, and the absence of diverting influences on the Superintendent's mind, has had much to do with the fact that the working at Garston has been continuously improved, in one respect or another, until now there is very little in the way of "problems yet to be solved," or "difficulties to be overcome." It is now proposed to particularize to some extent, and treat of the chief difficulties that have at various times arisen, and the manner in which they have been dealt with. During the fifteen years in which the works have been in operation, the author has been employed, in one capacity or another, in superintending the working of the plant under his esteemed father until fourteen months ago, when he had the honour of succeeding him as Superintendent; and therefore he is fully conversant with all that has been done.

To begin with the generating plant, the life of each set, from lighting up to letting down, used to be from six to eight weeks, because the walls of the generator, especially over the clinking doors, were by that time burnt through, while other parts of the set would be in a fairly good condition. It was evident that this damage was caused by the draught at clinking times; and it was decided to remedy it by reducing the pull at the stack. For some months clinking was done with the stack-valve shut; and this met the case. But it rendered the clinking process more arduous for the men, and somewhat dangerous. To meet this difficulty, auxiliary stack-valves, with holes in them ( $\frac{1}{4}$  inches diameter) were provided, and were found to be quite efficacious. The generator walls were still observed to fail first over the cleaning-doors—making it evident that cutting went on during the periods of working. But, by fixing heavy wrought-iron plates above the frames and on the fire-bar ends within the doorways, also by luting-up the opening with clay and ashes ground together, the fire was completely kept out of the doorways, and the generator walls were found to last some three to four times as long as before.

The lower hot-gas valve used to leak and give much trouble by corrosion on the face, owing to the wet acid dust which always lay about it. Also the steam introduced into the original rose nozzle seemed to please itself as to what part of the fire it entered; and uneven heating resulted. Both these troubles have been got over by taking in the steam supply at the side of the generator farthest from the blast inlet, leading it to the centre of the main bearer bar, and connecting it to four iron branch pipes, one along each side in each direction, perforated with holes, in such a manner as to drive the steam against all parts of the bottom of the fire.

It may be observed, in passing, that we have very little belief in down-runs; and if good fuel could always be ensured, they would be abolished altogether at Garston, as an unnecessary complication of the plant, and a means of unduly punishing the fire-bars. Two sets were worked for more than a month last winter without making a down-run, and no ill-effect was observed until some indifferent coke came along, which made two down-runs necessary per twelve hours to lower the clinker in the fire. This convenience is the only justification for not ripping out that vulnerable portion of the plant. As it is, the "uptake-pipe" has been altered, and it acts as a trap for the dust and fliers that otherwise would pass with the blast from the generator to the carburettor. The present practice is to make only one down-run in twelve hours (the period between clinking times); and the



fire keeps hot right down to the clinker, which is, however, cool enough to be easily broken up and removed. To keep the chequerwork clean long enough to last the 24 weeks, which is now the average life of the generators, advantage is taken of every moment that a set is shut down to burn off the carbon by leaving the sight-cocks open and the covers off. It is remarkable how effective the induced cold air is in cleaning the bricks and maintaining the heats during an idle week-end.

Most of the dust or breeze which blows past the down-run pipe finds its way out of the stack, and, with the degraded hydrocarbons from the oil-soaked bricks, used to cause much hostile comment in the district; and the gutters and down-spouts of the roofs required constant attention. Something like 98 per cent. of this dust, as well as most of the smell, is now eliminated from the blast products by an arrangement supplied nearly two years ago by Messrs. Humphreys and Glasgow, by which the gases are led into a U-pipe, erected on the roof of the generator-house, in the downward leg of which a special water spray is inserted, which wets the dust, and washes it down into a sludge-tank; the gases escaping at the upward leg in a comparatively innocuous state. The amount of sludge obtained varies according to the quality of the coke; but it may be taken as, in the moist state, from 1 to 2 per cent. of the coke used. The worst feature about this arrangement is the rapidity with which the combined scouring and solvent action of the liquor destroys the cast-iron pipes, which had to be replaced within the first year by a square pitch-pine pipe, braced (perhaps an earthenware pipe would be better, excepting for the danger of fracture by shock), which pipe is still in use, and quite tight.

The water is supplied by a small pump on the operating floor, fitted with relief-valves, &c.; and the regulation is made by a special cock, geared to the generator blast valve-rod, which cuts off the water during the run. All who have experience of carburetted water-gas plant know how quickly carbon grows on the inside of the take-off pipes, especially if the heats are high, the oil coarse, or the pressures heavy, or if the illuminating power of the gas made has to be high, as at Garston. Yet the full 24 weeks are worked without opening out, except down near the seal, which is cleaned out every five weeks, when the washer is emptied. Acting on a suggestion made by Mr. Owens, of Messrs. Humphreys and Glasgow, the carbon deposited during each "run" is burnt out during the following "blow" by means of a small jet of air (controlled by the lever operating the stack-valve), which enters the pipe half-way down, and which has to be cleared of tar, &c., where it enters the take-off pipe, (say) once in 24 hours.

When using oil-heaters at Garston, several difficulties and one or two accidents occurred. They were therefore dispensed with altogether some eight years ago; and there has been no reason to regret the step taken. With some oils, as, for instance, the Texan, a scale formed on the inner surface of the heater, which, when grown to a certain thickness, chipped off, and fell into the lower neck, causing obstruction to the flow of oil, and upsetting the sprays, &c. Moreover, the space occupied by the heaters could ill be spared in a situation where free-way is necessary; and where the tendency is for stoppage to occur through furring. The use of heaters undoubtedly causes complication; and as there is no practical difficulty in cracking the full amount of any kind of oil when supplied to the carburettor in a cold condition, the plant is better without them.

Some four years ago, the opinion was formed that it was a mistake to make carburetted water gas in a vessel under pressure, almost as much as it was in the case of coal gas in a retort; and some time was spent in investigating the plant, to find out just where the pressure came from, and how it might be relieved. The pressure in the generator was about 18 inches, and the daily make of gas about 900,000 cubic feet per set. The conclusion arrived at was that the whole trouble was caused by the seal, which offered considerable resistance to the flow of the gas from the take-off. In the first place, the seal was reduced to the smallest safe limit; and then, by using a weir instead of a round pipe for the overflow, it was found possible to work with a variation of  $\frac{3}{8}$  inch, whereas  $2\frac{3}{8}$  inches was the previous amount. The effect produced, however, was not so much reduced pressure in the set as increased capacity, and further steps were taken. The opinion was formed that an increase in the circumference of the bottom of the take-off pipe would permit the gas to pass through the water of the seal-pot with greater ease. This simply meant hanging a trumpet or bell-mouth on the bottom end of the shortened pipe, which was done in June, 1908. At once the make of gas went up and the pressure down; and since then there has been no difficulty in regularly turning out about 1,100,000 cubic feet per set per day, or nearly 40 per cent. more than the plant was originally designed for—the pressures being less than one-half what they used to be. The fact that the seal-pot is now quite silent, whereas it used to rumble and bubble like a boiling cauldron, proves that the gas now passes clean across the depressed surface of the liquor, which levels-up again at the moment of opening the stack-valve. It must be stated that neither at any time during the experiments nor since has there been the slightest appearance of back gas. The relief holder was subsequently counterbalanced; and this made the seal safer, and also helped to remove the gas as fast as it was produced. Considerable economy in manufacture has by these means undoubtedly been accomplished.

Trouble was experienced some years ago with the pitching-up of the wooden battens with which the scrubbers were fitted; and

these were replaced by 5 in. by  $\frac{1}{2}$  in. boards, placed on edge, with  $\frac{1}{2}$  inch spaces. The latter kept perfectly clear for years, but certainly removed very little tar from the gas. Three years ago, in an endeavour to reduce the amount of heavy tar carried forward to the condensers, a return was made to the original design of filling; using  $1\frac{1}{4}$  inch square wood ribs, arranged chequerwise. A continuous spray of water removes the tar arrested by the wood ribs; and, so far, the arrangement is quite satisfactory.

After a set had been idling some hours, the water in the primary or water-tube condensers used to get very cold, especially in winter time; and this reduced the quality of the gas made when the set was put to work again. The difficulty was overcome by abolishing the use of water at that point, and admitting a natural draught of air, regulated by dampers; and this has been found quite efficient during the past twelve months.

Another matter, and one of the greatest importance, is the system of complete purification best suited, for convenience and economy, for dealing with a high quality carburetted water gas. The original practice was to pass the whole of the gas, after being dealt with by the primary scrubbers and condensers, through plain pipe condensers, and to reduce it to the temperature of the air at the condenser outlets. It was then taken through the relief gasholder to the exhausters, and consequently during the winter season the gas was "starved," so that it was very difficult and expensive to maintain the standard illuminating power; while a large quantity of tar-fog was still carried forward, to the detriment of the oxide in the first purifiers. The problem was how to retain the illuminating power without permitting tar to go forward, or, in other words, how to get the tar out and leave the quality in.

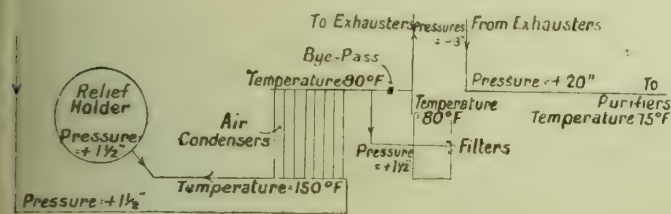
An endeavour to knock the tar out at the air condensers by introducing perforated steel discs in their outlets, resulted in back-pressure being thrown on the set; so it was decided to put the condensers direct on the exhauster inlet, and thus pull the gas through—the relief holder simply balancing the varying make, and maintaining a regular flow through the plant. In this way the bulk of the gas misses the relief holder altogether; the only fault being that more condensers had to be put on one day than another, according to the weather, and this affected the tar-extracting efficiency of the discs, because of the varying rate of flow. When frost came, the tar in the discs became so thick that the back-pressure went up from 4 to about 14 inches, threatening a stoppage; and the steaming of the discs, while giving some relief, caused naphthalene to go forward, and resulted in obstruction in the gas service pipes—a thing previously unknown at Garston. It was then decided to maintain a temperature of 70° to 75° Fahr. at this point by restricting the number of condensers used; and this enabled work to go on for six months at a time without the discs having to be cleaned. The oxide boxes became much more active; but still sufficient tar went forward to prevent the spent material from being of use to the vitriol maker. The oxide was clogged, so that a pressure of 12 to 15 inches was thrown by each box; and when a layer of the stuff burst, foul gas passed through the hole thus formed.

The next step was to remove the tar in the first purifier, by passing the gas through a layer of material which would be close, and yet non-porous, so as not to clog. Clinkers were used for this purpose, graded as follows: A 3-inch layer of  $1\frac{1}{2}$ -inch cubes, a 14-inch layer of  $\frac{3}{4}$ -inch cubes, and a 4-inch layer of ground clinker blinding, placed one upon another to form a bed. This box was put in action in September, 1907, and worked until November, 1909; passing upwards of 1200 million cubic feet of gas, from which it removed almost every vestige of tar—throwing it off in the bottom of the box, where it escaped through a sealed drain-pipe. In the last few months of its life, the material began to make-up—the back-pressure from it rising from 4 to 20 inches. The result was to throw out nearly all the water vapour as well as the tar; and the expanded gas at the outlet of the filter so dried the oxide as to make it inactive after a few weeks' work. There was no duplicate box, and this particular purifier was needed for use with oxide.

The success of this experiment led to the provision of a pair of luteless boxes, each 10 ft. by 10 ft. by 5 ft., fixed in the open air, connected to the outlet of the condensers and the inlet to the exhausters; and these were fixed and ready for use at the end of October last. They were put to work, charged in a similar manner to the No. 1 purifier before mentioned, but with 6 inches of  $1\frac{1}{2}$ -inch, 6 inches of  $\frac{3}{4}$ -inch, 18 inches of  $\frac{3}{8}$ -inch, and only  $\frac{1}{2}$  inch of fine blinding raked in. It was found that each box was capable of dealing with 2 million cubic feet per day, or 20,000 cubic feet per square foot per day; the pressure thrown being  $\frac{1}{4}$  inches. By keeping the temperature of the gas at 80° Fahr., the tar was separated in a condition liquid enough to run away. It was gratifying to find that, though the oxide boxes began to throw a little pressure, they seemed to get a new lease of life, showing that the pressure was not due to tar. The conclusion drawn was that the increase was attributable to the fact that, in knocking out the tar at higher temperature and lower pressure, more water vapour was going forward into the oxide boxes, helping to keep them in active condition; and the pressure was due to the separation of sulphur through the continuous revivification which is effected by allowing air to enter the filter outlet (where about 3 inches of vacuum exists) through automatic valves and calibrated cocks set to suit the make of gas. This opinion has been verified by the condition in which the oxide is now taken from the purifiers.



A rough diagram of the course of the gas is appended, with remarks as to the temperature and pressure obtaining at all the different parts of the system, when producing 2,200,000 cubic feet of 24½ candle gas per day.



It might be interesting to mention at this point an experience connected with the mixing of the gases for distribution. In drawing the necessary amount of coal gas from the Athol Street works for admixture with the carburetted water gas, one of Donkin's improved Beale type single two-bladed rotary exhausters is employed, of a capacity of 200,000 cubic feet per hour; and as this is usually worked at less than half its normal speed, driving the gas through a 125,000 cubic feet wet station meter only 10 yards away, one may very well imagine the degree of pulsation which occurred between the exhauster and the gasholder inlet, affecting both meters, which are placed side by side in the same house. In the month of November, 1903, the coal-gas meter ceased to register. On opening it for examination, it was found that several plates in the drum had started; and a large hole in one of the vanes seemed to indicate that at some time a shock had been unknowingly given to the meter. A thorough repair was made, and the meter put to work again in August, 1904; care being taken (by running the exhauster at 60 revolutions at all times, and by bye-passing a quantity of the gas to the inlet) to minimize as far as practicable the degree of fluctuation in the flow. In October, 1906, after working 26 months, the meter again broke down; and on inspection the drum was found to be worse than before—the stays being broken off, and the vanes and one of the cast-iron end blocks badly damaged.

The conclusion came to was that fatigue had taken place through the constant buckling of the sheets; and the drum had to be practically rebuilt. Inquiries as to the best means of getting over this trouble were made in many directions, but without success until Messrs. Thorp and Marsh took up the problem, and devised an arrangement in which a piston, working in a cylinder connected at one side to the inlet and at the other side to the outlet of the exhauster, and actuated by a shaped cam on the crank-shaft of the engine, absorbed the extra quantity of gas thrown out by each stroke of each blade, and giving it up again between the strokes. After careful adjustment, this arrangement (which, by the way, has been patented\*) was found to give a continuous flow of gas from the exhauster in regular volumes at all speeds, from 25 to 75 revolutions per minute. The meter was put into action in November, 1908, since which time not one cubic foot of gas has been bye-passed, and both meters are running quietly and satisfactorily. It is estimated that the fuel saved during the past fourteen months has just about paid all the expenses connected with the arrangement; and our Vice-President, Mr. Frank Thorp, is to be congratulated on the splendid success which has attended his efforts in the matter.

In the discussion which ensued, Mr. Carter answered the questions as they arose. In reply to Mr. Alsop, he explained the advantage of the false stack bar, and, with the aid of the black-board, showed how it was fixed. With reference to a query about the ash that was made, he said that it all depended on the quality of the coke supplied. In his case, it worked out at about 6 per cent., though he had known it run up to 8 per cent. The time occupied in clinkering was from 18 to 20 minutes; and eight men were required for the purpose. Replying to Mr. Woodhead, who said that in the making of a high-grade gas he found a great deal of carbon had to be dealt with, Mr. Carter said that at Garston they burned off the carbon. In regard to the temperature of the gas at the condenser, he knew of a case in which it was over 100°, with a report of increased efficiency. When they had more than two sets working, they had always two filters in use. As to steam pressure, he would work up to 130 lbs., because, in his opinion, 120 lbs. was not enough to keep the steam dry. Replying to Mr. Buckley, who asked the author how much naphthalene he found in his water gas, and how much of it went forward, Mr. Carter said the naphthalene varied very much, but, as a rule, it came out at about 5 per cent., and he had no reason to suppose any naphthalene went forward. Answering a further question about the oil spray, Mr. Carter said he had a Brighton spray presented to him the previous day. He had been asked to examine it, and give an opinion on it. The examination had, however, not yet been made. Mr. Carter went on to explain the spray that he has in use at Garston. This consists of a spindle in the centre of the tube, and a disc with diagonal holes in it, and rotating distributes the oil.

On the motion of Mr. J. Taylor, seconded by Mr. Wrigley, a vote of thanks was passed to Mr. Carter for his paper.

This concluded the proceedings.

## YORKSHIRE JUNIOR GAS ASSOCIATION.

Whenever a Junior Association can arrange a visit to their President's works, the fixture is always anticipated with pleasure, and attracts a good attendance. The position of the Yorkshire Juniors' President, as Manager of the Frizinghall Chemical Works of the Bradford Gas Committee, afforded the members the opportunity of a visit of great interest, somewhat off the beaten track. A goodly number assembled at the works last Saturday, and were shown round in small parties by Mr. S. W. Shepherd, his Chief Assistant, Mr. Percy Ward, and other members of the staff. A detailed description of the works appeared in these columns [Vol. CII., p. 565], when the Manchester District Institution of Gas Engineers visited them.

The works consist of a sulphuric acid plant and an ammonia plant, and deal solely with the oxide and liquor from the various stations of the Bradford Gas Committee. The visitors were all struck with the neatness and compactness of the works, and the signs (very evident to those who were somewhat familiar with these works) of constant improvements. Emphatically no "resting on the oars" prevails here. Various minor products have been made from time to time as a demand was found or created for them, and made only so long as remunerative, after which time inventiveness and alertness on the part of the management soon has new processes at work. In the two main departments, the aim has evidently been so to modify and improve the plant as to make a smaller one than usual suffice for a given amount of work, by bringing it to a very high state of efficiency.

The sulphuric acid plant was first inspected. About one-third of the total make of acid is used for sulphate of ammonia; while all the remainder goes to the neighbouring sewage works—being forced there through pipes by compressed air. The use of sulphuric acid for "cracking" the soap dissolved in sewage and waste effluents is common in the West Riding textile districts, and especially in Bradford. Many of the larger works treat their own effluents, in order thus to recover the fatty acids of the soap—the product being known in the oil trade as "Yorkshire grease." One Bradford works alone—and that not the largest—recovers nearly £6000 worth a year; while the inferior quality obtained from the crude sewage brings a return of about £12,000 a year to the Corporation. The chemical works are fortunate, not only in thus having but one customer for their acid, but in not having the trouble of concentrating it, packing it in carboys, and conveying it by rail or road.

In going round, the absence of the usual tall chimney was pointed out; the movement of the gases through the whole vitriol plant and the intake of air at the ovens being secured not by chimney draught, but by the action of a Kestner acid-resisting exhauster placed after the last chamber, and capable of passing 2000 cubic feet per minute. In recent years, the capacity of the plant has been greatly increased; and this has been secured with but little increase of chamber-room by the adoption of three sets of condensing or scrubbing towers intermediate to the chambers. These resemble small board-filled scrubbers on a gas-works, only glass plates of ½-inch thickness, ½ inch apart, and 4 inches broad are used instead of boards, giving a much greater surface for a given cubical space than any other scrubber filling (26 square feet per cubic foot). These have a high efficiency, and condense 20 per cent. of the acid, though having a capacity of only 1 per cent. of the total chamber space. The Gay-Lussac or nitre absorbing towers are similarly filled, and are therefore only of about one-fifth of the size necessary with older-fashioned fillings, such as coke. This improvement, patented from these works, may be of interest to some gas-works whose tower-scrubbers are falling behind the requirements of an increased make.

Another recent improvement was noticed in the introduction of fused silica channels for the passage of the hot, strong acid. This new ware answers well, resists strong acid at a very high temperature, and is uninjured by any sudden and considerable changes of temperature. It seems likely to be generally adopted in such places, in spite of its rather high prime cost. The same high efficiency of compact plant was noticeable also when the ammonia houses were examined; the exceptionally small size of a free ammonia still capable of dealing with 100 tons of liquor a day being much commented on. This is of special construction, and was also designed by Mr. Shepherd, in conjunction with the late Manager, Mr. W. Wyld. All the liquor from the Bradford Gas-Works is delivered here by gravitation through pipes. As Mr. Shepherd's subsequent address would lead one to expect, much care and watchfulness are expended on all details of the plant; and many striking economies and successful precautions were quoted. The boiler water is softened on the works; and its pre-heating by the heat remaining in the waste gases after the raw liquor has been warmed up, and by the economizer, effects a very large saving in fuel.

New to many of the visitors was the muriate of ammonia plant; and it came in for close and interested examination. The production of this salt has long been a special feature of the works. Sulphate plant can hardly be inspected without inquiries as to blue salt, effluents, &c. At Frizinghall, blue salt rarely occurs—largely owing, in all probability, to the cyanide recovery process employed on most of the Bradford works, as ammonium cyanide, which the Chief Inspector under the Alkali Acts regards as the usual source of the trouble, is absent from the liquors here treated. The bacterial beds for the purification of the spent liquor and elimination

\* See "JOURNAL" for April 21, 1908, p. 170.



of its cyanide compounds, which were referred to later in Mr. Shepherd's address, were pointed out, although the heavy rain prevented much examination of them.

The members reassembled after going round the works, and adjourned to a neighbouring school for the delivery of Mr. Shepherd's Presidential Address.

The PRESIDENT then delivered his

#### INAUGURAL ADDRESS.

It opened with an exhortation to his colleagues, as members of an Association formed for mutual improvement, to communicate to each other their acquired knowledge, whether as the result of success or failure, in the form of papers for their meetings. He urged them not to be diffident, and pointed out that if they had mastered a difficulty, the relation of their experience might be of valuable assistance to others. Having this in mind when thinking over the subject of his address, he decided to offer a few observations on the recovery of ammonia, and the making of it into sulphate; this being the only portion of gas-works practice with which he was in touch. He then proceeded as follows:

In looking over the returns of gas undertakings as published from time to time, I have always been surprised by the great difference in the amount of ammonia recovered between one undertaking and another; the difference between the highest and the lowest being more than may be accounted for by quality of coal or methods of carbonization. The yield of ammonia obviously is dependent upon the nitrogen content of the coal carbonized; and the difference between the theoretical and practical yield is so astonishing that I trust I may be permitted to allude to it for a moment. In Newbigging's "Handbook" are given analyses of 53 samples of coal from different mines, the average nitrogen content of which is 1.33 per cent.; and if the whole of this nitrogen were recovered as ammonia, it would yield 140 lbs. of sulphate (24½ per cent. of ammonia) per ton of coal. The experiments of Professor Foster and others on the distribution of nitrogen in the distillation of coal showed that about 80 per cent. of the nitrogen is to be found in the gas and coke. Of the total nitrogen of the coal, four-fifths are gone beyond recovery. In view of the address delivered to the British Association by one of its Past-Presidents on the future of the world's wheat supply and its dependence on nitrogenous material, gas-works chemists have here a wide field for research. It has been said that he who causes two blades of grass to grow where before there was only one is a benefactor to his race; and if that be so, what racial gratitude must be due to him who causes two ears of corn to grow in place of one. That such nitrogen may be recovered we have ample proof; for, in the production of Mond gas, 90 lbs. of sulphate of ammonia per ton of coal are obtained, while in the Young and Beilby vertical retorts for the distillation of shale, 125 lbs. of sulphate of ammonia have been got by steaming.

This leads to the point that methods of carbonization greatly influence the yield of ammonia; high heats leading to its decomposition, with formation of cyanogen. Mr. Charles Hunt found, as a result of experiments at Birmingham on the same coal, that with an increase in temperature of 100° Fahr. double the amount of cyanogen was obtained. Again, Mr. Ferguson Bell, in his paper read before the Institution of Gas Engineers last year, showed that, by doubling the weight of the charge and period of carbonization from six hours to twelve hours, the production of ammonia was increased by 17 per cent.; and, though not mentioned, it would probably be found to be partly at the expense of the cyanogen. In the results given of the working of some of the vertical retort systems, we find an increase in the amount of nitrogen recovered as ammonia; and it would appear, therefore, that a minor result of the latest developments in carbonizing plant and methods will be an increase in the quantity of ammonia recovered and a reduction in the amount of cyanogen—the latter possibly helping to balance the cyanide market, which has gone to pieces with the many attempts at recovery by gas-works.

To come back to the gas-works returns, what do we find in practice the yield of ammonia—or, rather, what I am more particularly concerned with in this address, the yield of sulphate of ammonia—to be? Taking the last published returns, I find the average of 51 gas undertakings returning their recovered ammonia as sulphate to be 24 lbs. per ton of coal; and while more than 50 per cent. are below this figure, 18 per cent. are actually below 20 lbs. If, then, 24 lbs. is an average yield, having regard to varying qualities of coal and differential practice in carbonization, I venture to suggest that, by care and vigilance, the average of 20 lbs. returned by the 50 per cent. who are below the average could be increased.

I will now proceed to point out certain places where, in my opinion, leakage may be found, and where the organization of a systematic and careful oversight will be amply repaid by an increased yield of the ammonia residual. The pipes conveying liquor underground should be carried in brick or concrete channels, the covers of which should be easily removable for inspection. The store-tanks and seal-pots should be quite tight and covered in; ammonia being very readily evolved from its solutions, even at atmospheric temperature. If the surface of the liquor be agitated or disturbed by such liquor being dropped in from an open pipe-end, the evolution of ammonia is accelerated; and it is advisable to dip the pipe in the liquor whenever possible. With regard to this, I remember seeing some time ago the report of a speech by the late Sir George Livesey, at a meeting of share-

holders of the South Metropolitan Gas Company, that they had had that year an increase of £5000 in their receipts from residuals, not because of better prices, but by preventing waste and loss by evaporation. A thorough overhaul of the ammonia-recovery apparatus had taken place, and much care had been exercised to make all quite tight. This is confirmed by the returns of the Company—the amount of liquor recovered being always well over 30 gallons of 10-oz. per ton of coal; and yet there are other undertakings returning less than 20 gallons.

By the way, I should think that in this twentieth century we gas people might add to our dignity by ceasing to speak of "ounce strength," and value our liquor on its percentage of ammonia. *Apropos*, why do so many gas undertakings continue to sell their liquor on the unscientific valuation by a Twaddell test? Even the old-fashioned "ounce" valuation is often arrived at by multiplying the Twaddell test by two, the result of which is still "twaddle," and absolutely unreliable. If the "ounce" valuation is preferred, then let it be arrived at by a proper analysis.

Certain inefficiencies tending to leakage of ammonia in the washing and purification plant may well be looked for. Inefficient scrubbing and washing plant will be the means of passing ammonia into the purifiers, where it is quite lost to the revenue account, and is the cause of considerable trouble to the purchaser of the spent oxide. I have often found in it 0.4 to 0.6 per cent. of ammonia; the latter figure causing great inconvenience and heavy consumption of nitrate of soda in the manufacture of sulphuric acid. Most acid manufacturers, when buying spent oxide, will claim an allowance for, or even refuse a parcel containing, an excess of ammonia. It is therefore necessary to watch the efficiency of the washing plant, not only on account of loss of ammonia, but also loss of revenue from the spent oxide.

Now as to working-up the liquor for the manufacture of sulphate of ammonia. It is my firm opinion that the real secret of low returns is a lack of vigilance while the sulphate plant is working, and that in many cases, if the profit on sulphate making turns out better than the former revenue when selling liquor, the management appears to be satisfied that all is well. This has been confirmed by two or three instances which have come under my personal notice, where, even under such circumstances, heavy losses of ammonia were taking place. The spent liquor from the stills should be very frequently tested for ammonia, and should never exceed 0.02 per cent. of ammonia. If higher than this, the cause should be looked for at once and remedied. A common error is that of exceeding the capacity of the stills, perhaps because there is a shortage of liquor storage, or one has a false notion that, by working up the stock quickly, the working expenses are reduced, forgetful of the fact that loss of ammonia may be taking place that will quickly swamp the reduction.

When this error has been pointed out, one has been met by the remark: "Why, the plant is of such-and-such capacity." That may be so; and the named capacity might hold good when the stills were new, but will not do for all time. When all is new and clean, the plant may be run at its maximum capacity without loss; but after several "runs," with long intervals between, the overflows and bubbling-hoods of the lime-still receive a coating of lime which on cooling sets hard, and this builds up after each stoppage—every layer built up reducing the contractor's guaranteed maximum capacity. It is necessary, therefore, to regulate the supply of liquor according to the result of the spent-liquor test; and this should be made by apparatus more scientific than a workman's sense of smell, which, sometimes, especially in the night, is wont to become dormant.

Another point to watch is regulating the lime supply. Here again rule-of-thumb is often in evidence. I remember once asking the attendant of a small plant how often lime was admitted. "Oh, just when we think fit," was his reply. A continuous feed is, of course, the ideal; but it is difficult to arrange in small plants, though I do not see why a small wall pump should not be used. If its duty was too high for the plant, it could have a bypass on the delivery, to return the surplus to the lime-tank, and it would also serve as an agitator. In order to find whether the liming periods are satisfactory, I would suggest that frequent samples of the spent liquor be drawn immediately before the lime is admitted, and distilled in the laboratory in duplicate—one without and the other with the addition of lime. If the latter yields a higher result, then, of course, the inference is that more lime is required in the still; and this should at once receive attention. A chart containing these tests and the time of liming (say) for a whole day would then show whether such periods are frequent enough. While speaking of stills, perhaps I may be permitted to point out the advisability of having pressure-gauges fixed to them; or, if these are considered superfluous, some form of safety-valve or pressure-box might be employed to relieve excessive pressure in case of blockage.

The "devil liquor" (which is the technical name for the condensed liquor from the saturator waste gases) should give an acid reaction to litmus paper; but if the latter turns blue, then ammonia is passing the saturator, or there is a leakage of liquor in the superheater. The waste-gas pipe from the saturator should have a tubulure and plug, in order that the gas may be tested frequently by litmus paper. If no alkaline reaction shows here, then either the trouble is over for the time being, and must be carefully watched, or the superheater is the source of trouble. If the alkalinity of the waste gases appears just after "fishing," the chances are that the saturator is too near being neutral; and as concentrated solutions of ammonia salts when hot dissociate,



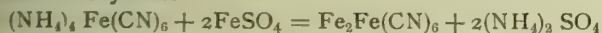
giving off their ammonia, there is always a danger while "fishing" of the hot acid (what little there is of it at such time) being unable to retain the ammonia passing into the saturator. It is advisable, therefore, to have in the ammonia-pipe many small holes rather than few large ones, for the smaller the bubbles of gas, the better the opportunity for efficient absorption. Should the saturator be quite acid, and there is no reason to suppose the ammonia-pipe is burst, the trouble is no doubt caused by an incrustation of sulphate building-up on the pipe, and forming a kind of annular tube which allows a portion of the ammonia gas to pass beyond the level of the acid. This is a frequent source of trouble, and, when first noticed, steps should at once be taken to clear it, as much ammonia may be lost in this way if allowed to continue. To clear, dilute the saturator with water, and stop the supply of liquor to the stills; keeping the steam on as usual. This will "boil up" the saturator, and eventually dissolve the incrustation. I have found it a good plan to perform this operation once a week; and I rarely experience the trouble of ammonia passing from the above cause—the saturator keeping very clean. I would suggest that this should be done every time the liquor stock is worked up, just prior to shutting down the plant; and at the same time one should also arrange to turn a good flow of water down the stills when the liquor is shut off. This will assist in washing out the particles of lime while the still is hot, and will minimize the before-mentioned incrustation of lime in the stills.

In bringing under your notice my observations on the difficulties liable to crop up in sulphate making, I must not leave out the question of "blue salts;" for what manager or person in charge of a sulphate plant has not, at some time or another, experienced this trouble. Happily much useful investigation has been carried on in this field, and the pitfalls are now pretty well known. The essential factor for the formation of "blue salts" is the presence of ferrocyanides in the saturator; and this has been accounted for in two ways. Some chemists claim that disorganization of the plant, bringing about a neutral or alkaline saturator, is the cause; while others say it is "priming" of the still—that is, liquor passing from the still to the saturator along the pipe conveying the gases. Both are quite right; and, according to certain conditions, one or the other may be the seat of the trouble. At the same time, I have seen "blue salts" formed when the saturator has never been other than normally acid; and I have also seen an alkaline saturator many times without the formation of "blue salts." The conditions for the first cause are the presence of ammonium cyanide in the liquor and the presence of iron, which is invariably found in the acid. The saturator must be neutral or alkaline, and if cooler than usual, so much the better for the "blue salts," for more cyanogen will be retained in the saturator liquor.

The reactions take place in the following manner: If the saturator is neutral or alkaline, the iron in the acid is precipitated by the sulphuretted hydrogen, and reacts on the volatilized ammonium cyanide in the gases from the still, forming ammonium ferrocyanide—

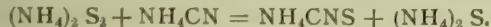


Ammonium ferrocyanide is quite stable, both in alkaline and acid solutions; and when the normal conditions are resumed, correcting the alkalinity of the saturator, the iron salts are redissolved, and the ammonium ferrocyanide is converted into ferrous ferrocyanide—



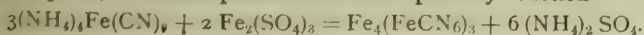
which is a white salt, gradually oxidized on exposure to the air into the ferric ferrocyanide (prussian blue). This, then, is why sometimes an apparently white sulphate is changed on standing to a beautiful "blue;" and when the manager seeks to diagnose the cause of his blue salt, behold the saturator is working quite normal. On attempting to imitate these reactions in the laboratory, I was faced with the difficulty of being unable to obtain a blue sulphate, even though my saturator solution was alkaline and quite cold; and on examination of the sample of gas liquor used I found it did not contain a trace of ammonium cyanide.

The Chief Inspector of Alkali Works, in his investigations on the constitution of ammoniacal liquors, has shown (see Fortieth Report, p. 34, and Forty-Second Report, p. 26) that polysulphides of ammonia react with ammonium cyanide, forming ammonium sulphocyanide, and that excess of either implies absence of the other—



In the case of the sample of liquor just mentioned, the absence of ammonium cyanide is quite accounted for in this way. The polysulphide method of cyanide extraction is in use at several Bradford Gas-Works, and consequently an excess of ammonium polysulphide is present in the liquor received at the Chemical Works. The same reason also accounts for my not finding "blue salts" when the saturator has been alkaline.

"Priming" may occur in such quantity as to cause the saturator to become neutral or alkaline, in which case the before-mentioned reactions take place, provided, of course, the liquor contains ammonium cyanide. If it contains ferrocyanide of ammonia, then, should the still "prime" with the saturator working under quite normal conditions, the result is bound to be "blue salts." Some liquors do not contain ammonium ferrocyanide; but that at Bradford contains from 10 to 15 per cent. of the total cyanides present in the form of the ferrocyanide. The iron in our acid being invariably in the ferric condition, when "priming" takes place, we obtain prussian blue as a primary reaction—



In this case, the salts are coloured when removed from the saturator, and "blue salts" are obtained, even though working the saturator under quite normal conditions, should the still "prime" into the saturator.

The sulphate may sometimes have a yellow colour, which is due to the presence of arsenic sulphide; this being precipitated from the acid in the saturator by sulphuretted hydrogen. If the acid being used is supposed to be "arsenic free," the inference is that a consignment of arsenic acid has been received. With an open saturator, it is quite possible to use the cheaper pyrites acid without affecting the colour of the sulphate. This is done by running into the saturator a little heavy tar oil along with the acid, and this carries the arsenic sulphide to the surface as it is precipitated, and must be continuously skimmed off.

The difficulties mentioned up to now are all such that with care they may be quite overcome; but I come now to a trouble of the sulphate manufacturer which has arisen within recent years. I refer to the disposal of his spent liquor. Happy were the days of old when such effluents were turned into the nearest watercourse or sewer, and there was none to say nay. But, alas for the peace of mind of manufacturers in general and of sulphate makers in particular, those days now belong to the "good old times." Though the Rivers Pollution Prevention Act was passed in 1876, it is only within quite recent years that anything has been done in the way of enforcing its provisions. The consequence is that where spent liquor was formerly frequently discharged into a watercourse, the distiller is called upon to stop his pollution. If he is discharging it into a sewer, the local authority are on his track to keep it out, as they find difficulty in conforming to the provisions of the Act because of its admission.

Of course, it is quite easy to provide settling-tanks for the lime sludge and cooling-tanks—indeed, this is necessary, because if the spent liquor went into the sewers hot, poisonous gases might be generated, causing danger along the sewer line. But having done all this, the polluting effect of the clarified liquor, judged by the "oxygen absorption" test, which is the standard at present applied to sewage and trade effluents, is enormous. When I mention that the spent liquor may require anything between 300 to 600 (I have even heard of 900) parts of oxygen per 100,000 to completely oxidize it, whereas crude sewage requires seldom more than 10 parts per 100,000, and that the spent liquor from the Frizinghall Works is only about 0.25 per cent. of the dry-weather flow of Bradford sewage—and even this small quantity is sufficient to increase the strength of the sewage by about 12 per cent.—you will readily understand that the less a local authority having such works in their district have to do with their spent liquor the better able are they to conform to the provisions of the Rivers Pollution Prevention Act. Owing to pressure brought to bear upon ammonia distillers, many attempts have been made, with more or less success—certainly less than more—to render spent liquor harmless for admission to a stream, for most processes have been banished to the limbo of forgotten things.

Unlike the majority of trade effluents, the one under consideration is not amenable to chemical treatment except by methods of precipitation whose cost rules them out of court; and even then the effluent is nowhere free from harmful constituents. The oxidizable matters in spent liquor are sulphocyanides, ferrocyanides, thiosulphates, and phenol compounds. All except the last may be removed by precipitation; and these may often account for 50 per cent. of the oxygen consumed. Dr. Skirrow, in a paper read before the Society of Chemical Industry, estimates that half the phenols evolved from the distillation of coal are found in spent liquor; so that another problem for investigation is how these phenols may be retained in the tar, thus causing the spent liquors to be less polluting. In order to precipitate sulphocyanides, an expensive salt like copper sulphate has to be used; and extreme care is necessary to prevent loss of precipitate and precipitant; and when obtained, there is practically no market for the copper sulphocyanide beyond what will yield smelter's value for the copper constituent, allowing nothing for the cyanide. The proper place for the recovery of cyanogen is from the gas and from the liquor before distillation; for where cyanogen recovery from the gas is practised, there is still the proportion of cyanogen which condenses out with the "virgin liquor." Evaporation of the spent liquor would ensure a more concentrated accumulation of cyanides. But again we are faced with a costly process, for with a low-class fuel the cost would be about 2s. 6d. per 1000 gallons; and though this could be reduced by vacuum evaporation, the capital outlay of such apparatus would be enormous. Experiments at Frizinghall showed that the distillate from vacuum evaporation consumed a much larger amount of oxygen than crude sewage.

Dr. Gilbert Fowler, of the Rivers Department of the Manchester Corporation, has for some time been carrying out experiments at Manchester on the bacteria treatment of spent liquor without admixture with sewage. It has always been thought that this liquor was not amenable to bacteria treatment on account of the presence of cyanides; but Dr. Fowler has proved conclusively that these may be broken down by bacteria under certain conditions. By diluting the spent liquor so that the oxygen absorption test is about 25 parts per 100,000, it is possible to run the diluted liquor on to a bacteria bed at the rate of at least 90 gallons per cubic yard per 24 hours; and the activity of the bed is maintained for a long period. Plans are under consideration for extending the filter-beds at the Manchester Corporation Gas-Works for treatment of the liquor before entering the sewers.



The Frizinghall spent liquor averages about 550 parts of oxygen absorbed per 100,000 and contains 0.3 per cent. of calcium sulphocyanide. A small filter was prepared according to Dr. Fowler's instructions, and the spent liquor diluted with fresh water from a neighbouring stream until the diluted liquor absorbed 25 parts of oxygen per 100,000. The capacity of the filter is 40 cubic yards, and consists of "clinker" graded in layers—rough at the bottom and fine at the top. The liquor was run on to the filter very slowly at first, and gradually increased, with periods of rest, until it is now possible to maintain a flow of 90 gallons per cubic yard per 24 hours, and a purification of 85 per cent. on the diluted liquor—the effluent being pure enough for the stream. The cyanogen compounds are quite eradicated—no traces being present in the effluent; and the phenols are reduced by more than 80 per cent.—showing that bacteria may be cultivated to do the work of purifying liquors containing such compounds. Owing to the geographical position of the spent liquor outfall, we are unable to send this to the sewage works; but if an effluent for admission to the sewers was required—say, a purification of only 60 per cent.—the flow per cubic yard could be considerably increased.

When the filter has been brought up to its proper condition, Dr. Fowler finds that the dilution of the spent liquor with the effluent from the filter is quite feasible; and in this case, of course, the purification is greatly increased. For instance, a spent liquor absorbing 500 parts of oxygen per 100,000, diluted with an effluent of 2.5 parts, and the purification of the effluent again brought to 2.5 parts, would mean a purification of 99½ per cent. Owing to difficulties over which we had no control, delay in maturing the filter has taken place; but now the experiments are proceeding, though it is too early yet to give any results. To show the advantage of treating the spent liquor on these lines, apart from mixing with sewage, I may mention that whereas when crude sewage is treated on bacteria beds for a purification of 85 per cent., 50 gallons per cubic yard per 24 hours is considered a good flow, Dr. Fowler's experiments show that by treating the liquor by itself, on the lines described above, a purification of 99½ per cent. can be obtained with a flow of 90 gallons per cubic yard per 24 hours.

The present state of the law regarding trade effluents is very unsatisfactory from the manufacturer's point of view; he being quite at the mercy of the local authorities. The Rivers Pollution Prevention Act provides that it is an offence against the Act to cause or knowingly permit any poisonous, noxious, or polluting liquor proceeding from a manufacturing process to flow into any stream. If such polluting liquid was passing into the stream prior to 1876, and it can be shown that the best practicable and reasonably available means are being used to render such liquid harmless, an offence against the Act is not committed. Proceedings are not to be taken without the consent of the Local Government Board, and such consent is not to be given unless the Board are satisfied that means for rendering harmless the polluting liquid are reasonably practicable and available, and that no material injury will be inflicted by such proceedings in the interests of the industry. By the Local Government Act of 1888, the powers for enforcing the Act were given to county councils and to joint committees of county councils and county boroughs. Such a Joint Committee is the West Riding Rivers Board, which is well known among sulphate makers in this part of the world. The Board consists of representatives from the West Riding County Council and the County Boroughs of Bradford, Leeds, Halifax, Huddersfield, and Sheffield, and has jurisdiction over all streams in these districts.

Unfortunately for the ammonia distiller, there are no reasonable or available means for the complete purification of his effluent; yet where he has been discharging it into a stream, he is informed that such discharge must cease, though to my knowledge no proceedings have been taken on account of pollution by spent liquor. If he endeavours to gain admission to the sewers of the local authority, the Act is against him if they choose to so read it. The Act provides that the local authority shall give facilities for enabling manufacturers within their district to carry their trade effluents into the sewers, "provided"—and here are the restricting conditions—that they would not injure the sewer, that they would not prejudicially affect the disposal of sewage, and that their volume is not too great for the capacity of the sewers. In the case of any trade effluent, therefore, a local authority wishful to evade their obligations under the Act are quite easily able to do so; and in the construction of a new system, they could even refuse to build sewers of sufficient capacity to admit trade effluents. With regard to spent ammoniacal liquor, no local authority in their normal senses would admit it to their sewers when, as I have already endeavoured to make clear, it has such a polluting effect; and any excuse may be found under the provisions of the Act just mentioned. The consequence is that some authorities allow trade effluents while others do not; some press for preliminary treatment, while other manufacturers go "scot free." This means unfair competition between people in the same trade; it being quite possible for two adjacent factories to be in different urban districts, the authorities of which hold different views on the Rivers Pollution Prevention Act. Of course, a manufacturer may take his case to a Court of Law. But such litigation is very costly, requiring expert witnesses; and the uncertainty of the result makes him hesitate at such a step. A local authority should seek to foster trade within their district, not to cripple it; and it should be compulsory on them to admit trade effluents into the sewers if manufacturers desire it.

Speaking generally, trade effluents can be treated in the aggregate with the sewage at a much less cost than by individual manufacturers, though I would make each pay his fair share of treatment. I understand that one District Council was faced with great difficulties by this spent liquor—it being about 10 per cent. of the dry-weather flow of the sewage; and the firm were allowed admission to the sewers by paying part of the extra cost of the filter-beds. By Dr. Fowler's method of treatment, a local authority would do better to erect filters at the ammonia works; the cost of treatment of the spent liquor being reduced thereby, as I have shown. It is gratifying to note that there is likelihood ere long of new legislation on this subject of sewage disposal and trade effluents—a Royal Commission having been inquiring into the question since 1898. Interim reports which have been issued point out that alterations to the existing law are necessary; and the appointment of a Central Authority is suggested. If such an authority be set up, whose officers are equal in kindness and courtesy to those appointed under the Alkali Acts, and have the same power to render assistance and give advice, then, as one who has occasion to come into close touch with these gentlemen, I can truly say that the manufacturer having trade effluents to dispose of has everything to gain and nothing to lose by the appointment of a Central Authority under the Rivers Pollution Prevention Act.

Gentlemen, I trust I have not wearied you by labouring this matter of trade effluents; but it is a question upon which I feel most strongly. The task I set myself is finished, and I thank you for your patient hearing of my somewhat disjointed remarks, wherein it has been my endeavour to show how, by attention to what may appear to be mere details, the output of the most valuable residual asset of a gas-works may be brought to its maximum.

Mr. F. SCHOLEFIELD (the Senior Vice-President), who occupied the chair, said that by his address Mr. Shepherd had further realized their expectations, and again shown what a good President the Association had. His address would not only prove a stimulus to their ingenuity and foresight, but would help them in the practical daily working of their plants. They could not at that late hour discuss the address, even if such a course were usual; but he should suggest that they would do well to return to the subject on an early occasion, and then ply the President with questions. They valued the privilege extended to them that afternoon in being permitted to visit the chemical works, and were grateful to the Bradford Gas Committee and their various officers.

Mr. J. H. HILL moved a vote of thanks to the Gas Committee and to Mr. Shepherd both for his address and for his arrangements for the works visit. He was sure that every one had appreciated the day's privileges, and had made this evident when going round the works. The works had impressed them all with neatness, compactness, and ingenuity seen everywhere, and with the notable absence of malodours. The address had been stimulating and informing, and its treatment of the question of effluents would prove especially valuable.

Mr. W. CRANFIELD seconded the vote. He knew Mr. Shepherd had had some hesitation in taking up a subject as hackneyed as sulphate-making was supposed to be; but he had justified all their expectations by delivering an address which would be of lasting value and helpfulness when printed in the Technical Press. So far from the subject being threadbare, a great variety of questions, theoretical and practical, arose from time to time to which it was difficult to find ready answers in books or periodicals. It was really a subject upon which many juniors were hard put to in gaining adequate and practical knowledge; and he was glad Mr. Shepherd had overcome any reluctance to handle the subject. He had been charmed with the lucidity, exactness, and literary excellence of the paper. As they were finding out, Mr. Shepherd had a happy gift of expressive phrasing; and his official appearances and utterances would amply justify their action in making him President.

After the vote had been enthusiastically passed,

Mr. SHEPHERD declared that he felt overwhelmed by their kindness; but if the little he had done was of any value or would be any credit to the Association, he was glad. He would frankly own that his reluctance to accept the office to which they had called him was largely because of the Presidential Address that would be expected of him. Many addresses had appeared in print that he felt himself incompetent to follow, as his association with gas-works practice was so limited. He had, however, resolved to confine himself to the branch of work in which his own experiences had been. Hence his choice of subject that day.

Councillor HORACE GELDARD, Chairman of the Bradford Gas Committee, said that on behalf of the Committee and himself he was much obliged for their vote. Permission to visit the works had been freely granted. He was pleased and gratified to hear their warm appreciation of Mr. Shepherd's address. He was proud of it himself, and proud of Mr. Shepherd, whose ability would bring him forward and make him widely known in future. He would not venture to talk "gas" to a company of experts, especially as three years ago when he was first made Chairman of a Committee managing a business with a capital of over a million pounds, he was comparatively a novice. He had, however, continuously taken great interest in gas matters, and was sometimes regarded as gas mad. In fact, it really was astonishing how keen an interest one could acquire in a new business when called to a responsible position.



## SCOTTISH JUNIOR GAS ASSOCIATION.

## EASTERN DISTRICT.

The Eastern District Division of the Scottish Junior Gas Association held a quarterly meeting in the Lecture-Room of the Museum at Perth on Saturday afternoon—Mr. H. RULE, of Falkirk, the President, in the chair. Considering the distance many members had to travel, and the bad weather prevailing, there was a good attendance—numbering nearly thirty.

The PRESIDENT expressed pleasure at seeing so large a muster of members, and the hope that those who had before the meeting visited the gas-works had seen something that had interested them. They were to have a paper from Mr. S. BUTTER, who was engaged at the works, on "Tar as a Preservative." As perhaps the members knew, at the Perth Gas-Works they went in for the distillation of the tar; so that he was sure what Mr. Butter had to say on the subject would be of interest, not only to themselves but to the gas industry in general.

Mr. S. M'N. BUTTER (Perth) then read the following paper on

## COAL TAR AS A PRESERVATIVE.

The advent of the automobile has created a new market for tar and tar products, as the excessive wear of macadamized roads has turned the attention of road engineers to the necessity for a suitable binding material. Refined tar and mixtures of tar with other bituminous substances have been found to answer this purpose. Different conditions require different treatment, and each gas manager may specialize on the roads in his particular district; so that there is room here for initiative on the part of gas managers to prepare a suitable distillate. Road engineers in various localities are not only willing but anxious to experiment with different mixtures until they have found one to answer their purpose.

Mr. Thomas Aitken, the County Road Surveyor of Fife, the inventor of the pneumatic tar-spraying machine, is a pioneer in the use of tar; and he has given practical demonstrations of how to make and keep roads with tar as the binding material. The roads under his care are known far and near for the excellence of their surface and freedom from dust or mud.

Experts generally acknowledge that tar is the best binding medium available for dust prevention, durability, and cheapness. Before applying it to the road, the surface is thoroughly cleansed, in order to remove all loose bindings and extraneous matter. When this is properly done, and refined tar of good quality is used, applied in the form of a fine spray under pressure, at the rate of one gallon to 5 to 7 square yards, the tar is forced into the interstices of the road crust, forming a waterproof surface. This penetration is a very important factor in surface spraying, and may vary from  $\frac{1}{4}$  inch to 2 inches in depth, according to the conditions of the road surface and the pressure employed when spraying with the machine.

For this class of work, ordinary refined tar may be used; but "tar compos" are preferable—that is, refined tar freed, as far as possible, of all deleterious constituents, including naphthalene, as a base, with bitumen or pitch added in certain proportions. This compo should form when cold a viscous, tough, flexible, and adhesive matrix, insoluble under ordinary conditions. Compo made from hard pitch revived by the addition of light oil or creosote is of no use; the agglomerating properties of the pitch so treated being very deficient. In making tar macadam on a 4-inch coat of metal, 8 to 10 gallons of compo are generally used. With Mr. Aitken's pneumatic tar-sprayer, he gives three to five applications at a pressure of 250 lbs. per square inch; and this ensures constant and equal distribution. Compo of high viscosity is in no way detrimental to this spraying-machine, as the railway tank-waggons are generally fitted with steam coils, which are used to liquefy the material sufficiently to pump into the tank of the tar-sprayer.

A few of the best known tar compositions in the market at present are Clare's "Marbit" and "Tarvia;" but road engineers naturally ask: "Can anything better be produced for this class of work at a reasonable price?"

For the preparation of refined tar, expensive plant is not required. An old boiler shell and a suitable condenser will do. The heating can be accomplished either by means of close steam or by a coke furnace. When the water and naphtha are extracted, the tar is ready for use. For certain purposes, however, it is sometimes necessary to return part of the oil to reduce the viscosity. The naphtha obtained finds an ever-ready market at a fair price. The Perth plant, which was put down six years ago, turns out pitch and oils or refined tar according to the demand. The stills are of the English type. The condensers are of the ordinary worm type, water-cooled. The naphthalene catch-boxes and store-tanks are composed chiefly of old disused plant. The stills are gas-fired, with one producer and separate gas-ducts and valves to each still. Coke fuel is used.

In refining tar, the still is filled to within 3 feet of the top. This allows space for frothing, which occurs in the early stages, owing to the water contained in the crude tar. Tar with a large percentage of contained water must be handled with care, to avoid boiling over; but ordinary separation in the tar-well is generally sufficient to prevent any difficulty in this respect. A moderate heat is applied at the start, and continued until the water is expelled. It is at this stage that the tendency to boil over occurs

unless this rule is observed. The firing can then be increased to 250° C. until all the naphtha has been taken off. The refined tar is then collected into store-tanks, and allowed to cool before being loaded for despatch.

The demand for tar for road spraying is increasing. During the summer of 1909, this demand caused a temporary rise in price. But unless suitable tar can be supplied at a reasonable figure, the development of tarred roads will be slow. Meantime, the policy of every gas department should be to foster road-tarring by selling tar at a price which will attract a steady demand.

A large and increasing number of the public are interested in this subject. They may be divided into three classes: (1) Those who use the roads for vehicular traffic; (2) pedestrians who suffer from the effects of dust clouds or mud thrown up by passing vehicles; and (3) dwellers on the public roads.

From remarks one occasionally hears, there seems to be an impression that tar roads mean tarry roads; and it is probable that those who have passed the Carse of Gowrie, and other places where the roads have been treated with tar, have been impressed with the contrast at the smooth, even surface, and resilience of the road, but have not realized that these results could have been obtained with coal tar. The beautiful brown, clean surface would suggest that the road had been treated with a fine colouring substance. This is caused by vaporizing the tar, and forcing the vapour into the roads at the high pressure mentioned, leaving no deposit whatever on the surface.

That tar-spraying has solved the dust problem there is no doubt. It has also improved the road surface and lengthened the life of the roads. The extra small initial outlay in this way is, therefore, amply repaid; and when once road authorities realize these advantages, tar roads will be general, and there will be less occasion for expensive causewaying, or for what has been known as tar macadam, with its treacherous surface.

In addition to all its other advantages, the sanitary aspect of the subject appeals to town dwellers. There is no road surface—wood block, granite, or whin sett—that can compete with the new tar-spraying on sanitary grounds; and in the end authorities must admit it to be the cheapest, most durable, and cleanest form of road-making that has ever been invented.

*Discussion.*

The PRESIDENT, in opening the discussion, remarked that the subject of the paper was one of great interest to everyone in the gas industry, not so much in regard to the treatment of roads, but because this provided another outlet for the sale of tar.

Mr. A. MORTON FYFFE (Dundee) said he had expected that Mr. Butter would have dealt with tar as a preservative in many ways; but he had confined himself to the most modern use of it. No doubt tar for road-making had a great future; but he scarcely agreed with the author of the paper when he spoke of tar roads superseding causewayed roads. In towns, where there was constant traffic, macadamized roads would not do. Tar put on such a road was a great advantage, as it lengthened the life of the road. There was also a great reduction of dust, as compared with an ordinary macadamized road. But in towns they must always have roads laid with whinstone or granite setts. At the same time he thought it was well that Mr. Butter had brought before them the fact that a field was open for tar for the purpose of road making.

Mr. R. B. CHALMERS (Alva) said that in his town they had done something in the way of getting people to use tar for making footpaths. They used two barrowfuls of ashes to a pailful of tar. They put down all the footpaths about the houses at the gas-works and also in the works, laying the macadam 5 inches thick, and with very good results. After this had stood the test of a winter, they went to some influential people in the town, and asked them to give the process a trial. Since then they had done a good trade in this line. They either made up the substance themselves at the works, or sold the tar and instructed the purchasers as to how to make it up. One contractor had made a tennis court with it. Another had laid a whole avenue, about a quarter-of-a-mile long, with it, and it had been a great success. It had cost absolutely nothing for repair; whereas formerly it was constantly in need of it. They were still pushing the system, and he hoped that before long they would have a good trade. They had not yet convinced the road authorities that spraying with tar was a good thing, but two or three members of the Town Council had been looking at tar-laid roads—roads laid with whinstone metal, rolled down, and the tar poured over it, and then covered with chips and rolled again.

Mr. R. W. COWIE (Dalkeith) stated that before coming to the meeting the use of tar for preserving roads did not enter so much into his mind as its employment for preserving woodwork. This certainly had not come before them lately, because, ever since gas was made, coal tar had been used for this purpose—probably at first as a substitute for paint; but it had been found to be a very good preservative of wood, especially of wood which was exposed to the elements. For roofing purposes, coal tar was largely used, as well as for making damp-proof courses in building. It preserved a building from damp and consequent decay—not only the wood but the stone. His experience of tar on roads had been somewhat limited; but at Lockerbie, on the main road between Glasgow and Carlisle, he persuaded the Road Surveyor to treat a considerable stretch of the road with it. It was fairly successful—at any rate, part of it. The portion which was successful was done in weather that had been good for two or three



weeks; that which was unsuccessful was done when the work was interrupted by rain. It was continued shortly after rain had ceased, with the result it did not last at all like the part that was tarred in good weather. It was treated in much the same fashion as Mr. Chalmers had explained—the road metal being laid on and rolled, and the tar put on as near boiling as possible, then covered with whinstone chips and sand, and rolled again. In the part which was done in wet weather, the tar did not seem to go down at all, and so caused considerable annoyance to users of motor cars as well as to all users of the road. It was well that the subject had been brought before them, because it would help to give them a better market for tar.

Mr. W. DUNLOP (Kirkcaldy) said he had had some experience in treating roads and garden paths with tar. In New Zealand they had cheap tar, and used it on various roads and footpaths, with varied results. In some places they produced splendid surfaces; in others they could not get the material to adhere or take-up. The conclusion they arrived at was that the subsoil had a good deal to do with the result. Where the bottom was open, and the tar got down, the road was good; but where there was clay, the tar did not seem to penetrate, and the work was practically a failure. Mr. Butter mentioned that, in preparing the tar, there was sometimes difficulty with it boiling over. He had seen tar which was very troublesome to treat in this way; and the difficulty was got over by blowing a small jet of air through the still.

Mr. R. B. WADDELL (Dunfermline) said that three summers ago he was in St. Andrews, where roads were treated with tar. They had a very fine surface, and when dry it was all right; but when it rained the roads were very slippery, and difficult to walk on. Just outside Dunfermline, however, a gentleman had laid a private road for about 500 yards with tar, and it was a good road—neither smooth nor rough, and not slippery on the surface. He was curious to know how this could be explained.

Mr. A. R. WILSON (Perth) thought it had been brought against the system of road making with tar that it was detrimental to fishing; but he considered that this objection might be removed by doing the work in dry weather, when the impurities on the surface would not be so liable to be carried away.

The PRESIDENT said Mr. Butter's excellent paper did not lend itself very much to controversy and discussion, but it nevertheless had indicated an outlet for a product which at present, at least in most gas-works, they had to hand over to the tar distiller, at whatever price he might like to give for it. It would have added very much to the value of the paper if the author had given them the cost of producing refined tar, and shown the profits to be derived from the adoption of plant to produce it. That was to say, supposing they got 8s. 6d. per 100 gallons from the tar distiller, how would it pay—say, in works making 25 million cubic feet of gas per annum—to put down the plant? What would the cost of working it be? For, after all, it really resolved itself into a matter of pounds, shillings, and pence for the gas manager. However much he might like to see a fine road for motoring, he was not going to work a process for refining tar unless it would pay him to do so. He had had the pleasure of going through the Perth Gas-Works that day, and certainly the tar plant there was of the simplest possible nature. He believed that in most works they could afford to have such a plant, even on a smaller scale. Where gas-works were in the hands of a town council, there should not be much difficulty in disposing of refined tar for the making of roads. It seemed to be only a question of persuading road authorities that treatment with tar was the best for roads. They were all agreed that such roads were much more pleasant to walk on than others, when motor-cars were passing. It would be a good thing if they could get the cost of a road made up in the ordinary way and one treated with tar. They should watch the development of the process; and if they could make more profit from their tar than they were doing, it would be their duty to prepare refined tar and put it on the market.

Mr. BUTTER thanked the speakers for their remarks on his paper. Mr. Dunlop had alluded to the difficulty of getting tar to penetrate the roadway in some instances. They would not be applying the tar under pressure. The roads he had spoken of had had the benefit of being treated under pressure, and in consequence the tar penetrated even the hardest road. It was not necessary to put down a large plant for the refining of tar. With that at Perth, they found they could earn 0'33d. per 1000 cubic feet of gas more than if they were selling the tar in the crude state. This worked out at about £300 a year.

The PRESIDENT invited Mr. M'Lusky, the Gas Engineer and Manager of the Perth Corporation, to address the meeting.

Mr. M'LUSKY expressed his pleasure in accepting the invitation. He said Mr. Morton Fyfe had made a remark about the relative strengths of square setts and of broken metal—from the same quarry he should say—that was to say, the relative resisting power of the two. But supposing they were to take whinstone, squared and laid, and the same whinstone, broken and rolled with a heavy roller, and bound together with a strong matrix of tar, he thought it had to be proved which was the stronger of the two. He was inclined to give way in this matter to Mr. Fyfe, who had had experience of road making, and he (the speaker) had not; but he would not like it to go out from that meeting that tar was weak in any respect. He would rather that it should be thought it was the very thing. If they thought that, probably they would get to perfection in road making by means of tar. For example, most of them were aware of the difference between Telford's and Macadam's methods of road making. The one believed in hand

setting and the other did not. These two great authorities differed in this—that Telford, who set his bottoming by hand, was criticized by the followers of Macadam, on the ground that there was a want of even distribution of the metal with hand setting. Some of the stones were too big, and carried more weight, while others did not carry weight enough. Macadam, on the other hand, believed in making all his road with metal of a certain size—not in putting in great lumps. But they had to consider that in those days there were no road-rollers, and that without rolling the stones became loose and ran away from their work; they would fly away from below the wheel of a baker's van. When stones flew off in this way, they had the road in ruts; but when they employed tar, almost as pitch, and when they sprayed it into the road to a depth of about 2 inches, the stones were bound together, and could not move, rub against each other, or have their corners ground off and roll out. Every stone was flat-turned to the surface; and he believed that experience, down to the present, had shown that these roads were stronger than ordinary macadamized roads. He considered also that whinstone setts would no longer be necessary in rural districts. To his audience it might appear absurd to speak of whinstone setts in rural districts; but, as a matter of fact, in the Border district there were towns in which the side streets were causewayed for cleanliness. A road made up with good macadam, and bound with a tar matrix, would, for all purposes, be better and also cheaper than one laid with whinstone setts. Mr. Waddell said he had come across a very slippery surface made by tar spraying; but he (Mr. M'Lusky) understood that road engineers were now able to produce either a rough or smooth surface to order. It was altogether a question of the density of the tar and the number of applications. As a matter of fact, if a very heavy tar were taken, and a certain number of coats of it were laid, it could be brought up to quite a glossy surface. But ordinary tar spraying left not the slightest suspicion of tar having been used; it made a brown opaque surface. It differed entirely from tar put on with a brush, which he understood was the method of applying it in Kent—men pouring on the tar hot, and others following with brushes; but this was not the same as spraying with tar.

The PRESIDENT said he was sure they had all appreciated very much Mr. M'Lusky's remarks, as well as Mr. Butter's valuable paper. He asked the meeting to accord to the author a very hearty vote of thanks for the trouble he had taken in preparing it.

At the close of the meeting, the company were taken to the Perth Laundry, owned by Bailie Robert Hamilton, the late Convener of the Corporation Gas Committee, where they were shown a most perfect system of lighting by incandescent gas, with inverted burners. A Keith rotary compressor, driven by a gas-engine, is employed to compress the gas to a pressure of 64 inches. The lighting effect was admirable. Besides lighting, gas is also used in the laundry for the heating of the irons and the rollers of the calendering-machines.

On the return to the city, tea was served. Ex-Bailie Macpherson, the Convener of the Gas Committee, presided, and there were present a number of members of the Gas Committee.

The CHAIRMAN extended a welcome to the Association, and said that in the matter of their gas-works he thought they had no reason to be ashamed; while in their Manager they had a man who was thoroughly interested in his work, and who did the best he could for the Corporation, to whom he was immediately responsible, and for the community whom he served in a wider sense. To those who had been to the gas-works, he probably did not require to say that possibly the system of stoking they had in operation was not quite in keeping with the rest of the works; but, on the advice of their Manager, they had been considering the desirability of adopting mechanical stoking. The desire of the Committee was that they might be able to recommend the Council to adopt machinery which would be economical, and at the same time, so far as the workers were concerned, more humane than the present system.

The PRESIDENT, having briefly thanked the Corporation of Perth for their kindness and hospitality,

The HON. SECRETARY (Mr. J. Dickson, of Kelty), on being called upon by the Chairman, added his thanks. He said that perhaps the Corporation of Perth were in about as pleasant a position, as regarded capital expenditure, as any town in Scotland. It was wonderful to see gas produced in Perth, taking the capital charges into account, and sold at 2s. 11d. per 1000 cubic feet. This meant that Mr. M'Lusky was taking the most he could out of the existing plant; and he had no doubt that when the extensions which were in contemplation were carried through, there would be cheaper gas in Perth.

Mr. E. B. Barnard, the Chairman of the Metropolitan Water Board, has been elected Chairman of the Lea Conservancy Board.

"Commercial Peat: Its Uses and Possibilities," is the title of a work by Mr. F. T. Gissing which has lately been published by Messrs. Charles Griffin and Co., Limited, as one of their series of scientific text-books. Mr. Gissing is joint author with the late Mr. P. R. Björling of "Peat: Its Use and Manufacture," which was well received by engineers and others. The present volume is designed as a companion to it, and deals with the question from a commercial point of view. The price of the book, of which a fuller notice will be given in a later issue, is 6s. net.



## EFFECT OF SEA WATER ON CONCRETE.

On the occasion of the meeting in Copenhagen last year of the International Commission on Reinforced Concrete, two pamphlets were distributed dealing with the problem of the influence of sea water on cement and concrete. One was a report by Herr A. Poulsen and the other one issued by the Association of German Portland Cement Manufacturers. Summaries of the pamphlets appear in the current number of "Concrete and Constructional Engineering," from which we take the following particulars.

The changes undergone by cement mortars and concretes in contact with sea water have been investigated by many workers (prominent among whom is Le Chatelier), without leading to entirely conclusive results. Systematic tests of this kind necessitate considerable organization, as it is not sufficient to immerse laboratory specimens in vessels containing sea water, but the actual conditions prevailing in coast constructions—rise and fall of tides, exposure to air and frosts, variations in temperature, &c.—must also be taken into account. The results of two very extensive and systematic series of tests have just been published almost simultaneously, with the effect of adding materially to the stock of knowledge on the subject. The first were due to the initiative of the Scandinavian Portland Cement Manufacturers, with the co-operation of the harbour authorities; the second form a part of the extensive researches in connection with cement undertaken by the great German testing-station at Gross-Lichterfeld, near Berlin; and the report, drawn up by Professor Gary and Herr Schneider, is published in the Bulletin of the institution. Both series of tests were conducted over a period of ten years; and, so far as it is possible to draw definite conclusions, the following may be said to be the principal results of the experiments:—

- 1.—Good portland cements, such as are now on the European market, are very resistant to the action of sea water.
- 2.—In a dense mortar, the chemical action is confined to an outer layer of small depth; further action being checked by the slowness of diffusion. A porous mortar, by admitting salt water to the interior, is apt to crack by expansion, owing to chemical change.
- 3.—The main agency in the destruction of mortar and concrete in marine embankments, harbour works, groynes, &c., is not chemical action, but the alternations of saturation, drying in the sun, freezing, &c., due to the alternate exposure and covering by the rise and fall of the tide. Destruction takes place sometimes by cracking, sometimes by scaling—the latter effect produced especially by frost.
- 4.—The denser the mortar the better (1 cement : 3 sand is too poor). An admixture of fine sand with the ordinary sand increases the closeness of the mixture. A well-graded aggregate would be advantageous for the same reason.
- 5.—The addition of finely-ground silica or trass to the cement before mixing is possibly advantageous in the case of weaker mortars. It is doubtful whether anything is gained by adding trass to the richer mortars.
- 6.—Hydraulic lime mixed with trass, &c., while of some value, where a cheap material is required, in the mild climate and absence of tide of the Mediterranean, is incapable of withstanding the conditions of coast work in northern latitudes.
- 7.—The destructive action of the sea being mainly physical and mechanical, and not chemical, tests by mere immersion in still sea water are of very little value in determining the behaviour of concrete in marine engineering works. A mixture which disintegrates under this test is certainly useless, but a mixture which passes the test may disintegrate possibly under the more stringent conditions of practical use.
- 8.—As long a period as is practicable should be allowed for the hardening of concrete blocks before placing in the sea. The German recommendation of one year in moist sand before setting in place is probably impracticable in most places, but should be approached as nearly as possible.
- 9.—The behaviour of test specimens for the first twelve months is very irregular, and definite conclusions can only be drawn from the results of long-period tests.

**Death of a Well-Known Patent Expert.**—The death occurred on the 6th inst., at the age of 64, of Sir William Lloyd Wise, the well-known authority on patent laws. He was the founder and first President of the Institute of Patent Agents, and had held the position for seven years.

**Recent Wills.**—Mr. E. H. Cardwell, one of the Directors of the South Metropolitan Gas Company, whose death was recorded in the "JOURNAL" for the 7th ult., left estate valued at £112,700 gross, with £105,396 net personality. Mr. F. A. Gamble, formerly Secretary of the Gainsborough Gas Company, left property of the value of £5800. Dr. Ludwig Mond, whose death on the 11th ult. was noticed in the "JOURNAL" at the time, left estate which has been sworn for probate "at not less than £1,000,000."

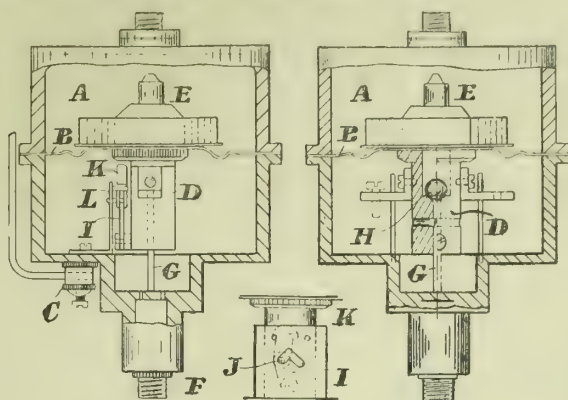
## REGISTER OF PATENTS.

## Automatic Gas Lighting.

COWPER-SMITH, M. G., of Tunbridge Wells.

No. 19,722; Sept. 19, 1908.

This mechanism designed for automatic gas lighting is one in which increase of pressure acts on a diaphragm, whose rise and fall causes the gas-conduit to be closed or opened; lever mechanism in conjunction with non-return gates or notches being provided for temporarily retaining the diaphragm in its respective positions.



Cowper-Smith's Automatic Gas-Lighter.

The chamber A is divided by the diaphragm B into two parts. At C is a bye-pass of common form. Attached to the diaphragm is a cylinder or tube D of sufficient weight to resist normal pressures. On the upper part the cylinder is fitted with an arrangement E that will permit gas to pass into the upper part of the chamber when the supply is open. F is the gas-inlet, which leads to the interior of D; and in it is a rod G on which rests the ball H when the cylinder is in one position; and when the cylinder is raised, the ball closes the aperture below. On the outside of the cylinder is a rod or bar I, pivoted on the cylinder so that it may swing from right to left. L is a guide-plate and support for it. At J, there is hinged to the bar a tumbler K, the pin of which is free to move in an angular slot in the plate L adjacent to the bar. Two pins are provided on the plate L, with which recessed parts on the tumbler engage.

When the parts are in the position shown in the separate detail, normal pressure obtains under the diaphragm; the ball H resting on the aperture below it, because the cylinder D is in position with its pin in the short limb of the slot. If the pressure be now increased, the diaphragm, and with it the cylinder D, will rise until the pin is in the highest part of the angular slot. The tumbler K will now fall over towards the right, and will thus present the pin to the long limb of the angular slot; and if, now, the pressure returns to the normal, the cylinder is permitted, by reason of the length of the slot, to travel down farther. This second downward travel is so calculated that it brings the outlet at a level somewhat lower than the upper end of the rod G. It turns the ball H aside, or raises it so that a clear passage is made from F, through the cylinder D, to the upper part of the arrangement at E, and thence to the outlet, upon which is fixed, or with which is connected, the burner. If pressure under the diaphragm is again increased, the operation is reversed; and the cylinder and parts connected with it return to the original position, and the supply is cut off.

## Controlling and Directing the Passage of Gas.

MILBOURNE, R. J., of Muxton, near Newport, Salop.

No. 28,207; Dec. 28, 1908.

This apparatus is specially intended for use in directing and controlling or reversing the flow of gas into and out of condensers, scrubbers, &c., and for bye-passing such vessels when required. The patentee proposes to combine with a valvular device of the kind described in patent No. 16,911 of 1906 (wherein a chamber is employed provided with inlet and outlet pipes or connections and containing two valves adapted to be simultaneously controlled by one spindle) two other chambers which are superposed and respectively connected to the upper and lower parts of the principal chamber. These superposed chambers have two communicating passages arranged between them—each having in it a valve for controlling the flow of gas through it, and being adapted for connection to the vessel through which the gas is to be caused to flow.

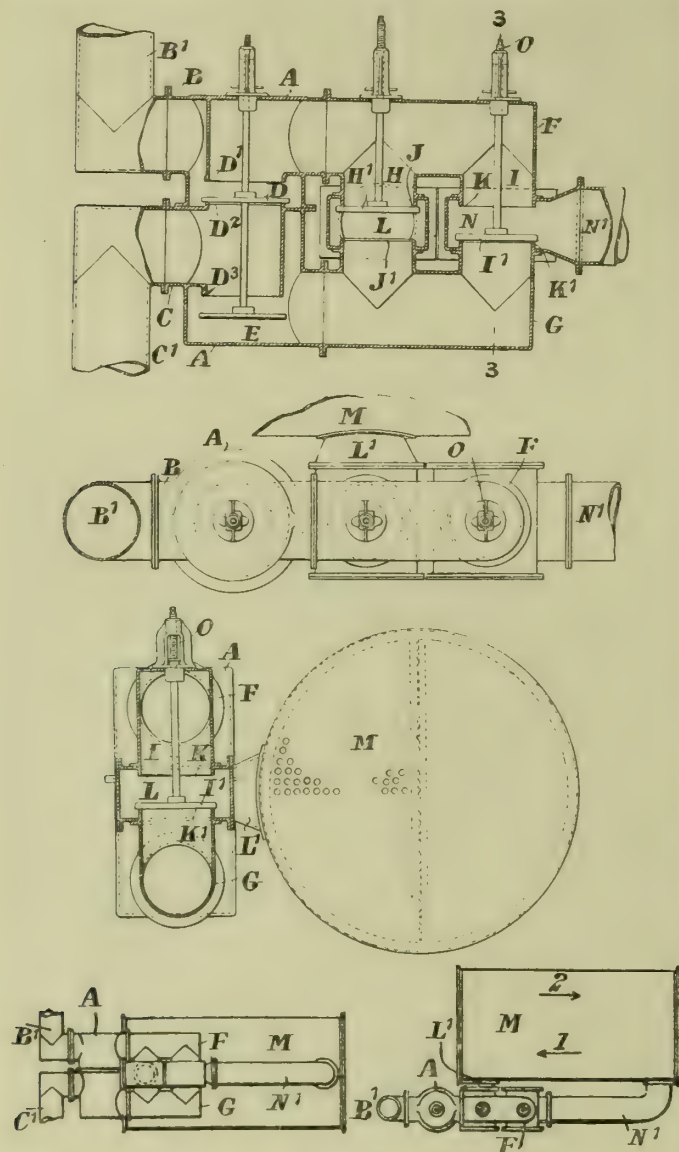
A (p. 182) is a valvular device (according to the 1906 patent) provided with connections B C, to which the inlet and outlet pipes B<sup>1</sup> C<sup>1</sup> are attached, and with the valves D E. The former co-operates with the two seats D<sup>1</sup> D<sup>2</sup>, and the latter with the seat D<sup>3</sup> in the manner described in the earlier specification. F G are the two superposed chambers, which, according to the present invention, are combined with the valvular device A. The upper chamber F is in communication with the valvular device above the valve D, and the lower chamber G with the valvular device below the valve. H I are two passages which establish communication between the chamber F and the chamber G; and H<sup>1</sup> I<sup>1</sup> are the valves arranged in the passages.

The valve H<sup>1</sup> operates in conjunction with the seats J J<sup>1</sup>, and the valve I in conjunction with the seats K K<sup>1</sup>; the space L between the valve seats J J<sup>1</sup> is adapted to be united by a connection L<sup>1</sup> to one end of a condenser M, as indicated in the small detail drawing, and the space N between the valve seats K K<sup>1</sup> communicates with the other end of the condenser through the connection N<sup>1</sup>. The spindles of the



valves extend through the wall of the apparatus, and are screw-threaded at O, so that they may be operated by a wheel for altering their position.

Assuming it is desired to pass gas from the main B<sup>1</sup> through the condenser and thence into the main C<sup>1</sup>, the valve D is upon the seat D<sup>2</sup> and the valve E away from its seat D<sup>3</sup>; while the valve H<sup>1</sup> is upon the seat J and the valve I upon the seat K<sup>1</sup>. The gas then flows from the main B<sup>1</sup> through the opening and the seat D<sup>1</sup> into the upper chamber F; thence through the passage I and the connection N<sup>1</sup> to the condenser, through which the gas flows in the direction of the arrow 1 in the detail drawing. The gas flows from the condenser through the connection L<sup>1</sup> and the passage H into the lower chamber G, and thence through the lower part of the chamber A, past the valve C, into the pipe C<sup>1</sup>. If it is desired to cause the gas to flow through the condenser in the reverse



Milbourne's Valve-Controlling Arrangement.

direction, the valve H<sup>1</sup> is moved away from the seat J on to the seat J<sup>1</sup>, and the valve I<sup>1</sup> away from the seat K<sup>1</sup> on to the seat K. The gas then flows through the upper part of the chamber A into the upper chamber F; thence through the connection L<sup>1</sup> into the condenser, through which it passes in the direction of the arrow 2; and thence through the connection N<sup>1</sup> and the passage I into the lower chamber G, and thence into the pipe C<sup>1</sup>. If it is desired to by-pass the condenser, it is only necessary to alter the position of the valves D E in order to bring the valve D on to the seat D<sup>1</sup>, and the valve E on to the seat D<sup>3</sup>. The gas then flows into the upper part of the chamber A, and then passes, through the opening in the seat D<sup>2</sup>, directly to the pipe C<sup>1</sup>; the valves D and E preventing the gas from flowing into either of the chambers F and G, which are in connection with the condenser.

### Gas Lighting Appliances.

BOND, C. F., of Old Kent Road, S.E.

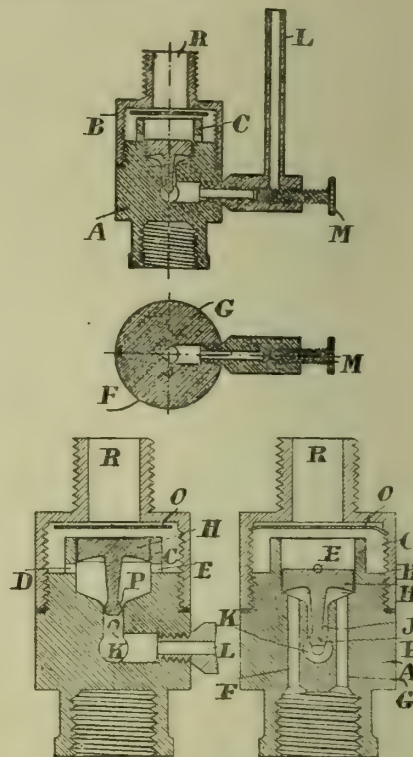
No. 1398; Jan. 20, 1909.

This invention refers to lighting appliances wherein there is normally a minimum supply of gas sufficient to constantly maintain a pilot flame, and wherein, on the pressure being raised (by turning on a cock situated possibly at some distance from the burner), the burner itself is supplied and is lighted by the pilot flame, the supply of gas to which is simultaneously reduced.

Appliances acting on this principle have already been designed, the patentee remarks, and have comprised a piston which is lifted when the pressure of the gas is increased so as to allow the gas to get to the burner; some part of the piston being arranged at the same time to cut off altogether the supply of gas to the pilot flame. In some cases there have been two passages for the gas to the pilot flame, one only of which has been closed by the rise of the piston.

The present invention "is intended to provide an improved piston

apparatus for the same end." It comprises a form of piston which is not dependent upon the closeness of its fit within its cylinder to cut off the supply of gas to the burner, and which is furnished with a depending portion or tail attached to it, to partly throttle the passage to the pilot light when it rises, and thus reduce the pilot light to a minimum when the burner is alight. To provide an efficient cut-off with a loose piston, the latter is furnished with a seat within the cylinder, upon which it rests when the pressure of gas is only sufficient to supply the pilot flame. By forming at the tail part of the piston a spherical or widened portion which is raised into the passage to the pilot light with the rising of the piston, the passage is partially closed. The use of two passages of the pilot light is thus obviated.



Bond's Gas Lighting Appliances.

To the service pipe under the burner is fixed a cylinder made in two halves A and B screwed together. The lower or gas inlet end of the cylinder is solid, with a circular projection C with two gas-ports D E in it. Inside this portion, two gas ports or passages F G are formed, admitting gas to the underside of a piston H, which fits loosely within the part C—the necessary gas-tight contact being between the underside of the piston and a seating formed in the part A. When the pressure is low, the piston remains upon its seat; the weight of the piston being designed to prevent its moving upwards. The gas then passes down through the annulus J into the by-pass chamber K, and on to the pilot light through the tube L; the size of light being regulated by the screw M.

When the pressure is increased by turning on the burner supply cock, the action is as follows: The piston is lifted upwards and the gas passes through the ports D E and round the diaphragm baffle O and then on to the burner by the gas outlet R. On the end of the piston axis an enlarged spherical part P is formed, which, in passing upwards through the central passage Q, reduces the amount of gas going forward through L. By this means, while the burner is alight the size of the pilot flame is reduced to a minimum.

On the pressure of gas being reduced by turning off the burner supply cock, the reverse action takes place. The burner is extinguished, and the pilot light is increased in size slightly.

### Electrical Ignition Devices for Gas-Lamps.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 7827; April 1, 1909.

This invention relates to ignition devices for gas-lamps of the kind in which an electric current is passed through a filament of platinum, nickel, or the like to heat it, so as, by the action of the hot platinum on the gas or of the gas on the platinum, to produce combustion of the gaseous mixture.

In such apparatus, the patentees point out, it has been found advantageous to locate the platinum in a small chamber disposed alongside of, and communicating with, the burner, and so arranged that a small portion of the explosive mixture is allowed to pass slowly through it, so that when the platinum is heated to the temperature at which the mixture explodes, an explosion is produced of the quiescent mixture in the chamber, whereby a flame is shot into the main flow of mixed gas and air issuing from the burner-nozzle, and the mixture is effectually ignited. But, even with such an arrangement, there is risk of the burner lighting-back. Accordingly, they propose that the communicating passage between the main supply to the burner and the chamber should be constituted by a fine saw-cut or a slit—a separate outlet being led from the explosion chamber to the outside of the burner-nozzle.

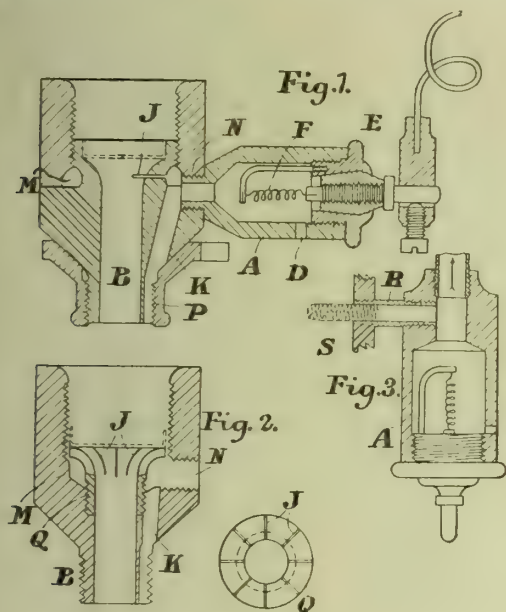
Figs. 1 and 2 (p. 183) are vertical sections of the devices as applied to an inverted incandescent gas-burner. Fig. 3 shows the device as applied to an upright incandescent burner.

In fig. 1, the chamber may be in the form of a small box A alongside



the burner-nozzle B; an orifice D being bored in the bottom of the box, so as to facilitate the entrance of the mixture into the chamber and to permit the burnt products to escape after an explosion of the mixture has taken place. Into the end of the box is fitted a plug E, carrying a filament F with connections to a source of current—this arrangement being that usually employed.

In order to prevent the flame of the explosion in A from passing to the main body of mixture in the burner-nozzle, it is now proposed to feed the explosion chamber through fine saw-cuts or slits, such as J, and to ignite the mixture at the burner-nozzle B by means of an additional outlet K, leading to the outside of the nozzle but inside the mantle.



Keith's Electrical Ignition Devices for Gas-Burners.

The gaseous mixture impinges on the trumpet-mouthed entrance to the constricted part of the nozzle B (fig. 1) and a certain quantity passes through the saw-slit J to the annular groove M, and thus, through the port K and the groove P, to the outside of the nozzle. The portion of the mixture which passes through the slit enters the explosion chamber or box A; and when this is ignited, a flame is shot down the port K and the groove P to the inside of the mantle—thus igniting the mixture at the outlet end of the nozzle. The fine saw-slot J, although sufficient to allow the mixture to pass into the explosion chamber and the port and groove, will not permit the passage of flame to the main body of the mixture which passes downwards through the nozzle. Thus, no matter how hot the nozzle may be, there is no lighting back.

The construction shown in fig. 2 is similar, except that the nozzle B proper is formed in one piece, and has a bush Q secured to it, so as to form an annular groove M leading to the port K and to the tapped orifice N, into which the explosion chamber is screwed. A number of vertical saw-slits J are formed in the upper portion of the bush, so as to give ample feeding area to the groove.

In fig. 3, the explosion chamber A has connected to it a tube R, which supplies the mixture to the explosion chamber and which is secured to the wall, S of the burner body or the nozzle; the tube being provided at its inlet end with a gauze protection T, or a tube closed at one end and having fine saw-slits may be provided. When the mixture is exploded in the chamber A, the flame passes, by way of a tube U, to the mantle.

### Manufacture of Ammonium Sulphate from Gases.

GEWERKSCHAFT DER STEINKOHLENZECH "MONT-CENIS,"  
of Sodingen, Germany.

No. 11,442; May 14, 1909. Date claimed under International Convention, May 15, 1908.

In the course of their specification, the patentees remark: The production of sulphate of ammonia from plant for generating heating or illuminating gas from coal has heretofore been generally practised as follows: The ammonia contained in the gases is washed out with water, and the ammonia water so obtained is distilled in column stills. Attempts have been made to withdraw the ammonia directly from the gases by means of sulphuric acid; and in these experiments, the following facts have been discovered: If the gases containing ammonia be conducted into concentrated sulphuric acid, solid salt (ammonia sulphate) is obtained, yet there is also a strong action of the sulphuric acid on the gas itself, which gives rise to troublesome separation of tar. If, however, the absorption liquid only contains a small quantity of free acid, no separation of tar takes place, but at the same time there is no separation of salt; so that the liquid obtained has to be evaporated in order to get the salt—involving heavy expense. A process has also been suggested in which an absorption liquid containing a comparatively small quantity of concentrated sulphuric acid is employed; but in order to effect the separation of the salt—that is to say, in order to prevent condensation of the water vapour contained in the gas—the gas, after separation of the vapours of tar and water, is again specially superheated before it passes into the absorption liquid. This superheating of the gas was intended not only to prevent condensation of the water vapour in the gas, but also to ensure that no further dilution of the absorption liquid should take place by condensation of the water in the simultaneous introduction of ammonia saturated with water vapour from the stills which treat the ammonia water that forms in the cooling of the gas.

Practical work with such a process has shown that, on the one hand, the superheating of the gas prior to its introduction into the absorption liquid necessitates special complicated apparatus, and that, on the other hand, the superheating does not suffice for preventing the condensation of the water vapour which simultaneously comes from the ammonia stills. There rather takes place with the process either a progressive dilution of the absorption liquid, so that no solid salts separate out, or the superheating must be carried to such a degree that decomposition of the ammonium sulphate (which is noticeable even at 90° C.) takes place.

According to the present invention, these disadvantages are said to be obviated in that, on the one hand, the troublesome superheating of the gas is dispensed with, and, on the other hand, separation of solid salt is caused to take place continuously; and although only a single absorption vessel is used, both the ammonia is withdrawn from the distillation gases and also the ammonia is fixed which is obtained in the column still from the ammonia water that forms in the cooling of the distillation gas when the tar and water vapour are removed.

The distillation gas is cooled to a temperature of from 15° to 20° C., and thus freed from tar. At the same time, a part of the ammonia contained in the gas (about one-fifth of it) is thrown down with the water of condensation. The cooled gas containing ammonia is now conducted without further heating into a solution of sulphate of ammonia, preferably of a strength of 29° to 35° Beaumé, which contains up to 5 per cent. of free sulphuric acid. Into this solution is simultaneously conducted the gas obtained by treating in the column still the ammonia contained in the water of condensation, but in a concentrated form.

By this means, the formation of solid salt in the absorption liquid is obtained, without any further dilution of the liquid taking place. In the supply of the concentrated ammonia gas to the absorption liquid, the heat resulting from the chemical action of ammonia on sulphuric acid is sufficient to prevent condensation of the water-vapour, both from the distillation gas and also from the column-still gas, without any special arrangement being required for superheating the mixture of water-vapour and ammonia introduced.

The production of the concentrated ammonia gas from the waste gases of the column still preferably takes place in the usual manner—that is to say, these gases pass through a cooler or condenser, and are thus cooled down to 40° or 60° C. By this means, not only is concentration of the ammonia gas obtained, but separation of water-vapour is effected; so that the latter no longer has a detrimental effect on the concentration of the absorption liquid. In this way, solid salt free from tar is continuously formed in the absorption liquid; the ammonia washer-scrubbers are dispensed with in the treatment of the gas according to this improved process; the labour in the ammonia-works is reduced by about 75 per cent.; and the amount of waste water is reduced by 75 per cent.

### Manufacture of Incandescence Bodies.

HADDAN, H. J.; a communication from the BRUNO-PATENTE-VERWERTUNGS, G.m.b.H., of Berlin.

No. 12,467; May 26, 1909.

According to the generally accepted theory of incandescent gas lighting, the patentees remark, the high efficiency of the method depends upon a co-action of oxide of thorium and oxide of cerium—the oxide of cerium performing the function of oxygen bearer. The most favourable effect is obtained if there are about 99 parts of oxide of thorium and 1 part of oxide of cerium. It has been observed that, in course of time, the bodies suffer loss of efficiency, though no change in the proportions of oxide of thorium and the oxide of cerium can be analytically ascertained. The reason of this peculiar observation is as follows: In the case of the ordinary incandescence mantles manufactured by impregnating the fabric in a mixture of the nitrates of thorium and cerium, with subsequent denitration by means of a gas-flame, the resultant mixture of oxides of thorium and cerium are in a more or less spongy state—due to the swelling of the oxides. In the first stages of use, the spongy state of the oxides is very favourable, inasmuch as it facilitates the exchange of oxygen, more particularly in the case of the cerium oxide. In the course of use, however, the spongy oxides fuse more and more together, so that the oxide of cerium becomes more and more enveloped by the thorium oxide, and is consequently prevented from performing its function as bearer of oxygen. If the active service of the oxide of cerium can be maintained at the same area, an incandescence body of constant illuminating efficiency must necessarily result. It is, therefore, necessary to deposit the cerium oxide in a spongy state on a skeleton structure of pure thorium oxide. The durability and efficiency are increased if the thorium oxide is not spongy but fused together.

The object of the present invention is to produce incandescence bodies of this kind; but the invention is not restricted to the use of salts of thorium and cerium. For this purpose, the fabric is first immersed in a solution of thorium nitrate or equivalent salt alone. The nitrate is then converted into oxide (hydrate or a basic compound salt), either by the Blasco de Lery process of treatment with ammonia or other alkali, or by the use of other suitable agents. After the removal of the excess of this solution from the filament, the latter is immersed in a solution of the second illuminating agent—preferably nitrate of cerium, which may be neutral or slightly alkaline. After the second immersion, the fabric is dried and treated in the usual manner with a gas-flame. The action of the flame results "in the production of a compact, strong skeleton structure of thorium oxide, with a coating of spongy cerium oxide. The two oxides do not mingle in course of use, and the cerium oxide retains its full activity."

No general claim is made to separately and consecutively applying thorium nitrate and cerium nitrate to the fabric, or to the conversion of the thorium nitrate by chemical means. It has, for example, been proposed to impregnate the fabric first with a thorium salt and then with a cerium salt, and to separately precipitate each of the salts by means of an organic base. According to the present invention, the cerium or equivalent salt is not chemically treated, but is converted by means of a flame into spongy oxide, deposited on a dense, compact structure of thorium oxide.

It will be seen, the inventors state in concluding their specification,



that the process also differs from the known process of saturating the fabric with thorium nitrate, then burning it, immersing the ash skeleton in a solution of cerium nitrate, and finally again exposing the structure to a gas-flame. This previously known process gives results inferior to those obtained by using mixed solutions of salts, owing to the fact that the spongy thorium oxide absorbs the second solution; so that the cerium oxide is too much enveloped to properly perform its function. Moreover, the structure of thorium oxide is very liable to break during the second immersion; and it is difficult to accurately proportion the oxides. The result by the improved process is not obtainable by treatment of the filament with a solution of cerium salt and peroxide of hydrogen, after its immersion in thorium nitrate. The reaction of thorium nitrate and hydric peroxide is not sufficiently rapid to prevent intermingling of the thorium and cerium salts.

### Liquid Meters.

CHECINSKI, A. F., of Paris.

No. 13,673; June 10, 1909. Date claimed under International Convention, June 12, 1908.

This invention relates to "turbine meters," having a turbine wheel in the form of a hollow body submerged in the water to be measured; and the object of the invention is "to increase to a certain extent the sensitiveness of the apparatus." To this effect the turbine wheel is of an ovoid shape; the upper half being provided with the usual blades or vanes. The outlets for the liquid are placed near the foot of the vanes; and the second or lower part of the wheel is immersed in a chamber beneath the outlets, so that no eddies arise in the chamber; "whereby the sensitiveness of the apparatus may be increased."

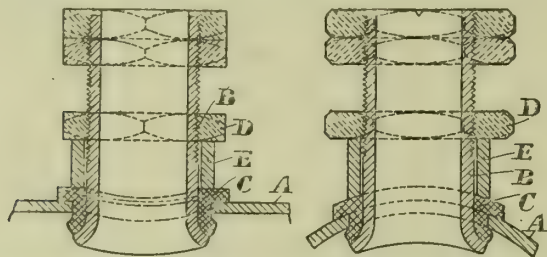
The advantages claimed for the meter are the following: Owing to the hollow movable part and to the inclination of the vanes of that part to the vertical, the meter is exceedingly sensitive, and "can measure even the smallest volumes of liquid without loss of accuracy." It is not necessary to have pressure in the supply conduit, since the weight of the liquid alone is sufficient to cause the movable part to rotate. The meter may also be arranged as a bye-pass to the main conduit. The contraction towards the top forms passages of gradually increasing cross section towards the outlet, which promotes the flow of liquid through the meter because it has a tendency to flow down to the place of greatest section. The vanes have such a form on the arrival side of the liquid as to allow the liquid to act upon them by its weight, and thereby cause the rotation of the hollow body.

### Fitting Branch Service Connections to Main Pipes.

STEWARTS AND LLOYDS, LIMITED, of Coatbridge, and  
BALLANTYNE, R., of Glasgow.

No. 21,358; Sept. 18, 1909.

The inventors' object is "to simplify the operation of taking a branch off a main and to simplify the means employed for this purpose."



Stewarts and Lloyds and Ballantyne's Service-Pipe Connection.

Sectional views (at right angles to one another) are given, showing the main pipe fitted with a nipple for attachment to a branch connection, with the devices for securing the nipple in place.

An orifice is drilled in the main A, into which is inserted the nipple B—tapered or flared at the end which enters the main and screw-threaded over part of its length. Over the nipple is passed a washer C, comprising a tubular portion which projects into the main and an annular flange portion which bears on its outer surface. Between the flange portion and a nut D, in screw-threaded engagement with the nipple, is interposed a distance-piece E. The nipple is drawn outwards by rotating the nut; and, in consequence of the pressure of the thickened end of the nipple on the washer, the tubular portion of it is caused to assume the form shown, and being pressed against the inner surface of the main provides a tight joint between the nipple and the main. Two jam nuts at the outer end of the nipple afford means for holding the nipple in position while the nut is being tightened up.

### Gas-Main Stoppers.

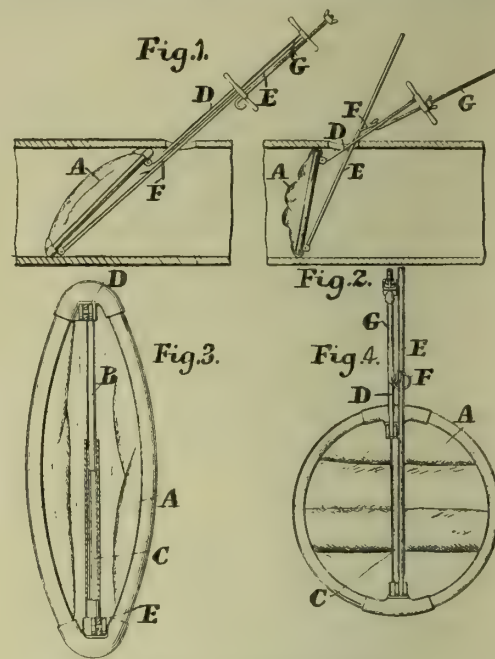
GOODMAN, P., of New York City.

No. 24,480; Oct. 25, 1909.

These gas-main stoppers embody a collapsible spring frame having a flexible diaphragm, which is expanded by exerting pressure at diametrically opposite points, and having handle-bars pivotally connected at or near these points to control the position of the diaphragm in the main. The invention contemplates means to simultaneously force one of the handle-bars inwardly and draw the other handle-bar outwardly to lock the stopper crosswise of the main.

Fig. 1 is a central longitudinal section through a gas-main, showing a stopper in position preparatory to expanding it. Fig. 2 shows the stopper fully expanded and locked in position. Fig. 3 is an inner face view of the stopper, partly in central vertical section. Fig. 4 shows the stopper fully expanded.

The stopper is a collapsible spring frame covered by a yielding packing and having a flexible diaphragm A stretched across it in circular form by exerting pressure on the frame at diametrically opposite points. At these points the frame is provided with pivotally connected telescoping members B C, bridging the diaphragm, and pivotally connected handle bars D E, each provided with a hand-grip. A ring F is swiveled intermediate the length of one of the handle-bars; and a hook G is adapted to be engaged with, and disengaged from, the ring. It has a threaded shank passing through the hand-grip of the other handle-bar, where it is provided with a nut to draw the hook outwardly.



Goodman's Gas-Main Stopper.

In use, the body of the stopper, fully collapsed, is passed through an opening in the main and placed at an inclination at that side of the main from which the gas is flowing. The handle-bar having the ring, and which is connected to the bottom of the stopper, is then drawn outwardly, to position the stopper crosswise of the main. The hook is then engaged in the ring, and on tightening the nut on the shank of the hook, the handle-bar at the top is forced inwardly, and the inwardly-extending handle-bar is pulled outwardly—thus tending to turn the body of the stopper further crosswise of the main, and locking it in place and effectually stopping the flow of gas.

### APPLICATIONS FOR LETTERS PATENT.

- 29.—MACPHERSON, A., "Generation of petrol gas." Jan. 1.
- 63.—SCHORR, P., "Igniting-apparatus." Jan. 1.
- 76.—AUTOLOCK SAFETY LOCK AND BOLT COMPANY, LTD., and FAVERO, M., "Cocks or taps." Jan. 1.
- 92.—HOLT, J., "Joints on pipes." Jan. 3.
- 103.—LANGFORD, P. N., and SHILTON, W. A., "Fastenings for doors of retorts and mouthpieces." Jan. 3.
- 164.—LYNDE, F. C., "Increasing the economy in the heating of surfaces and utensils by gas-flames." Jan. 4.
- 185.—SMITH, H. P., "Pipe-joints." Jan. 4.
- 214.—CHANDLER, S. B., "Purification of gas." Jan. 4.
- 216.—PEARCE, R. F., "Collection of dust and other matter suspended in gas." Jan. 4.
- 269.—HARSANT, H., "Petrol gas apparatus." Jan. 5.
- 286.—SOCIÉTÉ AUBERT FRÈRES, "Electrically kindling gas-burners." Jan. 5.
- 316.—TULLY, C. B., "Destructive distillation of coal." Jan. 5.
- 327.—DARRAH, H. M., and MARTIN, J., "Geyzers." Jan. 6.
- 342.—MERRICK, S. G., "Gas-purifiers." Jan. 6.
- 353.—M'LAREN, E., "Inverted gas-lamps." Jan. 6.
- 396.—LAMKIN, A. E., and HUNTER, L., "Incandescence burners and mantles." Jan. 6.
- 397.—LAMKIN, A. E., and HUNTER, L., "Ignition of combustible gases." Jan. 6.
- 398.—LAMKIN, A. E., and HUNTER, L., "Controlling the flow of gas." Jan. 6.
- 402.—LAMKIN, A. E., and HUNTER, L., "Switches for gas." Jan. 6.
- 423.—BRAY, A., "Acetylene burners." Jan. 7.
- 434.—JANSEN, F., "Gas-stoves." Jan. 7.
- 437.—SCOTT-SNELL, E., "Producing gas from petrol." Jan. 7.
- 441.—NEVEU, E. DE, "Incandescent gas-burner." Jan. 7.
- 442.—SAUVAGEOT, S. J., "Obtaining mineral grease and retort carbon from coal-tar residues." Jan. 7.
- 491.—LYNDE, F. C., "Increasing the economy in heating of surfaces and utensils by gas-flames." Jan. 8.
- 493.—YATES, H. J., "Gas-fires." Jan. 8.
- 526.—WOLF, O., BAMFURY, N. F., and BERNARDY, E., "Inverted gas-lamps." Jan. 8.
- 534.—METAL JOINTING COMPANY, LTD., and HARDEN, T., "Jointing of pipes." Jan. 8.
- 536.—METAL JOINTING COMPANY, LTD., and HARDEN, T., "Jointing of pipes." Jan. 8.
- 540.—SHELDON, J. T., "Stop-valves." Jan. 8.
- 541.—WILHELM, C., "Opening and shutting the gas-way of burners by means of electricity." Jan. 8.
- 556.—ROBIN, J. I., and WHITE, C., "Mantles." Jan. 8.



## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

## Air-Gas Lighting.

SIR,—I have just read under this heading in your issue of Dec. 28, p. 886, the article which presumes to give an exposition of "Air-Gas Lighting: Its Advantages, Some of Its Defects, and How to Remedy Them"—being a tissue of imaginary vapourings entirely belying the reading which the author has placed over it, and proving that he has not yet passed through the novitiate stage of air-gas lighting experience, and is thus quite unfitted to venture on an exposition as to the position to which petrol air-gas lighting has attained.

Many years ago, such a sentence as "very considerable progress has been made in the way of producing a satisfactory light from this agent" might have been written. For years past, no obstacle whatever to the attainment of most satisfactory petrol air-gas lighting has existed. The readers of the "JOURNAL," if they have given this article a glance, must have perceived the many inconsistencies and contradictions the author makes in his rambling statements. At any rate, every reader who occasionally consumes coal gas plus atmospheric air within mantles would immediately discern something very different as the proper explanations for his remarks regarding "680 (or of any other specific gravity) petrol, and would become particularly mystified regarding that "other objectionable matter."

The petrol air-gas plant with which I have been associated ever since it was first constructed nearly three years ago (and capable of generating 50,000 to 60,000 cubic feet of gas per day) has not only required no re-adjustment, but has in the most perfect manner generated petrol gas to fill ordinary gas-works holders, from which, during even the severest frosty weather experienced in the past thirty years, has been supplied uninterruptedly the gas to consumers through, not the quoted wonderful "5000 feet," but through 5 miles of road mains and services, besides probably other 5 miles of house-supply pipes, and this without any condensation whatever in street-mains, gas-meters, or the consumers' pipes or fittings. Every consumer is satisfied with the quality and wholesomeness of the gas, the permanent quality of which was verified by the fact that during such severe weather, as at all other times, those consumers farthest from the gas-works continually testified to the brilliance of their lights; mantles blackened by carbon never having occurred or been heard of. All this is because the turbine generator is a scientific and correctly designed and constructed apparatus for dealing with air and petrol by the fractionizing of both in small volumes; the units uniting within a central mixing-chamber before passing to the gasholders or to the consumers' fittings.

This statement completely annihilates the whole fabric of his story, with the author's mysterious "defects," and his as mysterious failure to show how to remedy them. It is noteworthy that he markedly omits to commit himself to an expression of opinion on the only other petrol air-gas generator omitted from his list of those which he has "damned with his faint praise."

109, Hope Street, Glasgow, Jan. 10, 1910.

WILLIAM KEY.

**Proposed Expenditure on Gas and Water-Works Next Session.**—We regret that, by an error on the part of the correspondent who sent the particulars, the amounts in the table under the above heading which appeared last week (p. 111) as the proposed total expenditure at Abertillery, Exmouth, Fylde, and Pontypridd, were given as exclusive instead of inclusive of the items specified.

## Improved Retort-House Plant at the Preston Gas-Works.

The Directors of the Preston Gas Company have decided to instal a bench of fourteen Klönne regenerative settings of six retorts, 24 ft. by 16 ft., and 22 feet long, operated by the Fiddes-Aldridge simultaneous charger, with stage floors, mountings, and complete coal and coke handling plant. The contract for the charging machine has been placed with Messrs. Aldridge and Ranken, and that for the De Brouwer conveyor with Messrs. W. J. Jenkins and Co. The successful Contractors for the retort-bench, floors, mountings, and coal and coke handling plant are Messrs. Robert Dempster and Sons, Limited, of Elland. The whole of the work has to be carried out in accordance with plans and specifications prepared by, and under the supervision of, Mr. Samuel Tagg, the Engineer and Manager of the Company.

**Maryport Water-Works.**—A contract has been placed with Messrs. C. Bushby and Sons, in connection with these works. It comprises a 10-inch cast-iron gravitation main from the Papcastle reservoir to the new filter-beds at Hayborough, about 4½ miles in length, and a 7-inch cast-iron gravitation main from the new filters to the service reservoir at Hayborough, about 650 yards in length, with air-slucie and washout valves and chambers, &c. Three concrete filters at Hayborough have a combined sand area of 1410 square yards. The amount of the contract is £10,586; and the Engineer for the scheme is Mr. J. C. Boyd, of Carlisle.

**New Joint-Stock Companies.**—The Henstridge Gas Company, Limited, has been registered with a capital of £500, in £1 shares, to manufacture, sell, and supply light and fuel in the parish of Henstridge, in Somersetshire, or in any neighbouring parishes, and to carry on the business of a gas company in all its branches. The Illuminating Engineering Company, Limited, has been registered as a private company with a capital of £10,000, in £1 shares, to acquire the patent rights in an invention entitled "Improvements in apparatus for lighting and extinguishing gas," together with any improvements for new inventions in connection therewith, and the rights, foreign or colonial, which may be obtained by Messrs. C. Ingreby and J. Bartlett, and to enter into an agreement with them and Messrs. R. Gill and J. S. Pollock.

## LEGAL INTELLIGENCE.

## QUESTION OF LIABILITY FOR A GAS EXPLOSION.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Jan. 13.

(Before Mr. Justice PHILLIMORE, and a Common Jury.)

Stacey v. Gaslight and Coke Company, Metropolitan Water Board, and West-End Tailoring Company.

This was an action to recover damages in respect of personal injuries sustained through a gas explosion which occurred in the Fulham Road on April 21, 1908.

Mr. MOYSES and Mr. DUNBAR appeared for the plaintiff; Mr. ELDON BANKES, K.C., and Mr. A. B. SHAW, for the Metropolitan Water Board; Mr. DANCKWERTS, K.C., and Mr. A. NEILSON, for the Gaslight and Coke Company; and Mr. ROGERS (trading as the West-End Tailoring Company) appeared in person. Before the case was opened, it was agreed that Mr. Rogers should be dismissed from the action—he not asking for costs.

Mr. MOYSES said the plaintiff, Miss Stacey, was walking along the Fulham Road on April 21, 1908; and when opposite the shop of Mr. Rogers, there was a terrific explosion, shattering the plate-glass window, and severely injuring her. No one could attribute to the plaintiff contributory negligence—she was lawfully using the highway; and the difficulty in the case was to place liability on the right persons. As the explosion was due to the ignition of gas which had escaped from the Gas Company's main, probably they were the persons liable. But they denied liability, alleging that the explosion was primarily due to leakage from a pipe of the Metropolitan Water Board washing away the soil from underneath the gas-pipe. The Water Board denied liability on the ground that the leakage was not from their main, but from a service-pipe belonging to a customer on whom notice to repair had been served.

Plaintiff was called, and described the nature of the injuries that she had sustained.

Dr. T. J. Chipperfield, who attended her, said his charges amounted to £5 3s.

Answers to interrogatories by the two Companies were then put in and read, from which it appeared that both the gas and water pipes were fractured.

Friday, Jan. 14.

William Rogers (trading as the West-End Tailoring Company) said that, as soon as the explosion took place, he communicated with the Gas Company, who sent some of their men; and they discovered a leak in the supply-pipe. Witness saw a leak. It was in the service-pipe just under the kerb of the footway, at a distance of 5 feet from his shop front. The iron communication pipe was about 3 feet below the surface. The explosion was in the corner of the shop farthest away from the meter. He supposed the gas followed the water-pipe into the cellar. The explosion was inside, not outside in the street. There was a crack in the gas-pipe about an inch long. It was an old rusty crack, and looked as if it had been there for some years. There was also a slight leakage from the water-pipe which went either over or under the gas-pipe. This leak was about 4 or 5 inches away from the leak in the gas-pipe. The water-pipe came into the premises at the same level as the gas-pipe. He had occupied the premises for about two years, during which time no one had interfered with either the gas or the water pipe. No one was working in the shop; and all the burners were carefully turned off.

By his LORDSHIP: He did not know what caused the explosion. The basement was full of gas. He could not say if any one struck a light. The gas might have forced its way up through the pavement and been ignited by a match thrown down by a smoker. After the explosion, he was required by the Water Board to have the water-pipe repaired.

Cross-examined by Mr. NEILSON: The explosion took place in the front shop. The only portion of the pavement disturbed was that just outside the shop, which had been closed from Thursday night to Tuesday morning. There was no smell of gas when he left on Thursday; but there was on the Tuesday, and all the windows and doors were at once opened. A gas-stove in the back-kitchen was alight. The explosion was in the basement; and the window board was forced upwards. When the gas men arrived, they saw the flames coming out of the ground. There was a little water under the gas-main, but not sufficient to cause subsidence of the ground. He did not know that a truck-load of earth was used to fill up the hole.

Cross-examined by Mr. SHAW: When the gas-pipe was removed and cut in half, the part cut through was quite bright; while the part where the crack existed was dark and rusty. There was no crack in the water-main, but simply a slight leak.

By the JURY: The gas-meter was turned off prior to the explosion. There was no fire in the basement where the explosion occurred.

A. H. Griffen, of No. 792, Fulham Road, said he heard the explosion and saw the window fall out. He could not say whether the pavement was disturbed.

A. F. Piper, a builder, said he was present when the pipe was taken out. He could not say which pipe was uppermost.

Cross-examined by Mr. SHAW: The pipe looked as if it had been broken with a hammer, so as to get it out. There were about 3 inches of rust. There was no water in the hole. He was speaking of the day after the accident.

This was the plaintiff's case.

Mr. BANKES submitted that there was no evidence against the Water Board that the leakage from the water-pipe contributed to the accident. Whatever leakage there was, came from a pipe belonging to the owner of the premises; and there was no evidence that the presence of the leak had been brought to the knowledge of the Water Board.



Justice PHILLIMORE said he was of opinion that there was no evidence that the leakage from the water-pipe caused or contributed to the escape of gas, or that they were in default in not having repaired the pipe; and therefore judgment would be entered in their favour.

Mr. BANKES said he did not ask for costs as against the plaintiff; but he might at a later stage have to ask for them as against the Gas Company.

Mr. DANCKWERTS then submitted that there was no case to go to the Jury as against the Gaslight and Coke Company, as the action was simply based on negligence. In *Ogden v. Gaslight and Coke Company*, Mr. Justice Darling ruled that it was necessary for plaintiff to prove injury from gas which got out of the pipe through the negligence of the defendants; and that if defendants had nothing to do with its accumulation once it was out of the pipe, they were entitled to judgment. This being so, it was necessary for the plaintiff to prove that the gas got out of the pipe through the negligence of the Gas Company. Now, what were the facts? On the Thursday when the shop was closed, there was nothing wrong; but the explosion occurred inside the shop on the Tuesday, blowing up the floor. When the ground was opened, it was found that the pipe had fractured—caused no doubt by the ground having subsided through leakage from a water-pipe.

His LORDSHIP remarked that the evidence was rather the other way.

Mr. DANCKWERTS said, even assuming that was so, it was necessary to prove defendants negligent in not finding out the escape.

His LORDSHIP said the evidence went to show there was an old rusty crack from which there must have been a considerable escape of gas.

Mr. DANCKWERTS asked what evidence there was that the Gas Company could possibly have found out there was an escape of gas.

His LORDSHIP thought there was enough to call upon the defendants to answer the case which had been made.

Mr. DANCKWERTS observed that in *Price v. South Metropolitan Gas Company* Lord Russell ruled that, before a plaintiff could succeed, he must prove there had been negligence on the part of the defendants. In that case, there was an escape of gas into the open, whereas in the present instance it was on closed premises. As there was no negligence on the part of the defendants, he submitted that the plaintiff should be non-suited.

His LORDSHIP ruled that there was some evidence to go to the Jury.

Mr. DANCKWERTS then proceeded to address the Jury. He said everyone must be sorry that the plaintiff had been injured; but no one had a right to express his sorrow at the expense of someone else's pocket. If there had been anything wrong on the Thursday night, one would have thought that Rogers would have noticed it, because as gas could not come up through the concrete on which the wood pavement was laid, it would naturally follow the line of least resistance, which was underneath the pavement, and into the premises alongside. This was what, in fact, did happen; and one could not help thinking that the gas had not escaped until comparatively late in the holidays. When Rogers came to the shop on the Tuesday, he smelt gas; and in some way, no one knew how, the gas was ignited. But there was nothing to show that any blame rested on the Gas Company. When the gangers arrived, means were employed to let the gas out of the ground; and then the pipe was temporarily repaired. On the following day, it was found that there was a leakage from the water-pipe which crossed the gas-pipe at right angles, causing subsidence, with the result that the pipe, being unsupported, was cracked by a passing motor omnibus. The Gas Company could not be continually going about digging up their mains to see whether they were growing, like vegetables. What they did was to offer a reward to persons reporting an escape of gas. Before liability could be saddled on the Gas Company, the Jury must be satisfied that they were negligent in letting the gas out of the pipe. If people would have gas, someone must supply it; and companies could only up to a point guard against accidents. There was no question as to the amount of damages, as these had been agreed between the parties.

A. T. Robson, District Main Inspector, proved having taken measurements from which he made a sketch plan of the *locus in quo*; and this was produced and handed to the Jury.

J. T. Redgrave, a fitter, said he was sent on April 21 to Fulham Road, in consequence of a telephone message received. On arrival, he found the fireman in possession, and told him to keep the fire as low as possible until he could get a gang of men. Both meters were turned off. If the fire had been put out, the gas would have escaped into the house again, and might have caused another explosion. Rogers denied having struck a match. Witness said he must have done so, or the gas would not have exploded. When the flagstone was taken out near the kerb, there was a hole full of water, which was baled out. After the water was cleared away, one of the men stopped the leak by knocking up the lead pipe.

J. J. Skinner, a ganger, said he went to the scene of the explosion, and found the gas burning under the fascia of the shop. He lifted the pavement so as to let the gas escape into the air. Under the pavement there was a hole full of water; and the ground to a depth of 6 inches round the main was sloppy. The broken pipe was cut out, and a new one put in; the hole being filled up with a truck-load of earth. There was slight rust on the bottom of the pipe from resting on the wet ground; and the crack was round the pipe near the hole drilled for the service-pipe. Making this hole did not cause the crack. The crack was a new one. It would have been rusted all round if it had been an old one. There was a great deal of heavy traffic on the road, as it was the main thoroughfare to Putney. His view was that the ground having been washed away, the vibration on the top caused the main to drop, and it was thus fractured. The main was 2 ft. 3 in. below the surface of the road.

G. Marvyn, Divisional Main Inspector, deposed that the service-pipe in question was laid in March, 1899. Witness had had upwards of forty years' experience; and from his inspection of the pipe on the day it was cut, he could say that the lower portion was slightly discoloured—caused by the water getting into it. He agreed with the evidence already given as to the cause of the fracture. A gas-main in good ground would last practically for ever. Forty years was not a long time for a gas-main to be buried. They had some which had been in the ground for seventy years. Notice was received of an escape in March, 1908; and it was found to come from one of the lead joints. This was at once put right.

Mr. H. S. Reeson, the Distributing Engineer of the Company, said he examined the pieces of pipe two or three days after the explosion, and found it in good condition. The fracture was a recent one. The Company supplied gas over an area of 62 square miles, having 2184 miles of pipes varying in diameter internally from 3 inches to 48 inches. In addition, there were some 2000 miles of wrought-iron service-pipes through which gas was supplied to the consumers. Notices were always received from electric lighting companies and borough authorities of any openings which they had to make in connection with their plant; and workmen from the Gas Company were always sent to examine the pipes.

Mr. G. Bird, M.Inst.M.E., said he examined the pipe in question some three months ago, and found it to be a good one.

Cross-examined: Drilling the hole for the service-pipe, if properly done, would not tend to cause a fracture.

Counsel having addressed the Jury, his Lordship summed up; and, after some consultation, the verdict returned was for the defendant Company.

## CLAIM ARISING OUT OF A TAR-PAINTED ROAD.

As was briefly stated in last week's "JOURNAL," judgment was delivered at the Ashford (Kent) County Court on Monday, the 10th inst., in the case of *Ellen and Sons v. Kent County Council*. It was a claim by the plaintiffs, who are farmers at Charing, for £26 16s. 6d. damages in respect of the loss of a cow, alleged to have been poisoned by drinking water from a stream polluted with tar washed from the main road. The evidence (see last volume of "JOURNAL," pp. 414, 685) was heard by Judge Shortt, who now forwarded his written judgment for Deputy-Judge Charles Haigh to read in his absence through indisposition. The judgment was to the following effect.

The case was argued on the understanding that all amendments were made in the pleadings necessary to enable either party to bring forward any legal ground of attack or defence. Two questions of fact were raised—first, whether the death of plaintiffs' cow was caused by swallowing tar or water containing tar; and, secondly, if so, whether the tar came from the defendants' road. The evidence on these points was conflicting; but he answered both in the affirmative. The questions of law were whether, under the circumstances of the case, the defendants were liable; it being admitted, or proved, that there was no negligence on their part. It was proved to his satisfaction that the tarring of the road was a proper and efficient method of repairing it, and more economical than the use of granite. The case of *West v. Bristol Tramway Company* was relied upon by plaintiffs as a decisive authority in their favour. In that case, the Jury found that it was not absolutely necessary for the defendants to tar the road when they did; and, secondly, that it was not absolutely necessary, but that it was reasonably necessary, for them to do the road as they did and at the time they did it. On these findings, the Court of Appeal held the defendants liable. His (Judge Shortt's) findings were that it was reasonable to repair the road with tar—this method being more economical than that previously in use; but he also found it was not absolutely necessary, as there was an alternative method (by granite) open to defendants. He considered himself bound by the finding of the Court of Appeal in the case quoted, and gave judgment in favour of plaintiffs for the amount of the claim, but with stay of execution for fourteen days. If an appeal be entered within this period, he further suspended all proceedings pending that appeal.

Mr. L. R. COKE, on behalf of plaintiffs, asked for costs on the higher scale; but to this Mr. H. J. BRACHER raised objection on behalf of the defendants.

His HONOUR decided to leave the matter over to the next Court, for Judge Shortt to deal with.

## Recovery of a Gas-Meter.

At the Tottenham Police Court last Thursday, Charles Gordon, of Rosebery Gardens, Harringay, was summoned by the Tottenham and Edmonton Gas Company for detaining a gas-meter of the value of 30s. A fortnight previously (see *ante*, p. 50), the defendant was summoned for the same offence, and also for illegally disconnecting the meter. He was fined upon the latter summons; but the former was dismissed, as the Bench were not satisfied that a proper demand had been made for it. It was explained that since then an inspector of the Company had been to the house and demanded the meter; but the defendant still refused to give it up, as he claimed a lien on it. Mr. Hill, for the defence, said his client felt very strongly about his rights in the matter. A meter had been previously taken away from the house with 5d. in it, for which he had not had the equivalent in gas; and he brought an action against the Company. He took the present stand on what he considered to be public grounds. Of course, he had no right to detain the meter when he was refunded the money that it contained, which belonged to him. It seemed hard that a consumer was not at once repaid money due to him in such circumstances. Mr. Williams, who appeared for the Company, said the meter had to be tested, and then the money was returned. The defendant said the Company demanded the second meter two days after he had put eleven pennies in it; and he did not consider he had then burnt a pennyworth of gas. The Bench ordered the meter to be given up; the Chairman pointing out that any money found in it that was due to the defendant should be returned. Mr. Williams said this, of course, would be done.

**Wandsworth and the Gas-Burner Bill.**—A petition is to be presented by the Wandsworth Borough Council against the Gas Companies' Standard Burner Bill (No. 1), with the view of obtaining the insertion of provisions with respect to the testing of the calorific power of the gas supplied by the Wandsworth and Putney Gas Company. Other councils are to be asked to co-operate.



## MISCELLANEOUS NEWS.

### GAS MATTERS AT BISHOP'S STORTFORD.

#### The Gas Company's Bill and the Council's Proposed Bill.

Practically the whole of the proceedings at meetings of the Bishop's Stortford Urban District Council which were held last Tuesday had reference to the gas question. The first discussion took place respecting an item on the agenda "to consider the Gas Company's proposed Amalgamation Bill, and what action shall be taken regard thereto."

The CLERK (Mr. T. Swatheridge) opened the discussion by stating that he had received a letter from the Sawbridgeworth Urban District Council agreeing that it was desirable that a conference of the Local Authorities interested in the Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill should be held, and suggesting that the Bishop's Stortford Council should convene such a conference.

The VICE-CHAIRMAN (Mr. H. Kent) thought it was essential that they should place themselves in a position to negotiate with the Gas Company. It was the duty of the Council to protect their interests while they had the chance. It was, he knew, no use arguing in reference to the price of gas; but he had obtained the last returns by the Local Government Board. When they analyzed these figures, they would find losses; but they found that with even a derelict company purchased from a group of financiers in 1903, the local authority were not making so much loss to-day. Furthermore, the fact was clear that when they aggregated the whole of the English and Irish Gas Companies, and also the municipal authorities supplying gas, they found that the average price charged by companies was 2s. 10½d. per 100 cubic feet, and by municipal authorities 2s. 6½d. The position was such that they could go no farther upon the lines of the purchase of the undertaking; but they had it in their power to negotiate for conditions, or to ask Parliament to give them such conditions as they were entitled to. He moved that the Council lodge a petition against the Bill.

Mr. NEWBY, in supporting the motion (which had been previously formally seconded), remarked that, notwithstanding anything said to the contrary, the Gas Company could charge more than 4s. per 1000 cubic feet. It stated pretty plainly in the Bill that slot meters had to pay 5s. With regard to quality, so long as they received 16-candle power, it did not seem to matter what the gas consisted of. They ought to be in some measure protected, so that, even if it was 16-candle power, nothing should come through with the gas that was likely to be objectionable. There was another clause by which they would have to give two hours' notice in writing before they could test the gas. Supposing anybody were to receive by the first post an intimation from a Government Inspector that he was coming about 10 or 11 o'clock, they would be very thankful. He, however, did not think that the Government would dream of giving any such notice; and he did not see why the Gas Company should want two hours' notice to get the gas up to 16 or 19 candle power, or whatever it was.

Mr. HOLLAND said he was of opinion that they ought, as a Council, to get the very best terms they could from the Gas Company; but he still believed they could do it by conference, instead of taking the decided action of opposing the Bill. He knew, of course, that they had certain rights under the last Act. They would lose the power of purchase—that he was aware of; but there were certain other rights of theirs that would continue.

Mr. CARRUTHERS was in favour of a purchase-clause being inserted in the present Bill. He believed the townspeople were eager that the Bill should not go through, and that more than one of the Company's shareholders did not desire it, and regarded the matter as having been more or less sprung upon them.

Mr. FOWLER: Can you say what the expense of the petition will be?

The VICE-CHAIRMAN: It depends upon what you have to do.

Mr. FOWLER: I know that; but what are you laying yourselves out for? If you spend £1000 for nothing, you will be publicly thanked.

Mr. WATERMAN: What did the petition cost last time?

The CLERK: I think the bill was taxed at about £225.

Mr. EDWARDS: But what did you get for the money?

The CHAIRMAN (Mr. J. L. Glasscock) and Mr. FOWLER: Nothing.

The VICE-CHAIRMAN: I beg your pardon; we got the right to purchase.

Mr. HOLLAND: It seems to me that if we oppose the Bill we shall and ourselves in an expenditure of £200 or £300.

Mr. FLINN: It has been stated that we are likely to lay ourselves out for a large expenditure. Mr. Kent has shown that the lodging of the petition is a minor thing; and it clearly remains for the Gas Company to negotiate with us to the extent that opposing the Bill should be avoided. It is quite clear that if the Gas Company do not try and meet us, any expense that is incurred will be caused through them, and the ratepayers will have them to thank for it.

Mr. NEWBY: Is it a correct interpretation that the £50 shares were made £100, and now the £100 are made £140? Does that not give a larger range for dividend?

The CHAIRMAN: They would not get any more dividend really.

The VICE-CHAIRMAN: In the future it looks as if there is going to be something in the nature of 20 per cent. on the original shares. Surely it is the duty of the Council to see we are not bled to that extent.

Mr. CARRUTHERS: The Bill is going to cost the Gas Company a lot of money; and I take it the consumers will pay for it. We ought to have gas cheaper.

Mr. PRYOR, in announcing his intention of voting against the motion, expressed the opinion that it would not be wise to spend a large amount of money opposing the Bill. The bigger the undertaking, the cheaper and better would be the supply of gas. There were on the Board of Directors gentlemen who took a deep interest in the town.

The CHAIRMAN: I have not heard to-night of anything excepting two small items suggested as likely to detrimentally affect the interests of

Bishop's Stortford. Mr. Kent has mentioned monopoly—none of us would look with favour on that. But the objection to monopoly is more or less sentimental; and whatever steps we might take in opposing the Bill, I do not think the House of Commons would listen to us on the grounds of objection to a monopoly. Mr. Kent did not indicate any clause that should be amended; and therefore I think, before we commit ourselves to lodging a petition, we ought at least to know what we want and what we intend to get. The points mentioned by Mr. Newby do not seem sufficiently strong to warrant the taking of the action suggested. With regard to what has been said about the purchase clause, I think we ought to profit by the experience we had four years ago. We know very well that we started on the lines that some are proposing to do to-night; and our aim was to get the purchase clause inserted. We wanted the purchase clause put in the Bill; and we lodged a petition and spent something like £300 to get it. But we knew very well at the time, with the Council as then constituted, that there was not the remotest chance of the undertaking being purchased; and therefore I consider, from the ratepayers' point of view, that we wasted our money. I shall not support a reckless and useless waste of money in opposing the Bill.

Mr. HOLLAND moved, and Mr. FOWLER seconded, an amendment that they should ask for a conference with the representatives of the Gas Company.

After some further discussion, the amendment was put and lost—four voting for and five against it. The original resolution that steps be taken to lodge a petition against the Bill was then carried. It was, however, arranged that the Clerk should incur no expense until he had received further instructions from the Council. Subsequently, a further resolution was carried unanimously, to the effect that steps should be taken to open up negotiations with the Gas Company.

A Special Statutory Meeting of the Council was then held, pursuant to notice, for the consideration of the following resolutions:—

- (a) That the Council do apply in the next session of Parliament for an Act to enable the Council to purchase the undertaking of the Bishop's Stortford and District Gas Company, to supply gas, and for other purposes.
- (b) That the expense be defrayed in the first place out of the general district rate, and ultimately out of money to be borrowed under the provisions of the Act.

The VICE-CHAIRMAN said he recognized that it was an absolute impossibility to secure a majority of the whole Council; and therefore the resolution formerly passed (see "JOURNAL" for Dec. 14, p. 762) fell to the ground. He was sorry there was no chance of going to the electors for a vote on the question of purchase. He, however, formally moved the adoption of the first resolution.

On being put to the vote, five voted for it and five against.

The CHAIRMAN thereupon announced that it had fallen through.

The CLERK said there was no necessity to put the second resolution, as they were not proposing to promote any Bill.

Some discussion then took place with regard to the expense already incurred; and it was decided that the Clerk should consider how the Council stood in the matter, and, if necessary, place a resolution on the agenda for the next meeting.

At the quarterly meeting of the Essex County Council, the Parliamentary Committee reported that they had directed that the necessary notices should be given under the Borough Funds Acts, prior to that meeting, to enable the Council to spend a sum not exceeding £500 in opposing the Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill. Alderman Brooks said he was very glad to assure the Council that this matter was not likely to cost the county any very serious sum of money, if anything at all. A study of the Bill showed that the promoters had conceded to the county of Herts all that they in Essex were likely to require. Why they had not included in the Bill a clause giving the same measure of protection to Essex, he did not know; but it was hardly conceivable that they would refuse to Essex what they had already conceded to a neighbouring county, though it was necessary for them to have the power of opposition. He had had put into his hands a letter from Mr. Jones, of Ongar, who evidently did not understand the object of this provision. They had had resolutions of this character year after year; and, as the Council knew, it was only when they had failed to obtain concessions in other ways that they had gone to actual opposition in Parliament. He asked them to authorize the Committee to spend the money if necessary; but he did not think they would be actually called upon to expend it. A resolution to this effect was adopted.

### HOYLAND DISTRICT COUNCIL AND THE GAS-WORKS.

#### Purchase Scheme not Sanctioned.

There was a crowded meeting of the ratepayers of Hoyland in the Town Hall, on Monday last week, for the purpose of considering the proposal of the Urban District Council to purchase the undertaking of the Elsecar, Wentworth, and Hoyland Gas Company. Mr. M. T. KENWORTHY, the Chairman of the Council, presided.

The CHAIRMAN explained that in October, 1906, the Council appointed a Sub-Committee to approach the Directors of the Company and discuss with them several grievances. These were chiefly the price of gas, which everybody agreed was too high; the quality, which was cause for much dissatisfaction; the public lighting arrangements; and the breaking-up of roads by the Company. Discussion was continued at a second meeting, when the Chairman of the Gas Company said: "Why do you not buy the gas-works; then you could remedy these defects." That meeting was held on Dec. 11, 1907; and this was the first intimation they had of the idea of purchase. The Council had considered the matter at great length, and eventually appointed a Sub-Committee to supply the Council with the details. This was done, and the Council decided then to call in an expert to report to them as to the value of the works, &c. Mr. Newbigging was acknowledged to be one of the first gas experts in the country; and on his recommendation, the Council



offered the Directors £25,200. This was arrived at on the usual basis of 25 years' purchase of the maximum profits earned. The Company had authorized share capital to the amount of £24,000, of which £12,000 had been issued and was fully paid-up in the form of consolidated stock. The maximum dividend of 10 per cent. on £12,000 was £1,200; and this amount multiplied by 25 made a total of £30,000 as the purchase price. Assuming that the works and mains were in a condition to continue earning the maximum dividends, the £30,000 would represent the value of the undertaking. But, as a matter of fact, these were far from being satisfactory. This sum was offered to the Company; and they replied that they required £33,000, which figure was afterwards amended to £32,500. Having given particulars of the Company's financial position, the Chairman said he acknowledged that the total price (£34,100) was a high one, but it was the lowest possible; and even at this the purchase would be, in his opinion, a profitable undertaking. He was encouraged in this opinion by the fact that there were private individuals who were prepared to give the price named, and more, for the concern. In this connection, comparisons of prices paid by local authorities in recent years would be interesting, and would support his contention. These he proceeded to give. Continuing, he reminded the meeting that in their project the Council were acting on the advice of Mr. Newbigging, and he was convinced that not only could the price of gas, which was now 3s. 7d. per 1000 cubic feet—a figure much above the average—be reduced, but they would also be able to contribute a good amount to the relief of the rates. They would also be repaying capital at the rate of £850 a year; and in time the works, paid for out of profits, would belong to the community. He understood that many who were in the meeting had come to oppose the scheme; but he hoped they would hesitate. He reminded the meeting that some years ago the Local Board had approached the Gas Company in regard to the purchase of the undertaking; and it was now considered that their decision not to do so had been a gross mistake. The works would never be obtained on better terms than now. He had pleasure in proposing that the Council should proceed to complete the purchase.

Mr. E. JAMES seconded the motion.

Mr. W. J. LAZENBY, the Commercial Manager of the Hoyland Silkestone Colliery, in a speech of some length, opposed the motion. He said the ratepayers were being asked to buy a business which was already declining, and the very existence of which forty years hence was doubtful. The amount which the Council had agreed to pay for the works as they stood was £27,000; and they were to take over the mortgage of £1000. The costs of the Act and expenses incident to the purchase of the undertaking were expected to amount to £1000; and consumable stores were estimated to be worth £300; and for improvements and extensions to the undertaking, £4800 was to be borrowed. The total of these figures was £34,100. Nothing had been provided for working capital. The speaker proceeded to deal in detail with the financial aspect of the question, and concluded by saying that, if he could believe that the purchase of the gas-works would be any benefit to the ratepayers or the consumers, he would support it most heartily; but he was regretfully driven to the conclusion that it would entail a very serious annual charge, for a long period of time, without bringing in return the slightest compensation. He urged the meeting, therefore, to consult the best interests of themselves, their children, and even their grandchildren, by most decidedly refusing their support to the promotion of the proposed Bill.

Mr. W. A. DURNFORD, the Commercial Manager of the Elsecar Colliery, supported the scheme; saying he was convinced that if the ratepayers decided against it they would regret it. The reluctance of the Gas Company to sell their undertaking was to him a decided reason for its purchase. Mr. Newbigging was the best expert on the question in the country; and he strongly recommended the Council to buy.

Mr. T. C. NEWTON, the Managing-Director of Messrs. Newton, Chambers, and Co.'s Collieries, and Dr. W. L. ALLOTT suggested an adjournment; but the proposal was quickly rejected.

On the vote being taken, 12 were in favour of the scheme, and an overwhelming majority voted against it.

Commenting on the subject, the "Hoyland Express" says: "We are rather sorry that the scheme of the Hoyland District Council has fallen through. . . . Rarely is it bad policy on the part of a municipality to take over a gas concern. Gas is one of the most profitable of undertakings at the present time. Take this case of the Hoyland works. The outlay is put at something like £33,000. An Act of Parliament can be obtained, and the money raised and repaid in fifty yearly instalments of £686. The gas-works, well-equipped and in proper condition, are capable of earning £1800 a year. This means that they would be a source of immediate profit to the extent of £814 a year, without costing the ratepayers a single penny. That is money thrust deliberately into their pockets. With equal deliberation they have thrust it out."

### CROYDON AND THE STANDARD BURNER BILL.

The Town Clerk of Croydon (Mr. F. C. Lloyd) has drawn up a report upon the Gas Companies Standard Burner Bill (No. 1), which the Croydon Gas Company, together with other companies, are promoting. After setting forth the provisions of the Bill, he proceeds as follows.

The substantial question for consideration is whether the adoption of the standard burner, which is said by gas experts to appreciate the gas, will injuriously affect the interests of the consumer by the lowering of the standard candle power or otherwise. I understand that the quality of the gas supplied is the important factor in determining the question of how far, if at all, the adoption of the standard burner will affect consumers in any particular area, as the better the quality of the gas supplied, the less the standard burner appreciates the gas—e.g., in the City of Liverpool, which is one of the county boroughs affected by the proposals of the Bill, I find upon inquiry that the standard burner appreciates the gas to the extent of between 2 and 4 candles in the total illumination, with the result that the quality of gas required to give the statutory

20-candle power through the standard burner will only suffice to give from 16 to 18 candles through the existing prescribed Liverpool burner. Therefore the view is held in Liverpool that if a standard burner were adopted there, the consumer would suffer a reduction of 2 to 3 candles illumination; and that, failing a corresponding reduction in price, such a new burner would be detrimental to the consumers' interest.

After considering the proposals of the promoting Companies, I communicated with the Secretary of the Croydon Gas Company, stating that I had received communications from several of the towns affected from which it appeared that they regarded the proposals of the Bill with apprehension, on the ground that the same would injuriously affect the consumers, and asked him to be good enough to inform me whether his Company would be prepared to compensate consumers in any way, and, if so, how. I have received the following reply from the Secretary (Mr. W. W. Topley):—

My Directors are aware that the Local Authorities in some of the districts affected by this Joint Bill are in communication with one another, in the belief that its proposals may possibly be prejudicial to consumers. They feel sure, however, that such apprehensions as any Local Authority may feel can only be based on an incomplete knowledge of the facts.

Enclosed is a list of 76 cases in which during the last few years the change of standard burner proposed in the Bill has been authorized by Parliament. The point to which my Directors wish to draw your attention here is that in no case, as far as they know, has any condition in the nature of compensation been attached to Parliament for protecting the interests of the consumers by reason only of the altered method of testing; it having been recognized that under the regulations which now apply generally to the relations between gas companies and consumers, the greater part, not the whole, of any benefit which a company may reap from a change of burner automatically finds its way to the consumer.

In the case of this Company, if and when any saving arises from the use of the new burner, its result will be to enable the Company to take, earlier than would otherwise be the case, a step the Directors are naturally desirous of taking at the earliest possible moment—that of effecting a reduction in the price of gas.

The question whether the adoption of the standard burner will, in fact, be detrimental to the interests of the consumers of gas in Croydon is one that can only be answered by an expert gas engineer, who has ascertained by analysis the quality of the gas supplied by the Company; and it must be remembered that the problem is now complicated by the use of incandescent burners.

As to petitions against the Bill, the last day for presenting petitions in opposition will, if the Bill commences in the House of Commons, be on Feb. 12, and if in the House of Lords on Feb. 19; and in the event of the Corporation deciding to oppose the Bill, definite instructions to do so should be given me at the next Council meeting.

### THE RATES AND PUBLIC ELECTRIC LIGHTING.

Among the correspondence in a recent issue of the "Bexhill Chronicle," there is a long letter on the subject of the "High Cost of Public Electric Lighting," which will be read with interest. The author, who is evidently well informed on the question with which he deals, writes under the *nom de plume* of "Assoc.M.Inst.C.E."

I notice from your report of the recent Local Government Board inquiry that the unusually efficient Inspector, Mr. Hooper, called attention to the high cost of public electric lighting. And no wonder for in his investigations about the country he must have been much struck by the fact that, generally speaking, where public authorities own the local electric undertakings, the cost of public lighting is excessive. Mr. Hooper was probably not informed that the present lighting rate at Bexhill represents 4d. in the pound, or 21 per cent. the general district rate of 1s. 7d.—being, in fact, the highest item with the exception of that of highways. It is as certain as anything can be, that if an Electric Light Company were in fair competition with the Gas Company, the ratepayers would not be called upon to pay this extravagant rate for public lighting. Competition is a *sine qua non* with municipal work in the ordinary way. Yet it is a curious fact that this is being ignored in the important matter of public lighting; and the price charged for the same is practically in the hands of the Electricity Committee.

It is true that the finances of the electricity undertaking show improvement; and the Committee are to be congratulated upon starting the very necessary depreciation and reserve fund. But how has the apparent improvement been brought about in the face of considerable capital expenditure and the fall in custom due to metallic filament lamps? To me, the reason seems clear, for, if I remember rightly there was a deficit on the undertaking year by year until the charge for public lighting were increased; and though these have subsequently perhaps, been modified, owing to the introduction of metallic lamp (which take less current), the fact remains the same at Bexhill as in many other places in the country where municipal trading in electricity is indulged in—that the ratepayers, some of whom do not, and cannot receive the slightest benefit from the undertaking, have to pay indirectly to keep the concern going. And the ratepayers pay instead of the consumers of electricity, who surely are the people who should have to pay for what they have—more especially as electricity is by no means necessary, in the same sense as water, for instance.

It is almost amusing to read the remarks attributed to the Chairman of the Electricity Committee, who suggests that, contrary to general opinion, electricity for public lighting purposes is being supplied at under the average cost. And yet his Committee are still anxious to do the lighting, and continue to heap up capital expenditure under this head. From your report, I gather that the average cost per unit is 3'86d. and that the charge for public lighting (which includes all items) is 3'75d. But as this is such a bad bargain, why do not the Electricity Committee (excluding the arc lighting, for which there may be some justification for additional expense) offer the same sum of money to the Gas Company as they receive, for providing an equal, or probably



ter, light. Let them do so, and they will find that they will have raised the price of current to private consumers to make ends meet; but, of course, from an electrical point of view, a long-hour consumer such as public lighting furnishes (approaching more the ideal) should give every consideration, and not be charged top price.

At Hastings, to which reference was made at the inquiry, and where record of the electricity undertaking in the hands of the Corporation has been a disastrous one, there has recently been an endeavour to apparently improve matters by converting certain gas-lamps for the use of electricity, much to the annoyance of those ratepayers who are inconvenienced by the resulting inferior lighting. In this case, it is simply not competition, but preferential custom. But in order that the Electricity Committee could secure the work, they had to price the lamps the same as the Gas Company received for them; and this works out at 3'04d. per unit, including all charges other than interest. On the other hand, when the price to private consumers was recently increased, the price of current to the public arc lamps was also increased; and the total cost per unit of current, covering all charges, amounts to 6d. This last charge will be reduced after certain charges are paid, but it will be observed that the figures are utterly inconsistent, and we have but one motive in view—namely, to inflate the revenue at the cost of the ratepayers, instead of at the cost of the electricity consumers.

## GAS POISONING OF A BELFAST ALDERMAN.

### Electric Wire Fuses a Gas-Pipe.

On Saturday, the 8th inst., the City Coroner of Belfast (Dr. James Raham) opened an inquiry into the circumstances attending the death

of Mr. John Rooney, an alderman of the Corporation, which occurred the previous day at his premises in the city. Among those present were Mr. J. A. Doran, J.P. Chairman of Gas Committee, Mr. Robert Harpe (Gas Engineer and Manager), Mr. A. M. I. Cleland (Chief Inspector), and Mr. T. W. Bloxam (City Electrical Engineer).

Mr. P. S. Brady represented Mrs. Rooney; Mr. John M'Cormick (own Solicitor) appeared for the Corporation.

Mrs. Mary Rooney deposed that on the previous evening she went to the room in which her husband usually slept in the afternoon, for the purpose of calling him. There was a very strong smell of gas; but a light was burning. She went over to her husband, and raised his head, at which he fell back. She then opened the door and two landing windows, and called for the ambulance. The gas appeared to be turned full on, though it was only burning dimly—about half strength.

Mr. Brady said he had no questions to ask the witness. Of course, their resources were at the command of the Coroner and the Jury to assist in discovering the cause of death. They placed themselves at their disposal.

The Coroner said it was his intention to have a full investigation into the whole circumstances of the case; in fact, he had instructed two experts—one to make an examination of the dog which was found underneath the bed, and the other to state what was the exact composition of the gas. He did not wish to go into the particulars that day; but he thought it would be well to have a full investigation. They had many gas-poisoning cases in Belfast that he thought it was his duty and that of the jurors to investigate this one, with a view to seeing if anything could be done to prevent the occurrence of these troubles. He might state, in regard to the evidence they had had, that no doubt there was a leakage of gas caused by some fusing between an electric light wire and the gas-pipe.

Mr. Brady said they had a witness who opened the floor of the room in which the death occurred; and if it would meet with the approval of the Coroner, he could be examined as to the condition in which he found the room that morning.

The Coroner: Certainly; it will explain the circumstances.

John M'Cullough, a gas-fitter, stated that the floor of the room in which Mr. Rooney had been lying was opened that morning and the gas-pipes were examined. A pipe ran from one side of the room to the other, and parallel with it, at a distance of about 4 inches, was an electric wire covered with metal sheathing. From the pipe a branch led to a gas-jet which was burning. The wire went over the branch, touching or almost touching it. At the point of contact there was a hole in the gas-pipe, which was melted away about 3 inches. The under side of the flooring was scorched. He was the plumber who put in the piping. He had a free hand, and did the work in the best possible manner.

Mr. Brady said that, in justice to the electric wire fitter, he might state that he did his work on the same conditions; he put in the best material. They had given the City Hall officials notice of the matter, and they had attended to give any assistance in their power.

The Town Solicitor said before the inquiry was adjourned he should like to express, on behalf of the Corporation, the deep sympathy of every member with the family of the late Alderman Rooney in their sad bereavement, and also their profound regret at the occurrence.

Mr. Doran testified to the kindly and generous disposition, as well as to the business capacity, of the late alderman, whose death he regarded as not only a personal but a public loss. If there was any information to be obtained from the Gas Committee or any of the officials, he would, as a duty he owed to his late colleague, see that it was placed before the Coroner and the Jury, so that the inquest, when finished, would give satisfaction as far as possible to the deceased's friends.

Mr. Brady said, on behalf of Mrs. Rooney and the family, he thanked those who had spoken so kindly of the deceased. With regard to the sad occurrence, they did not say the Corporation were in any way responsible. It was quite clear, from the examination that had been made, that, no matter what sort of gas was passing through the pipes, the volume that escaped was so great that death would have resulted. The cause of the leakage was perfectly obvious—the fusing of the electric wire, and the consequent melting of the gas-pipe.

The inquiry was then adjourned till last Thursday. On the resumption of the proceedings,

John Cunningham, who had been in the service of the deceased for fifteen years, stated that Alderman Rooney was in the habit of going upstairs every afternoon for a nap. About ten minutes past six on the evening of the 7th inst., he heard a scream from Mrs. Rooney. He ran up to see what was the matter; and he heard her say that her husband was poisoned by gas. He assisted in carrying the deceased out of the room, and laid him in the passage. They put pillows under his head and rubbed him. The ambulance arrived a few minutes later, and he was removed to the hospital; but witness believed he was dead when taken from the room. There was a very strong smell of gas in the room. The gas-jet was alight, but the flame was only flickering—about the size of a candle light.

Dr. Michael Aicken stated that about half-past six o'clock on the evening in question he received a message by telephone, asking him to go down to Alderman Rooney's business premises. A few seconds afterwards he had another message from Mr. Brady telling him to hurry to the Royal Victoria Hospital. He did so, and arrived at practically the same time as the ambulance. He examined the body in the emergency-room, and found no external marks of violence. There was a little blood and froth from the mouth and nose, and the face was congested and the pupils of the eyes dilated. He believed Alderman Rooney had then been dead about an hour-and-a-half. He (witness) afterwards made a minute examination of the bedroom. There was a shocking smell of gas, and they searched for the escape, but could not find it. On looking under the bed, he found the body of the dog. He was of opinion that death was due to asphyxia, following carbon monoxide poisoning.

Dr. M'Kenzie, of the Royal Victoria Hospital, gave corroborative evidence, and agreed with Dr. Aicken's opinion as to the cause of death. He thought death occurred about an hour before deceased was taken to the hospital.

Dr. W. J. Wilson, Lecturer in Hygiene at the Queen's University, stated that, at the request of the Coroner, he, in conjunction with Mr. Totton, made, on the 8th inst., a post-mortem examination of a dog stated to have been found in a bedroom at the late Alderman Rooney's business premises. Witness described the appearance of the dog, and said that when the blood was diluted it presented the cherry-red colour produced by the action of carbon monoxide poisoning. Spectroscopic and chemical analysis confirmed this diagnosis. When the blood was examined by Haldane's carmine method, it was found to be saturated with carbon monoxide to the extent of 76 per cent. Analyses of the gas supplied to the city were also made, for the purpose of ascertaining the percentage of carbon monoxide it contained. Four samples were taken from an ordinary gas-bracket—one in the forenoon, two in the afternoon, and one in the evening. The analysis of each sample resulted as follows: 19.9 per cent., 21 per cent., 20.6 per cent., and 19.7 per cent.—the four tests giving an average of 20.3 per cent. of carbon monoxide. The percentage of carbon monoxide in ordinary coal gas, free from admixture with carburetted water gas, was usually found to be from 6 to 8 per cent. Therefore the city supply contained at least 12 per cent. of carbon monoxide above the average for coal gas. The experiments of Professor Lorrain Smith had shown that in cases of gas poisoning it was carbon monoxide alone which was the lethal agent. The Departmental Committee on Water Gas, which reported to the Home Office in 1899, recommended that the limit of carbon monoxide in gas supplied during the night hours should be 12 per cent. Any escapes of ordinary coal gas would, under certain circumstances, be dangerous to life, owing to the presence of the percentage of carbon monoxide given above; but when carburetted water gas was mixed with coal gas to such an extent as to raise this percentage to 20, the danger was, of course, increased. Dr. Haldane, one of the experts on the Departmental Committee, had shown that deaths from carbon monoxide were enormously more frequent in cities using coal gas mixed with carburetted water gas than in those in which ordinary coal gas only was consumed. From experimental and statistical data, he concluded that the number of accidents referable to the use of mixed gas would appear to increase approximately as the cube of the gain in percentage of carbon monoxide. Thus, if the percentage of carbon monoxide were increased from 6 to 12, the chance of being poisoned was not twice, or even four times, but eight times as great as before the increase; and if the carbon monoxide became three times as abundant as before, the chances of being poisoned were increased no less than twenty-seven fold.

Mr. Brady: Am I to understand from your evidence that there was an excess of 12 per cent. of carbon monoxide in the gas supply over the amount recommended by the Committee you mention?

Witness: The percentage in ordinary coal gas is 6 to 8, and the Committee recommended that the percentage present in a gas supply should not exceed 12 per cent. during the night hours. The samples we analyzed contained 8 per cent. more than was recommended by the Committee.

Mr. M'Cormick: As I understand it, there is 6 to 8 per cent. of carbon monoxide present in ordinary coal gas? Am I right in saying that this is quite sufficient to produce death if inhaled?

Witness: Yes; if inhaled sufficiently long.

And the only difference is that one is a little more deadly than the other?—I would not say a little more; I would say more deadly.

Have you any doubt in this case that if the gas had been ordinary coal gas death would have ensued?—I think the chances of Mr. Rooney would have been three times as good if it had been ordinary coal gas.

That is a speculation?—Yes; but we know, as a matter of fact, of many instances in which people have been exposed all night to a considerable escape of coal gas, and yet have revived under proper medical treatment.

The medical evidence is that Mr. Rooney had been dead probably an hour-and-a-half before he arrived at the hospital. Now, suppose he was for this time exposed to an escape of coal gas alone, what would his chances be?—Well, one does not know exactly how much of this gas escaped or was diluted with air. There was a chimney in the room, and if the skylight were open it is possible there was a good dilution of the gas going on; so that a person might breathe the gas for some hours without being suffocated if it were pure coal gas.

Do you suggest that a man might inhale coal gas for an indefinite period?—If it were diluted. You must remember that the burner was



still alight in the room, and there must have been a considerable quantity of oxygen present to feed the flame.

Are you aware that carbon monoxide reveals itself by the pungency of its odour—that it is much more pungent than ordinary coal gas?—I think they have pretty much the same smell.

In further cross-examination, witness said he quite agreed with the report of the Departmental Committee that the danger from water gas mixed with coal gas only arose when it escaped, and not when it was consumed. Except the risk of poisoning when the gas escaped, it was not more dangerous than ordinary coal gas. He had seen the percentages of water gas used in English towns, and quoted some of them.

In answer to Mr. BRADY, witness repeated that if the gas had been ordinary coal gas, Mr. Rooney's chances of being alive that day would have been three times as good as they were.

Mr. J. Harold Totton, B.A., B.Sc., the County Analyst for Armagh, corroborated this evidence. In answer to a juror, he stated that, in his opinion, deaths from gas poisoning were not so numerous when coal gas only was used as they were now; and this was the reason for having the present investigation.

Mr. Robert Sharpe, the Corporation Gas Engineer and Manager, examined by Mr. M'CORMICK, stated that the carburetted water gas in Belfast differed in no way from that manufactured in any of the large centres in the United Kingdom. Carbon monoxide was a necessary ingredient, and it was found in no greater percentage in the Corporation gas than was the case in other towns. It contained about 32 per cent. He had made inquiries as to the percentage of the mixture of carburetted water gas and ordinary coal gas in other towns, with this result: Liverpool, 50; Bath, 50; Lea Bridge, 50; Dublin, 51; Southgate, 52; Tottenham, 52; Barking, 50; Southend, 50; Southport, 51; North Middlesex, 67.55.

Mr. M'CORMICK: Belfast is lower than all the places that you have mentioned?

Witness: Yes. For the three months October, November, and December, our average was 46.11 per cent. of water gas and 54 per cent. of coal gas.

Mr. M'CORMICK: There was a question asked as to the increase of deaths from gas poisoning since water gas has been used; but has there not been a very large increase in the consumption of gas generally?

Witness: Yes. I might say there is an increase of 7 or 8 per cent. all over the country each year. We have enormously added to the number of our consumers, especially since the introduction of prepayment meters, of which I think we have 24,000 in Belfast. With this increase, I should naturally expect there would be an increase in the number of deaths.

Have you any reason to suppose that the proportion of deaths is greater?—No.

In reply to further questions, witness said the use of water gas reduced the price of gas. Water gas revealed itself by its pungent odour. One cubic foot in 10,000 cubic feet of air would be at once detected? He tested the pipe which had been fused under the floor of the room, and calculated that on the evening in question it was discharging gas at the rate of about 3 cubic feet per minute. His theory was that, as the floor was covered with linoleum, the gas found its way along the joists and escaped round the skirting of the wall at the head of the bed. He thought Mr. Rooney was lying in the full force of the volume of escaping gas. Death must have ensued in ten minutes or a quarter-of-an-hour.

Mr. BRADY asked if the gas-piping and the electric light wire were laid in contravention of any regulation of the Corporation.

Witness replied that the Corporation had no powers with regard to the laying of pipes throughout a house. Their responsibility ended at the meter.

Was the arrangement you saw highly dangerous?—It was. There should always be a space between the gas-pipe and electric light wires; and in this case they were touching.

A model was produced in which the metal tube containing the electric light wire was seen touching the gas-pipe.

Witness explained that a short-circuit caused the fusion of the gas-pipe, and the sparks set fire to the escaping gas, and combustion lasted until the air in the space between the joists was consumed. Sufficient gas made its way through to keep the jet in the room alight. The tube containing the wire should have been at least an inch away from the gas-pipe, or have been properly insulated.

Mr. BRADY: Do you think it would be any safeguard to the public if the Corporation had control over fittings of this kind?

Witness: They have such control in some cities.

The CORONER asked if it were not the fact that it was because such large quantities of gas had now to be supplied that water gas had to be used?

Witness: Yes. We have to do it, and we must do it in future, whether we like it or not. We were very hard pressed in December to keep up the supply; and had it not been for the water gas, we could not have done so. If we had other means, we would use every endeavour to keep down the supply of water gas as far as possible. We do not wish to send out more than we can help; but we must do it when the time comes.

The CORONER said Mr. Sharpe had answered in a most straightforward manner all the questions put to him.

Mr. Thomas Bloxam, the Engineer to the City Electricity Department, stated that the class of wire employed in electric lighting was a most important factor in the prevention of leakage. He had examined that used in the premises in question, and found it of quite a superior class—in fact, if a contractor were so disposed, he might put in a very much cheaper description of wire. The only mistake made was the running of the  $\frac{3}{8}$ -inch branch gas-pipe, and allowing it to come in contact with the casing carrying the electric wire. If the precaution had been taken to keep it an inch away, there would have been no leakage of electricity, and no puncturing of the pipe, and the sad accident would have been avoided.

The CORONER: The branch pipe had been recently added, I believe?

Mr. BRADY: It was put in as recently as the 9th of November; and the other work was done a couple of years ago.

The CORONER said he hoped the Jury would be satisfied with the evidence in this most unfortunate and lamentable case. It was unnecessary for him to say anything now concerning the sad death of

Alderman Rooney, as sympathy had already been extended to his family by them. When he (the Coroner) was a member of the Corporation, Mr. Stelfox (the former Gas Engineer) made a report stating that, owing to the limited accommodation for the manufacture of gas and the want of space for extension, the inhabitants would some day find themselves in darkness. Mr. Sharpe and Mr. Bloxam both felt this accident very much.

Mr. BRADY desired to thank the officials of the Corporation for the trouble they had taken and the courtesy they had shown.

The CORONER said Mr. Sharpe had to supply the city with gas, and there were no other means of keeping up the supply than by the use of water gas; but there was no question at all that the number of deaths had increased since the use of this gas.

The Jury, after a short deliberation, returned a verdict that the deceased had died from asphyxia, following carbon monoxide poisoning, due to inhaling gas from an escape caused by an electric wire fusing the gas-pipe. They added a rider stating that they were of opinion that more care should be taken in laying gas-pipes close to electric wires.

The CORONER: Would you like the Corporation to get a clause or bye-law to enable them to supervise the laying of gas-pipes and electric wires?

The FOREMAN: No; it does not amount to that.

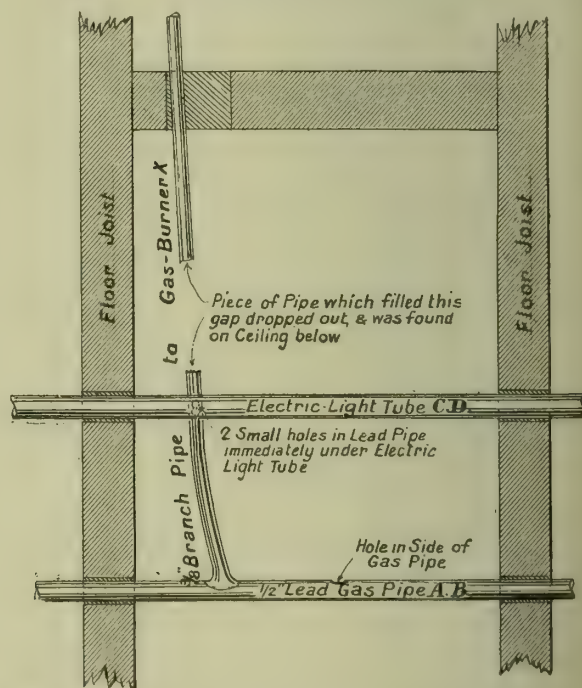
Mr. M'CORMICK: It would be a very big thing for the Corporation to undertake to supervise every house in Belfast.

The CORONER said he was glad Mr. Bloxam was in a position to say that the materials used in the electric light installation in the premises were of a first-class description.

The proceedings then terminated.

### Report by the Superintendent of Mains.

A report on the accident has been made by Mr. A. M'I. Cleland, the Superintendent of Mains. He first explains that the room in which the deceased was found was lighted by one flat-flame burner fitted on a bracket fixed over the fireplace, 6 feet from the floor, and then gives particulars of his examination of the premises the day after the occurrence. On the flooring-boards being removed, the cause of the disaster was at once apparent. The bracket was supplied by a  $\frac{3}{8}$ -inch lead pipe passing under, and in contact with, a  $\frac{1}{2}$ -inch iron tube enclosing electric wires. The former pipe was taken off a  $\frac{3}{8}$ -inch lead pipe. The arrangement is shown in the accompanying diagram. At the point where the  $\frac{3}{8}$ -inch pipe had been in contact with the iron tube, two holes, each rather less than  $\frac{1}{2}$  inch in diameter, had been made in its upper surface



Plan of Pipes under Floor of Bedroom in Winecellar Entry Premises, Belfast.

At a distance of 1 inch from the iron tube, there was a gap of 3 inches in the  $\frac{3}{8}$ -inch pipe; the broken ends showing ragged edges, but full apertures. There was also a hole about  $\frac{1}{2}$  inch in diameter in the side of the  $\frac{1}{2}$ -inch pipe, and 3 inches from the point at which the  $\frac{3}{8}$ -inch pipe had been taken off. The boards above the gap in this pipe were burnt and charred to a maximum depth of  $\frac{5}{8}$  inch, and over an area of 3 to 4 inches. Mr. Cleland comes to the conclusion that electrical action holed the  $\frac{3}{8}$ -inch pipe. The boards were separated from this pipe by a space of only  $\frac{1}{2}$  inch; and a hole 1-64th of an inch in diameter would have allowed a flame to issue more than long enough to ignite the boards. Once the gas was ignited at the hole, the iron tube immediately above caused the flame to be deflected in two directions—one upwards, igniting the under surface of the flooring, and the other playing about the side of the  $\frac{1}{2}$ -inch lead pipe. The burning and glowing boards gradually baked the portion of the  $\frac{3}{8}$ -inch pipe immediately beneath them; but before the pipe was sufficiently softened to be ready to drop of its own weight, the air in the cavity was so heavily charged with carbonic acid that the gas could no longer burn. Everything was now in train for the gas to find its way beneath the floor and into the room. A certain portion of it shot across the gap in the  $\frac{3}{8}$ -inch pipe and kept the jet in the room going, though feebly; but a far greater portion followed the line of the pipe over the joists, up behind the skirting-board, and into the room through a hole in the plaster just above the board.



## SULPHATE OF AMMONIA MARKET.

## Messrs. Bradbur and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1909;" and, as on similar occasions, we extract from it the portions which chiefly interest our readers.

In their "Review" for the year 1908, Messrs. Bradbury and Hirsch took occasion to refer to the condition of trade and industry during that period; and they described it as having been the worst in any recent year. Supply had been in the process of adjustment to consumption by means of reducing output and working off surplus stocks in the hands of producers and distributors, and trade and industry had been suffering accordingly. They thought, however, that the year had gone far to bring about this adjustment, and that in 1909 production might again be raised to the level of the year's consumption; stocks having been reduced to something like a working level. At the time, however, they could not see that more could be looked for; and now that 1909 has passed, it does not seem to them that much more than they suggested has been achieved. It cannot be said that the year was a good one for farmers in the United Kingdom. The spring was fairly open and seasonable, but the summer and autumn were dull and wet; and though crops were sufficiently abundant, they were, on the whole, not very satisfactory in either quality or condition. Prices were, however, good where quality and condition were right; and, if the year's working cannot be considered as having been good, it cannot, on the other hand, fairly be described as having been distinctly bad.

At the end of 1908, it was possible to make a much closer estimate of the probable supply of nitrate of soda for January-April than was the case at the end of 1907; the factors concerned being less perplexing. But the argument from the probable supply to the probable course of the market was rendered more difficult by the fact that no agreement for the renewing of the Combination of Producers, which was expiring at the end of March, had been arrived at, and by the further fact that 90,000 tons of the season's supply had been pooled for the purpose of regulating the available supply as the season progressed. The actual supply for January-April proved to be 997,000 tons. This was 16,000 tons less than was estimated by Messrs. Bradbury and Hirsch; but, as at the time they expressed some doubt as to whether their figures would be reached, they were not surprised to find they had rather overshot the mark.

There was nothing exceptional about deliveries in January; and there was no improvement upon the opening price of 9s. 6d. per cwt. In February, however, after a slight decline early in the month, there was an advance to 9s. 9d. per cwt.; the demand being particularly good. Deliveries continued on a heavy scale all through March, and the price became 10s. 3d. per cwt. In April, 10s. 4½d. was scored; and in May 10s. 6d., though supplies were always far more than enough. The high level of prices reached was due to the scientific handling of the supply—the 90,000 tons pooled and the other supply controlled by the large holders who were parties to the pool. In June, stocks were accumulating too seriously for the comfort of holders; and, notwithstanding the delivery of 120,000 tons from the ports, the price declined to 10s. 3d. per cwt., for ordinary quality, *ex store* at Liverpool. On the 1908 figures, with the Combination in force, the price steadily declined from 11s. 1½d. per cwt. in January to 9s. 10½d. per cwt. in June; whereas on the much heavier figures in 1909, with the Combination expiring at the end of March, and practically no prospect of its being renewed then, prices just as steadily advanced from 9s. 6d. per cwt. in January to 10s. 6d. per cwt. in May. From 10s. 3d. per cwt. in June, the price drooped to 9s. 9d. in July; and in August, though there was no further material increase in the stocks at the ports, there was a decline to 9s. 6d. There was no further alteration in values until October, when 9s. 3d. per cwt. was accepted. Shipments in November were exceptionally heavy—255,000 tons—and at the end of the month the visible supply was 93,000 tons ahead of that at the end of November, 1908; but the spot price remained 9s. 3d. per cwt. Shipments to Europe in December were substantially less than those during December, 1908; but there was no improvement in values—the closing price being 9s. 3d. per cwt.

The visible supply (stock and afloat) for the United Kingdom and the Continent at the end of 1909 was about 1,008,000 tons; while at the end of 1908 it was 923,000 tons, and of 1907, 702,000 tons. The present visible supply is, therefore, larger by 85,000 tons than it was at the end of 1908. What Messrs. Bradbury and Hirsch's friends are more concerned about, however, is the probable actual supply for the next four months; and, since a new element has been brought into the problem of estimating, the difficulty in estimating closely has been very much increased. In previous years shipments were strictly limited by agreement among producers. But since April last, production and shipments have not been limited in any way; and, consequently, one must expect that the quantity shipped early in the current year will only be limited by shipping facilities. After making allowance for losses at sea, something like 110,000 tons must be added to the present visible supply in order to get at the probable actual supply for January-April; and if this estimate happens to be approximately correct, the actual supply for the four months will be about 1,118,000 tons, or some 121,000 tons more than the actual supply for January-April, 1909. What are the prospects of increased consumption to correspond with the increased supply which must be reckoned upon? And what are the chances for the market, always remembering that last season's consumption left a stock at the end of April of 155,000 tons, or 40 per cent. more than was delivered from the ports in May. Messrs. Bradbury and Hirsch discuss these questions, and express the opinion that there will be a very marked increase in the consumption of nitrate over the coming season; but, inasmuch as heavier deliveries within recent months from Continental ports point to larger stocks already in the hands of distributors in the interior, they are afraid that the much greater consumption they reckon upon will not be enough to bring the available supply down to moderate limits. This being their view, and the heaviest arrivals being due a month earlier than were those last spring, they fail to see how prices are to be materially improved,

especially as holders cannot find encouragement in the further forward position to maintain a firm attitude and carry heavy stocks.

Dealing next with sulphate of ammonia, Messrs. Bradbury and Hirsch say the situation at the beginning of the past year was decidedly interesting, though somewhat perplexing. It was certain that the Japanese demand, which was the dominant factor in the market over the early months of 1908, would be very much reduced, and it was by no means obvious from what quarters would come the increased demand necessary to absorb the extra supply thus rendered available. This was one thing. Another was the knowledge that there were in the hands of German producers surplus stocks to set against any diminution in German production there might be over the first half of the year. Then the price of nitrate of soda was relatively low in comparison with that ruling at the beginning of any recent previous year, and also with the price of sulphate of ammonia; so that in relative cheapness there was an inducement to revert to the use of nitrate. Unless, therefore, German sulphate producers persisted in holding for impossible prices, or unless the nitrate market made an upward move, the Continent was not a promising outlet for British sulphate. It was thought, however, that if Germany kept out of the Colonial and Spanish markets, where she was much in evidence over the spring season of 1908, this, with sustained demand for the United States, might go far to adjust the Japanese shortage in requirements from the United Kingdom. The authors show later in their report that there was a big advance in the price of nitrate of soda, which provided an incentive to a larger use of sulphate of ammonia; so that the Continent not only absorbed the German surplus stocks and current production, but made increased demand upon British production as well. And Germany substantially reduced her exports; so that extra Colonial and Spanish requirements from the United Kingdom, with an increased demand for the United States, went far to adjust the falling-off in shipments to Japan. The opening price in January was consequently more than maintained over the spring months. In order to allow of the movements of exports being conveniently traced, the usual four tables are given showing the shipments from January to March, April, June, and December respectively. From the last we take the following figures: To France, Germany, and Belgium, 49,142 tons; to Spain and Portugal, Italy, and the Canaries, 72,512 tons; to Holland, Java, British Guiana, the West Indies, and the Mauritius, 49,157 tons; to Japan, 49,275 tons; to the United States, 35,080 tons; and to other countries, 8875 tons—a total of 264,041 tons, as against 234,921 tons in 1908, 230,537 tons in 1907, 201,456 tons in 1906, and 189,349 tons in 1905.

The true significance of the January-December table is shown when it is read alongside that for January-June. When this is done, it is found that shipments to the Continent decreased no less than 14,193 tons in July to December, though, owing to shipments against old contracts, there was no decrease to Germany until October. The increase to Spain for the six months was 3959 tons; and, having regard to the exceptionally heavy shipments over the corresponding period in 1908, when Germany was out of the market, Messrs. Bradbury and Hirsch think this must be considered highly satisfactory, as must also an increase of 8262 tons to the United States. Apart from Java, where German competition has again made itself felt, shipments to the Colonies since June show a substantial increase; but the demand for Japan was, as during the same period in 1907, the dominant factor in the situation—the increase having been no less than 28,810 tons over that for July to December, 1908. The cause of the shrinkage in Japanese requirements over the early months of 1909 was well understood a year ago, though it is probable that it was under-estimated everywhere except in Japan.

Coming to the price of sulphate of ammonia during 1909, Messrs. Bradbury and Hirsch say that from £11 5s. per ton f.o.b. Hull at the beginning of the year it had advanced to £11 11s. 3d. per ton by the end of March, though in the meantime the total exports were less by 551 tons than the total for January to March, 1908. But the shipments in this period were only rendered possible by the draining of supplies to the utmost, causing an advance in price from £11 13s. 9d. per ton at the outset to £12 7s. 6d. per ton in April; whereas at the end of March, 1909, there were surplus stocks in the hands of producers which brought the price down to £11 5s. per ton in April, though there was an increase of 3540 tons in the exports in that month. Notwithstanding the heavy shipments, for the summer season, in May and June, the price dropped to £10 18s. 9d. per ton in June, recovering to £11 2s. 6d. per ton at the end of that month. So that the somewhat pessimistic view which Messrs. Bradbury and Hirsch took of the outlook a year ago was amply justified by events; and but for the upward movement in the nitrate of soda market, the price of sulphate of ammonia must, they say, have found a lower level than it actually reached. There was no special feature in the market in July and August—the price fluctuating between £11 2s. 6d. and £11 1s. 3d. per ton; but improved demand caused an advance to £11 7s. 6d. per ton in September. Increasing output brought about a decline to £11 2s. 6d. in October; and, notwithstanding heavy shipments, there was no recovery in prices in November, though the market assumed a very firm tone. In December, however, the demand from the outset being well sustained, prices gradually hardened; and at the close £11 7s. 6d. per ton was the quotation. The average price for the year was £11 5s. per ton f.o.b. Hull; and, having regard to all the factors in the case—to stocks in producers' hands at the outset, to shrinkage in Japanese demand over the spring months, to increased output, and to the competition of cheap nitrate of soda in the second half of the year—the authors cannot say that, in their opinion, a higher average price was justified, though in the interests of producers they would have been pleased to see a better result. British producers have all along met demand freely; and in this they have done well. A temporary advantage can, of course, be created by withholding supplies. But the inevitable reaction has to be faced; and experience shows that it does not pay to keep back supplies when production is increasing substantially, as was the case in the past year.

Production in Germany during the first half of 1909 was less than in the corresponding period of 1908, when carbonizing was at high pressure. But it was on an increasing scale almost from the outset; and the total output for the year is estimated at 340,000 tons, against 313,000 tons in 1908, and 287,000 tons in 1907. Production in Belgium



during 1909 was about 35,000 tons, against 30,000 tons in 1908; while that in France was about 54,000 tons—there having been some increase from carbonizing works in the North. There was no doubt an increase in Austria and in other countries in Europe; but as no figures are forthcoming, the extent of it must remain a matter of conjecture. The output in the United States reached 100,000 tons; and it is still rapidly increasing. The world's production is now about a million tons per annum. Messrs. Bradbury and Hirsch are careful to mention that the figures do not represent the quantity of sulphate actually made, but the ammonia calculated into terms of sulphate. Some increase in production in the United Kingdom was counted upon in the early months of last year, and a larger one later from carbonizing works; the process of reconstruction of ovens being actively pushed forward. This view proved to be correct; and within the year there was a very substantial increase in the output. Owing to depression in the industrial world, protracted strikes, and other circumstances, the output of sulphate of ammonia from gas-works in 1908 was barely on the level of that in 1907. The condition of our industries still leaves much to be desired; but, notwithstanding the short time being worked in the cotton-mills, there was, on the whole, last year a decided improvement upon 1908, and a corresponding increase in the output from gas-works. There was also an increase from shale; and the output from producer gas continues to make headway. From blast-furnaces, however, production remains without material alteration from year to year. The production of ammonia, therefore, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom in 1909 is estimated at 348,000 tons, apportioned as follows:—

	Tons.
Gas-works . . . . .	171,000
Iron „ . . . . .	19,000
Shale „ . . . . .	57,000
Coke and carbonizing works and producer gas . . . . .	101,000
	348,000

Of this production, the authors reckon that England contributed 233,300 tons; Scotland, 112,000 tons; and Ireland, 2700 tons. The production (in tons) during the previous five years was as follows:—

	1908.	1907.	1906.	1905.	1904.
Gas-works . . . . .	165,000 ..	165,500 ..	157,000 ..	156,000 ..	150,000
Iron „ . . . . .	18,000 ..	21,000 ..	21,000 ..	20,000 ..	19,500
Shale „ . . . . .	53,500 ..	51,000 ..	48,500 ..	46,000 ..	42,500
Coke and carbonizing and producer gas . . . . .	85,000 ..	75,500 ..	62,500 ..	46,500 ..	33,500
Totals . . . . .	321,500 ..	313,000 ..	289,000 ..	268,500 ..	245,500

Messrs. Bradbury and Hirsch's estimates of production in 1908 from carbonizing works and from producer gas were under the mark; but those of the output from other sources were very close. They probably under-estimated home consumption to some extent, as also stocks left in the hands of producers. Assuming that the latter amounted to 16,000 tons, the account for 1909 will stand as follows, if their estimates of production are correct:—

	Tons.
Stocks brought forward from 1908 . . . . .	16,000
Production during 1909 . . . . .	348,000
	364,000
Exports during 1909 . . . . .	264,000
Home consumption (for all purposes) in 1909 . . . . .	87,000
Stock to carry forward into 1910 . . . . .	13,000
	364,000

Reviewing the position generally, Messrs. Bradbury and Hirsch say: With regard to German producers, it has to be said that although they left their market fairly open up to last September they have since taken good care of it, so that shipments from the United Kingdom to German ports have been on a reduced scale compared with those for October to December, 1908. Altogether, shipments to the Continent, including Holland, from July to December, have shrunk 16,997 tons, compared with those for July to December, 1908. It may be that cheap nitrate of soda has had something to do with the much reduced demand upon the United Kingdom for sulphate of ammonia for France; but this only partly explains it. Certain it is that Germany has again appeared in the Spanish and other markets, and she has no doubt been busy in France. It is also obvious that the German selling policy is going to be more on the lines followed during the first half of 1908; and British producers would do well to make up their minds to this. Then the total German production in 1909 proves that the output must have been largely increased during the second half of the year, and justifies the opinion that fairly large stocks must be carried by producers at the present time. Moreover, production on the larger scale must be looked for over the next six and following months. A liberal selling policy on the part of German producers is therefore only common-sense policy; and Germany must be looked for in all the foreign markets which she so successfully invaded two years ago.

Turning to the United Kingdom, the authors make the following remarks: While short time continues to be worked in the cotton-mills there cannot be any great expansion in the output of sulphate of ammonia from gas-works, though the greater activity in other industries assures some increase. From fresh installations in view, it seems probable that the output from carbonizing works may be increased 10,000 or 12,000 tons within the year; and, having regard to greater capacity within the past twelve months, there is bound to be a larger supply from this source than there was over the spring months in 1909. A normal increase may be expected from shale; but not much from other sources. If, then, a substantial increase in the British as well as in the German output over the next six months is assured, what are the chances of the market in view of it, and in view of the abundant supply and low price of nitrate of soda?

Without entering into the question as to whether the unit of nitrogen in sulphate of ammonia and that in nitrate of soda are equal in value to the agriculturist, we may be permitted to point out that since 1900 they

have never had anything like the same market value, and that, notwithstanding the present low price of nitrate of soda, the market value of the unit of nitrogen in sulphate of ammonia is still something like 9d. less than the market value of the unit in nitrate of soda. It would seem, therefore, that for all purposes, or for most purposes, the unit value in the two articles, as determined by present knowledge and up-to-date experience, is not equal. The important practical question is, however, whether the dearthness of sulphate of ammonia in relation to nitrate of soda at the present time compared with the relative market prices of the two articles over last spring will cause any important reversion to the use of nitrate of soda over the coming season. Manifestly there will not be so great an inducement to use sulphate of ammonia as there was during the first six months of 1909; but beyond this the question does not admit of a simple and general answer—there being other things to take account of, such as climate, soil, and crops, and even prejudice. . . . We think that, notwithstanding abundant and cheap nitrate of soda and the increased output of sulphate of ammonia in the United Kingdom and in Germany, the demand for sulphate will be sufficient to absorb the supply over the coming spring months at the present level of prices. But we also think that supply and demand will be too nearly balanced to make it safe and prudent for producers to attempt to force an advance.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 2, sulphate was £11 6s. 3d., and nitrate £9 10s. per ton; on April 3, the prices were £11 10s. and £10 7s. 6d.; at Midsummer, they were £11 2s. 6d. and £10 5s.; at Michaelmas, they were £11 6s. 3d. and £9 10s.; while at the close of the year, they were £11 7s. 6d. and £9 5s. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1900, 8s. 5½d.; 1901, 8s. 11½d.; 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; 1906, 11s. 4d.; 1907, 11s. 2d.; 1908, 10s. 2½d.; and 1909, 9s. 9d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 43 years—1867 to 1909. The following are the averages for the past ten years: 1900, £11 2s.; 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.; 1908, £11 12s.; and 1909, £11 5s.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the meeting of the Eastern District of the Scottish Junior Gas Association at Perth this afternoon, the author of the paper which was read—Mr. S. Butter, of Perth—led the members upon an excursion into one of the many side avenues in the path of the gas industry. His subject was "Tar as a Preservative"—a subject quite limited in itself, but which he chose to limit still further, by confining his attention to the effect of tar, applied under pressure, in the preservation of road surfaces. Mr. Butter acted with great wisdom in doing this. The tendency is for authors to write a treatise upon their subject, and not a paper bringing out points which are new, and which they wish to emphasize. The result too often is that discussions go rambling about upon a number of topics, and the main point is in danger of being, and sometimes is, lost sight of. If the members of the Junior Gas Association concur in the view that example is better than precept, and apply this doctrine to their own course, they will surely follow Mr. Butter's example; for in the proceedings that followed the reading of his communication there was ample justification for the view that a single-barrelled paper is more profitable than, and is to be preferred to, one in which too wide a field is endeavoured to be covered. The speaking was all by junior members of the Association, with the exception that Mr. W. B. M'Lusky, an honorary member, wound it up with a few well-chosen thoughts. Mr. M'Lusky refrained from speaking until the juniors had said what they had to say; and in this he is to be commended, because there are not many juniors who care to rise in a meeting and express opinions which may run counter to those already announced by a senior. The Association are to be congratulated upon the success of their meeting at Perth, which, it may be said, was held under the most inauspicious circumstances—the day being very wet; but, as I have observed before, in connection with the meetings which are held outside of Edinburgh, there was a great dearth of members coming from that city. So far as I could ascertain, there was but one Edinburgh gentleman present; and there were only two altogether from south of the Forth. This state of matters is to be regretted, as much for the sake of the members themselves (who are losing the benefit of association) as for the sake of the Association, which loses the benefit of the talents that are absent. When the quarterly meetings are held in Edinburgh, there is always a strong representation of the membership north of the Forth; and in this matter it would be pleasant to see a spirit of reciprocity prevailing.

The plebiscite of ratepayers in Kirkcaldy as to the transfer of the gas undertaking to the Corporation was taken on Wednesday. The resolution of the Town Council to acquire the concern was agreed to all but unanimously; Mr. Mackinnon being the only member who dissented. He and his supporters, after the Council had resolved to proceed with the transfer, held a series of meetings in the town, with a view to creating an adverse agitation. Mr. Mackinnon was himself the principal speaker at these meetings. Following upon this, the members of the Council who supported the transfer held meetings in the respective wards in the town, at which reasons for the transfer were placed before the electorate. Polling took place all day on Wednesday. There were 7884 electors on the roll. Out of these, there were 4881 who did not record their votes; leaving 3003 who did. The result of the poll was: For, 2281; against, 735—a majority in favour of the transfer of 1546. There were nine spoiled papers. After the result was announced, Mr. J. Wright proposed a hearty vote of thanks to Bailie Peebles, who had acted as Polling Sheriff. As Convener of the Committee on the gas



transfer, he expressed, on behalf of the Council, their thanks to the staff for their labours that day.

In the "Glasgow Herald" of Thursday, there appeared the following statement: "Mr. Wm. Wilson, Gas Manager, Falkirk, who was formerly Gas Manager at Kirkintilloch, has made a claim against the Town Council of Kirkintilloch for a considerable sum as a percentage on the cost of the new gas-works at Kirkintilloch, built under his superintendence and to plans of his preparation. The Council have unanimously resolved to repudiate the claim." Without entering into the merits of the claim, as to which I know nothing except what is contained in the above announcement, I may recall that Mr. Wilson left Kirkintilloch for Falkirk in February, 1907, about the time the erection of the new gas-works was begun. His successor—Mr. J. M'Leod, of Provan—saw the works opened in June, 1908, and not very long afterwards—in November of the same year—he was appointed Gas Manager at Greenock, in succession to Mr. W. Ewing. What I wish to call attention to is that in less than three years Mr. M'Leod has had the good fortune to hold two appointments as Gas Manager, and that in both of them his predecessor has seen fit to make a claim upon the Corporation.

In the Hamilton Town Council on Tuesday, the Gas Committee reported that the Convener had been waited upon by two gentlemen representing a large number of inhabitants in the Eddlewood and Meikle Earnock districts who desire a supply of gas; and that after hearing a report from the Gas Manager regarding a proposed scheme for lighting the Eddlewood district, the Committee unanimously agreed to proceed with the scheme, and remitted to the Manager to make arrangements with the County District Committee for the opening of the roads. At a subsequent meeting of the Committee, however, there was submitted a petition, signed by 18 owners and occupiers in Meikle Earnock, requesting a supply of gas. As this number was less than had been stated at a previous meeting, it was resolved to delay proceeding with the scheme until fuller information should be laid before them as to the probable demand for gas. The Town Council agreed to this course being followed.

At a special meeting of the Fraserburgh Town Council on Monday, it was unanimously resolved, on the motion of Mr. G. Low, that the Burghs Gas Supply (Scotland) Act should be adopted, and the existing gas-works of the Fraserburgh Gaslight Company, Limited, acquired. The Town Clerk was instructed to take the necessary steps to carry through the provisions of the Act. A plebiscite of the ratepayers will be taken next month.

Yesterday, the formal ceremony of turning on the water at the new reservoir at Glenquey was performed by Mr. David Alexander, the Chairman of the Dunfermline District Committee. As is well known, the works are intended to give a supply of water to practically the whole of the district of West Fife, with the exception of Dunfermline and Cowdenbeath. They are to provide a supply also, under agreement with the Admiralty, for Rosyth. It is also matter of common knowledge that the works have been long delayed owing to exceptional and

unforeseen engineering difficulties having arisen after the works were begun, and that the same cause has been the means of more than doubling their cost. The main pipe is able to provide a supply of 3 million gallons every 24 hours. After the water had been turned on, luncheon was served in the Rumbling Bridge Hotel. Mr. Alexander, who has been Chairman of the District Committee for 16 years, was presented with a rose bowl and silver salver, in recognition of his long and arduous services to the Committee. In the course of his remarks in acknowledgment of the gifts, Mr. Alexander said that the first estimated cost of the works was £91,500; and, so far as he could see, the total cost would now be £195,000. In carrying out the works, they had provided, and he thought wisely, for the future. The embankment of the reservoir had been so made that it would stand to be raised by another 11 feet; so that in place of containing 260 million gallons as at present, it would have a storage capacity of 370 million gallons. Mr. J. D. Parker, of Glasgow, was Engineer to the scheme.

## CURRENT SALES OF GAS PRODUCTS.

### Sulphate of Ammonia.

LIVERPOOL, Jan. 15.

There has been an abundant supply; but it has all been eagerly sought after at continually hardening prices. Demand has not only been for the purpose of covering sales made by dealers in advance, but new orders direct from consumers have also been fairly plentiful. The market closes at the highest point reached; and the nearest values are £11 11s. 3d. per ton f.o.b. Hull, £11 13s. 9d. per ton f.o.b. Liverpool, and £11 15s. per ton f.o.b. Leith. In the forward position, there are sellers over the next few months at prompt prices; but buyers remain quite apathetic, evidently preferring to wait till later on in the hope of then purchasing at less money.

### Nitrate of Soda.

This article is rather easier again, and spot quotations have been reduced to 9s. 1½d. per cwt. and 9s. 4½d. for ordinary and refined qualities respectively.

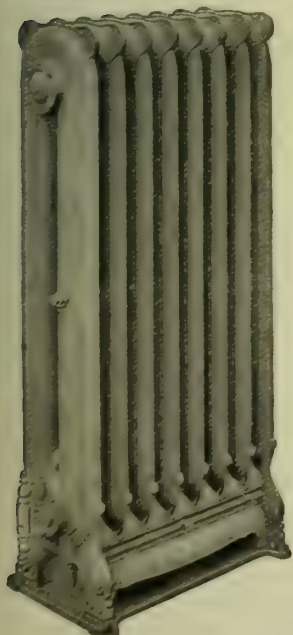
### Tar Products.

LONDON, Jan. 17.

Markets for tar products have been firm throughout the past week, though there has not been really any further advance in price. The market, however, is in a very healthy condition; and though it seems to be impossible yet to interest the Belgians, in certain parts of France consumers are certainly buying. In South Wales, there is not very much business to be done, as consumers appear disinclined to buy until they have obtained their fuel orders. In creosote, the market is steady all round, and it is still generally believed that an improvement will take place in a month or two. Benzol, 90 per cent., is very firm

# THE "St. Andrew"!

The "St. Andrew."



WE seldom advertise any single order,  
WE are constantly receiving large orders,  
WE are constantly receiving repeat orders,

## In Fact,

Wherever the HIGHEST QUALITY,  
Wherever SUPREME SCIENTIFIC ACCURACY,  
Wherever PERFECT ECONOMY are appreciated, as distinguished from

Mere cheapness joined to unscientific construction, the apparatus specified is invariably

## The "ST. ANDREW."

JOHN WRIGHT & CO.,  
The Radiator Experts,  
Essex Works, BIRMINGHAM.



for prompt delivery; while for forward, makers are not at all inclined to sell except at good figures. Fifty-ninety per cent. benzol is firm; while the demand for toluol is good, especially in the North. Solvent naphtha remains very steady, though it is reported that the Germans are selling on the Continent at low figures. Heavy naphtha is quiet. Carbolic acid is a little firmer; but consumers are still unwilling to pay any advance. Creosote salts remain very firm.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 30s. to 30s. 6d.; east coast, 29s. to 29s. 6d.; west coast, 29s. to 30s. f.a.s., 29s. f.o.b. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 6¾d. to 7d. Toluol, casks included, London, 9¾d. to 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 4½d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. 1½d. to 1s. 1¾d.; heavy naphtha, casks included, London, 11¾d.; North, 10¾d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10¾d. to 11½d.; west coast, 11d. to 11½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

#### Sulphate of Ammonia.

The market has been steady during the past week; and for prompt delivery there is an exceedingly good demand. In London, the principal Gas Companies quote £11 15s. for January-June delivery; but outside makes are selling for prompt delivery at about £11 6s. 3d. In Hull, £11 10s. to £11 12s. 6d. is the quotation. In Liverpool, £11 15s. is reported to have been paid, and the same figure in Leith; while in Middlesbrough also £11 15s. is obtainable for forward delivery.

**Proposed Extension of Barnstaple Water-Works.**—A meeting of the shareholders of the Barnstaple Water Company was held yesterday week, for the purpose of authorizing the Directors to proceed with the application for a Provisional Order to extend the area of supply to Instow. Mr. C. E. R. Chanter, the Chairman, explained that the area did not at present extend beyond Fremington. The Company possessed a very large quantity of water; and since safeguards would be provided against supplying it at a loss, it was desirable they should not keep the water to themselves. In any case, the question of supplying Bickington and Fremington would have to be faced. If the work were carried out, it would be necessary to lay mains from the high level; and on the way to Instow these mains would pass through Bickington and Fremington, the inhabitants of which could be supplied. The Rural District Council would give a guarantee of 10 per cent. on the outlay, as for a few years the water-rate would probably not yield this amount. He moved that a Provisional Order be applied for; and this was carried.

## COAL TRADE REPORTS.

### Northern Coal Trade.

There has been some slight increase in the output of coal at the north-eastern collieries, but it is not up to the average. Still the high prices of a week ago are now to some extent reduced. In the steam coal trade, coal appears to be more plentiful; and thus for best Northumbrian steams, the quotation is now from 11s. 3d. to 11s. 6d. per ton f.o.b., with second-class steams and steam smalls at comparative prices. The work at the steam coal collieries seems to be fuller on the part of the miners, and the outlook is more hopeful than it is for the Durham collieries at the time of writing. In the county of Durham, the output is more reduced, and there are some classes of fuel that are more scarce, while the prospect is a little more doubtful. It is difficult to quote prices; but best gas coals are somewhere near 12s. per ton f.o.b. where delivery can be readily given. One or two contracts are in the market, but not for large quantities; and neither buyers nor sellers are very eager to contract until the production is more settled in prospect. It is hoped, however, that the next few days will see a change for the better in this respect. Coke is firm and scarce. Gas coke is more in demand at from 13s. 6d. to 14s. per ton f.o.b. in the Tyne.

### Scotch Coal Trade.

The first report for the year is that trade has opened under quite favourable conditions; there being a healthy demand for all descriptions of fuel, and prices having an upward tendency, particularly for all coal. The prices now quoted are: Ell, 10s. 3d. to 10s. 9d. per ton f.o.b. Glasgow; splint, 10s. 6d. to 11s.; and steam, 10s. 3d. to 10s. 9d. The shipments for the week amounted to 143,870 tons—a decrease of 100,753 tons upon the preceding week, but an increase of 11,945 tons upon the corresponding week of last year.

**Power-Gas Corporation, Limited.**—The Directors, in their report for the year ended Sept. 30 last, state that the works of Messrs. Ashmore, Benson, Pease, and Co., Limited, have been maintained in a condition of efficiency and repair, and all expenditure for this purpose has been charged to revenue. After placing £1800 to a fund for renewals and contingencies, the year's trading of the Company named shows a profit of £2777, which has been carried forward to their next account. The results of the year's trading of the Power-Gas Corporation show a total profit of £3799, to which has been added just over £2660 brought forward from the previous year's account; making altogether £6440. This sum the Directors propose to deal with as follows: Creation of a reserve, in terms of Article 3, £750; balance to be carried forward to next account, £5690. The Directors state that the works were fairly well employed during the year, and continue so at the present time.

# Richmond's Gas Flasher.

A Gas Manager, when sending  
an order for a Gas Flasher,  
mentions "it is urgently wanted

## FOR POLITICAL PURPOSES"



**Q** We suggest that your Electioneering Agents are looked up. It is an opportunity to exploit GAS in the way of illuminating a SIGN which "talks" Day and Night. Simply a locally made Glass Frame, with necessary wording on the Glass, suspended in front of Two or Three Incandescent Burners (controlled by a Richmond Gas Flasher), will make an effective Electioneering Device; or, if desired, we can supply sign complete, any size, any shape, any wording.

**THE RICHMOND GAS STOVE & METER CO., LTD.**

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.



**Proposed Gas-Works for Llanwrtyd.**—At a recent meeting of the Llanwrtyd Wells Urban District Council, a letter was received from Mr. R. D. Edmunds (Llanelly), informing the Council that Messrs. Willey and Co., Limited, had secured a plot of land with a view to building gas-works at Llanwrtyd Wells, and asking the Council's permission to lay mains. The Council resolved to approve of the proposal, and referred the provisional agreement to the General Purposes Committee.

**Longton and the Staffordshire Potteries Water Bill.**—In connection with the proposal of the Staffordshire Potteries Water Company to promote a Bill in the ensuing session for an additional extension of their system, the Longton Town Council have passed a resolution to the effect that, in view of the pending federation of the Potteries towns, it is desirable that the local authorities in the district should unitedly take the above matter into consideration; and that it should be suggested to the other local authorities that a joint conference should be held to consider the subject.

**German Welsbach Company.**—The report of the German Incandescent (Auer) Gaslight Company for the year 1908-09 states that the net profit, including a sum of 510,080 marks brought forward, amounts to 4,038,199 marks (about £198,000), which, after writing off 375,000 marks, admits of the payment of a dividend of 50 per cent. on the founders' shares (against 35 per cent. the year before). The preference shareholders receive 5 per cent. on the amount (30 per cent.) paid up of the nominal preference capital, and a special dividend of 6 per cent. on this nominal capital sum. The prospects of the current year's working are regarded as favourable.

**Clevedon Water Purchase Question.**—A meeting called by the Urban District Council was held at the Public Hall, Clevedon, a few days ago, in connection with the proposed purchase by the town of the water-works, at a cost of £58,000. The case for the purchase was put by Mr. A. E. Y. Trestrail (Solicitor); and afterwards speeches in opposition were made by a number of gentlemen. Councillor Lee proposed, and Councillor Taylor seconded, a resolution in favour of the purchase; and, on account of the late hour, Councillor Brett moved that the meeting be adjourned. This was defeated by cries of "Vote;" and ultimately, by an overwhelming majority, the meeting decided not to favour the purchase.

**Fatal Gas Explosion in the City.**—Soon after eight o'clock on Saturday morning, an explosion took place at 58, Coleman Street, E.C., on premises tenanted by Messrs. Jackson, Pixley, and Co., chartered accountants. A painter named Lloyd, who, it is stated, had been warned by the caretaker that there was a smell of gas, went down to the basement to get his paints. A few seconds afterwards there was a violent explosion, which shattered the cellar walls, blew out the pavement lights, demolished most of the fittings on the ground floor, and threw a postman, who was standing on the doorstep at the time, into the road. Several windows of neighbouring houses were broken. On the arrival of the Fire Brigade, almost immediately afterwards, Lloyd was found dead, pinned down under a mass of brickwork.

**Prepayment Supplies and Gas-Stoves.**—At the monthly meeting of the Burton Town Council, Alderman Lowe moved the adoption of a recommendation of the Gas Committee that the tender of the Richmond Gas Stove and Meter Company be accepted for a further 1000 gas-stoves for use in connection with prepayment installations. He remarked that they were exactly the same as those which had been supplied before. The Council would observe with satisfaction that the amount of gas consumed and sold during last month showed a considerable increase compared with the corresponding period last year. He hoped this would continue. They could not help thinking that they had been assisted a good deal by the supply of stoves to prepayment consumers. The recommendation was adopted. In this connection, it may be remarked that in 300 instances where the actual consumptions of prepayment consumers with stoves were compared with the corresponding consumptions before the stove was fixed, an increase of 60 per cent. was found.

**Opposition to the Exmouth Water Bill.**—As was the case last year, the opponents of the Exmouth Water Bill are sparing no effort to impress their views on the minds of the inhabitants. Following the statutory meeting of ratepayers, at which it was decided to proceed with the Bill, they called another public meeting, at which the case against the District Council's scheme was explained at length. Mr. J. Carter contended that the reason for the shortness of water was that the bogs which formed the natural reservoir of the present supply had been cut through, and the water allowed to drain into the sea instead of being preserved for dry seasons. He was also of opinion that if the pipe-line were extended at the intakes they would get all the water they needed, and the cost would not be more than £400 or £500. Mr. Beavis, who was Manager of the water-works before they were taken over by the Council, also spoke in opposition to the scheme, and contended that there were other methods of obtaining the water required at less cost. A resolution against the Council's proposal was unanimously passed. A poll on the question has been demanded, and will take place.

The question of the purchase of the local gas undertaking has been raised in the Penistone Urban District Council; but as only half the members happened to be present, it was arranged to call a special meeting for the discussion of the matter. This will be held next Tuesday.

Mr. A. W. Brightmore, of the Local Government Board, held an inquiry at Faringdon, last Thursday week, with reference to the sanctioning of a further loan (to be secured on the rates of Faringdon) to cover the cost of construction of the new supplementary water supply. The proceedings did not excite much outside interest; the attendance being principally confined to members and officials of the Rural District Council. Mr. Margetts, the Engineer of the works, and the Medical Officer of Health were among those who afforded information to the representative of the Board; while Mr. G. Adams, a resident, urged the unfairness which would arise if the area of rateability embraced parts of the parish outside the town.

# PARKINSON

GAS-HEATED

## Steam Radiators

ARE

UNEXCELLED

FOR THE

Efficient and Economical Heating of

**CHURCHES, SCHOOLS,  
PUBLIC BUILDINGS,  
SKATING RINKS,  
SHOPS, &c., &c.**

EXTRACT FROM LETTER JUST RECEIVED:—

"The Radiators which I fixed in the Wesleyan Chapel and Schools are giving the **greatest satisfaction**. Any inquiries you have refer to me, and I will refer them to the Chapel Committee, from whom they will get the **greatest praise**. They are at present recommending them to the Baptist Church. . . Other Radiators in the town fixed in offices, &c., are **all** giving satisfaction."

YOUR INQUIRIES WILL BE ESTEEMED.

**THE PARKINSON STOVE CO.,**

LTD.

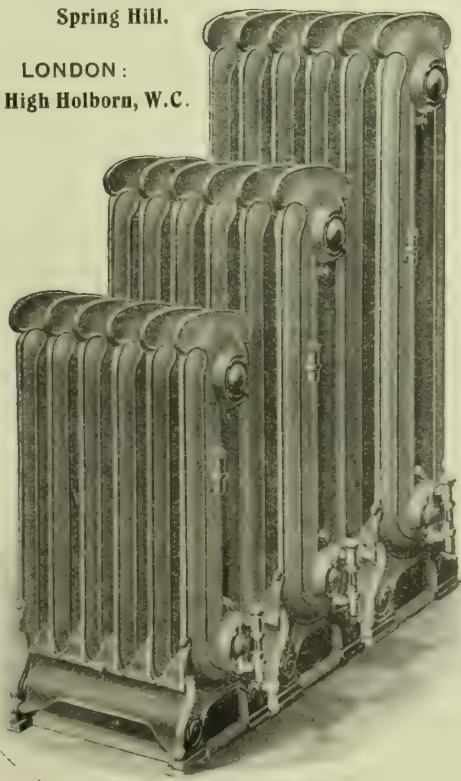
(Incorporating Maughan's Patent Geyser Co.)

BIRMINGHAM:

Stour Street,  
Spring Hill.

LONDON:

129, High Holborn, W.C.





The Parkinson Stove Company, Limited, of Birmingham, have forwarded to us one of their presentation inkstands, which takes the form of an attractive looking little model of a gas-fire.

At a meeting of the Wolverhampton Town Council on Monday last week, the Water Committee recommended the acceptance of the tender of Mr. Holloway, of Wolverhampton, for providing and laying a 24-inch pumping main at £17,764 2s. Alderman Marston, the Chairman of the Committee, said there were 31 tenders adjudicated upon. Mr. Holloway's was not the lowest, but the Committee thought it was the best. The highest tender for a similar specification was £26,162.

As indicating the briskness of their trade just now, the Bland Light Syndicate, Limited, send a newspaper cutting of a Police Court case in which one of their men was recently involved. He was summoned for causing 42 packing cases to remain in the carriageway of Little Trinity Lane for a longer time than was required for loading or unloading. Defendant said they were very busy with export orders, and the cases were left there longer than usual. He was, notwithstanding fined 20s., and costs. The Syndicate have declared an interim dividend at the rate of 10 per cent. per annum for the six months ending Nov. 30 last.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

ASSISTANT-ENGINEER (New Zealand). No. 5172.  
ENGINEER AND MANAGER. Beccles Water and Gas Company. Applications by Feb. 1.  
GENERAL MANAGER (Commercial Company). S.R., c/o Streets, Cornhill.  
WORKS' DIRECTOR (To take up shares). No. 5171.

### Situations Wanted.

DRAUGHTSMAN. Barker, Ilford.  
ENGINEER'S ASSISTANT. No. 5173.  
SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.

### Plant, &c., for Sale.

WASHER-SCRUBBER. Mansfield Gas-Works.

### Meeting.

SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel, Feb. 9, Two o'clock.

### Coal.

LEIGH-ON-SEA GAS DEPARTMENT. Tenders by Jan. 27.

### Coke.

ASHFORD URBAN DISTRICT COUNCIL. Tenders by Jan. 28.

### Fire-Clay Goods, &c.

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.

### TENDERS FOR

### Gas Oil.

ASHFORD URBAN DISTRICT COUNCIL. Tenders by Jan. 28.

### Iron Work for Retort Bench.

SHEFFIELD UNITED GAS COMPANY. Tenders by Feb. 8.

### Mantles.

OSSETT CORPORATION. Tenders by Jan. 28.

### Retort Bench, &c. (Dismantling Old and Re-building New Complete).

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1910, are reminded that this can only be done during the present month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 151.

Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	85-87	..	5 14 11	£	Stk.	Nov. 11	p.c.	Imperial Continental	175-177	..	4 10 5
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	4,940,000	Stk.	Aug. 12	3 1/2	Do. 3 1/2 p.c. Deb. Red.	94-96	..	3 12 11
310,000	Stk.	Oct. 28	6 1/2	Bombay, Ltd.	52-61	+ 1/2	5 6 1	1,235,000	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
200,000	Stk.	"	6 1/2	Do. New, £4 paid.	48-44	..	5 6 8	195,242	Stk.	"	10	Liverpool United A.	227-229	+ 4	4 7 4
40,000	Stk.	Aug. 26	15	Bourne- ) 10 p.c. .	28 1/2-29	..	5 3 5	561,000	Stk.	"	7	Do. B.	16-16 1/2	+ 1	4 2 10
50,000	Stk.	"	13	mouth Gas ) B 7 p.c. .	16 1/2-16 1/2	..	4 3 7	718,100	"	Dec. 29	4	Do. Deb. Stk.	103-105	+ 1	3 16 2
311,810	Stk.	"	6	and Water ) Pref. 6 p.c.	15 1/2-15 1/2	..	3 16 2	500,000	"	Nov. 26	6	Malta & Mediterranean.	4 1/2-5	..	6 0 0
75,000	Stk.	Aug. 12	12 1/2	Brentford Consolidated	253-256	..	4 17 8	560,000	100	Oct. 1	5	Monte Video, Ltd.	99-102	..	4 18 0
380,000	"	"	9 1/2	Do. New	193-192	+ 1	4 19 0	250,000	100	"	4 1/2	Melbourne ) 4 1/2 p.c. Deb.	100-102	..	4 8 3
300,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3 1/2	Do. 3 1/2 p.c. Deb.	91-93	..	5 7 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 29	4 1/2	Newcastle & Gateshead Con	107-108	+ 1/2	4 3 4
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	518,795	Stk.	Dec. 29	7	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
246,320	"	"	10	Do. A Ord. Stk.	154-157	..	5 1 1	55,040	10	Aug. 26	8	Oriental, Ltd.	137-139	..	5 15 1
460,000	Stk.	Oct. 14	10	British	42 1/2-43 1/2	..	4 11 11	300,000	Stk.	Nov. 26	8	Ottoman, Ltd.	6 1/2-6 1/2	..	6 5 6
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	115-120	..	5 0 0	60,000	5	Sep. 10	8	Portsea Island A.	137-139	..	4 19 0
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	88-90	..	5 0 0	31,800	53	Aug. 26	13	Do. B.	129-131	..	4 19 3
82,278	"	"	5 1/2	Do. C 5 p.c.	106-108	..	5 1 10	60,000	50	"	12	Do. C.	122-124	..	4 16 9
55,000	"	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	50	"	10	Do. D and E.	102-104	..	4 16 2
500,000	Stk.	Oct. 14	7	Buenos Ayres (New) Ltd.	14-14 1/2	..	4 16 7	114,800	50	Oct. 28	7	Primitiva Ord.	7 1/2-7 1/2	..	4 14 11
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	July 29	5	Do. 5 p.c. Pref.	5 1/2-5 1/2	..	4 13 0
100,000	"	"	—	Cape Town & Dis., Ltd.	3-4	..	—	796,980	100	Dec. 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	"	Nov. 11	6	Do. 4 1/2 p.c. Pref.	51-54	..	6 2 6	1,200,000	10	Oct. 14	8	River Plate Ord.	17-17 1/2	..	4 11 5
50,000	Stk.	Dec. 29	4 1/2	Do. 6 p.c. 1st Mort.	48-49	..	5 9 9	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	108-100	..	4 0 0
100,000	Stk.	Aug. 12	5	Do. 4 1/2 p.c. Deb. Stk.	80-82	..	4 10 6	250,000	10	Sep. 29	8	San Paulo, Ltd.	14 1/2-15	..	5 6 8
157,150	Stk.	Aug. 26	5 1/2	Chester 5 p.c. Ord.	108 1/2-110 1/2	..	4 13 8	62,500	10	"	6	Do. 6 p.c. Pref.	11 1/2-12 1/2	..	4 18 0
1,493,280	Stk.	"	5	Commercial 4 p.c. Stk.	109-111	..	4 15 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50-51	..	4 18 0
500,000	"	"	5	Do. 3 1/2 p.c. do.	103-105	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	5 3 1	209,984	"	"	10	Do. B.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 0 9	523,560	"	Oct. 14	10	Do. C.	124-124 1/2	..	7 10 11
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	4 1 4	70,000	10	Aug. 12	5 1/2	South African	120-122	..	4 7 4
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	3 16 2	6,429,895	Stk.	Jan. 13	5 1/2	Do. 3 p.c. Deb.	81-83 1/2	+ 1/2	3 18 9
55,000	"	Oct. 14	5	Do. Deb. Stk.	103-105	..	5 0 0	117,958	Stk.	Aug. 26	8	South Shields Con. Stk.	160-162	..	4 10 2
145,995	"	July 14	12	East Hull 5 p.c. Ord.	98-100	..	4 16 0	209,823	Stk.	Aug. 12	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 2 0
486,090	"	"	12	European, Ltd.	245-25	..	4 14 9	605,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
311,060	Stk.	Aug. 12	4 1/2	Do. £7 tos. paid.	18 1/2-19	..	4 9 1	60,000	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	120-122 1/2	+ 1/2	4 0 0
15,141,545	Stk.	"	3 1/2	Gas ) 4 p.c. Ord.	103 1/2-104 1/2	+ 1/2	3 18 8	117,958	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
2,690,000	"	"	4	light ) 3 1/2 p.c. max.	87-89	..	3 16 2	502,310	Stk.	Aug. 12	6 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
3,793,735	"	Dec. 29	3	and ) 4 p.c. Con. Pref.	103-105	..	3 12 3	120,000	"	"	5 1/2	Do. B 3 1/2 p.c.	111-113	..	4 15 3
4,193,975	Stk.	Sep. 10	5	Coke ) 3 p.c. Con. Deb.	81-83	..	5 8 4	149,470	"	Dec. 29	4	Edmonton ) 4 p.c. Deb.	98-100	..	4 0 6
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	94-96	..	6 2 3	182,380	"	Dec. 29	8	Tuscan, Ltd.	9-9 1/2	..	4 19 0
62,500	"	Sep. 29	11	Do. do. 5 p.c.	118-120	..	4 9 0	149,900	Stk.	Aug. 14	5	Do. 5 p.c. Deb. Red.	99-101	..	4 9 3
70,000	Stk.	Sep. 10	6 1/2	Hongkong & China, Ltd.	17 1/2-18	..	4 10 11	236,476	Stk.	Aug. 26	6 1/2	Tynemouth 5 p.c. max.	110-112	..	4 14 0
131,000	"	Dec. 29	4	Ilford A and C	144-146	..	3 18 5	255,636	"	"	3	Wands- ) B 3 1/2 p.c.	139-141	..	4 14 0
65,793	"	"	5	Do. B	108-110	..	—	79,416	"	"	3	worth ) 3 p.c. Deb. Stk.	72-74	..	4 1 1
65,500	"	"	4	Do. 4 p.c. Deb.	100-102	..	—	—	"	"	3	—	—	..	—

Prices marked \* are "Ex div.



**OXIDE OF IRON.****O'NEILL'S OXIDE**

For GAS PURIFICATION.  
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

**WINKELMANN'S****"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.  
ANDREW STEPHENSON, 182, Palmerston House, Old  
Broad Street, London, E.C. "Volcanism, London."

**LUX'S GAS PURIFYING MASS.**

See Advertisement on p. 133.  
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**BROTHERTON & CO., LIMITED.**

Offices: City Chambers, LEEDS.  
Correspondence invited.

**KRAMERS AND AARTS WATER-GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.  
89, VICTORIA STREET, S.W.

**GAS TAR wanted.**

BROTHERTON AND CO., LTD., Tar Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WARRFIELD, AND SUNDERLAND.

**METER INDICES**

WITH AND WITHOUT DIALS.

**A. ROUX & CO., Limited,**

9, SOUTHAMPTON STREET, HOLBORN, W.C.  
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND  
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
WORKS, HANDSWORTH, BIRMINGHAM.

**BRISTOL RECORDING GAUGES AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.

**SULPHURIC ACID.****SPECIALLY prepared for Sulphate of AMMONIA Makers by**

CHANCE AND HUNT, LIMITED,  
WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.  
Address Correspondence and Inquiries to OLDBURY,  
WORKS.  
Telegrams: "CHEMICALS, OLDBURY."

**AMMONIACAL Liquor wanted.**

BROTHERTON AND CO., LTD., Ammonia Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
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**PATENTS AND TRADE MARKS**

PUBLICATIONS, "MERCHANDISE MARKS  
ACT, and Decisions thereunder," 1s.; "TRADE  
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EQUIVALENTS, Mechanical and Chemical," 6d.;  
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MEWBURN, ELLIS, & PRYOR, Chartered Patent  
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-  
grams: "Patent London." Telephone: No. 243 Holborn.

**AMMONIACAL Liquor wanted.**

CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."

**D. ANDERSON AND COMPANY,**

GAS LIGHTING ENGINEERS AND  
CONTRACTORS,  
18 & 20, FARRINGDON ROAD, LONDON, E.C.  
Telegrams: "Dacolight London." Telephone: 2836 HOLBORN.

**HYDRATED OXIDE OF IRON.  
PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.  
Gives no back Pressure.  
The Cheapest in the Market.  
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters  
Limited), Globe Meter Works, OLDHAM, and  
54 & 47, Westminster Bridge Road, LONDON, S.E.  
WET AND DRY GAS-METERS, PREPAYMENT  
METERS, STATION METERS, AND GOVERNORS.  
REPAIRS RECEIVE PROMPT ATTENTION.  
Telephones: 815 Oldham, and 2412 Hop, London.  
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

**OXIDE OF IRON (BOG ORE).**

ANY QUANTITY. ANY PORT. ANY STATION.

**DONALD M'INTOSH,**

110, CANNON STREET, LONDON.

**DUTCH OXIDE OF IRON.**

SPENT OXIDE PURCHASED IN ANY DISTRICT.

**THE First Dutch Bogore Co., Ltd.,**

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

**W. EDGAR, Blenheim Works,**

Hammersmith.  
GAS APPARATUS MANUFACTURER  
AND CONTRACTOR.

Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

**GAS PLANT for Sale—We can always**

offer NEW and SECOND-HAND GAS AP-  
PARATUS, including Retorts and Fittings, Condensers,  
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,  
Tanks, Valves, Connections, &c. Also a few COM-  
PLETE WORKS. Compare Prices and Particulars  
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,  
Thornhill, DEWSBURY.

**SULPHATE OF AMMONIA**

SATURATORS and all LEAD and TIMBER  
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-  
pairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,  
BOLTON.  
Telegrams: SATURATORS, BOLTON. Telephone 0648.

**AMMONIA.**

Consumers in any form are invited to correspond  
with CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.

**SPENCER'S PATENT HURDLE GRIDS.****THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement, Dec. 7, p. 705.

**TAR WANTED.**

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,  
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.

**"HALLITE" Asbestos High-Pressure**

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,  
LONDON, E.C.

**"FORTO" Incandescent Gas Mantles**

Combine Brilliance and Strength. British  
Made. Send for List.

ISAAC EALES AND CO., Howard Street, BIRMINGHAM.

Telephone: Central, 5623.

**WARNER & VAN DER BIESEN,**

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

**FINEST DUTCH BOG-ORE.**

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,  
Station, or direct into Works, please apply to—  
LONDON OFFICES: 6, LEATHER LANE, E.C.

**SULPHURIC ACID for Sale, specially**

suitable for making Sulphate of Ammonia.  
BROTHERTON AND CO., LTD., Chemical Manufacturers,  
WORKS: BIRMINGHAM, LEEDS, WARRFIELD, AND SUNDER-  
LAND.

**OXIDE OF IRON.**

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

**BALE & CHURCH,**

5, CROOKED LANE, LONDON, E.C.

**SULPHURIC ACID.****SPECIALLY prepared for the Manu-  
facture of SULPHATE OF AMMONIA.**

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, Mark Lane, LONDON, E.C. WORKS: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

**J. E. C. LORD, Ship Canal Tar Works,**

Weaste, Manchester. Pitch, Creosote, Benzols,  
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,  
Carbolic Acid, Sulphate of Ammonia, &c.

**"GAZINE" (Registered in England and**

Abroad). A radical Solvent and Preventative  
of Naphthalene Deposits, and for the Automatic  
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West  
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Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-  
TYNE.

Telegrams: "Doric," Newcastle-on-Tyne. National  
Telephone No. 2497.

**JOHN RILEY & SONS, Chemical Manu-  
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Hapton, near Accrington, are MAKERS  
of Special SULPHURIC ACID, for Sulphate of Am-  
monia Making. Highest percentage of Sulphate of  
Ammonia obtained from the use of this Vitriol, which  
has now been used for upwards of 50 Years. References  
given to Gas Companies.

**GAS OILS.****MEADE-KING, ROBINSON, & CO.**

Represent the Strongest Independent Re-  
fineries in America; also Petroleum Spirit for Gas  
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and  
11, OLD HALL STREET, LIVERPOOL.

**"NUGEPE" GAS PLANT CEMENT.****JOHN E. WILLIAMS AND CO.,**

LOWER MOSS LANE,  
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For all Joints in connection with Oil-Gas Plant  
and Sulphate Plant.

For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

**APPLICATIONS FOR APPOINTMENTS.****DO you appreciate how much success**

depends on well-considered and lucid present-  
ment of your qualifications? I make a Specialty of the  
Preparation of Applications, and am continually re-  
ceiving complimentary letters from clients. Write now  
for Particulars.

HERBERT GREATORREX, HACKNEY, MATLOCK.

**MR. W. B. MIMMACK, for many years**

Secretary, Manager, and Accountant of the Crays  
Gas Company (111 Millions), now in Amalgamation,  
seeks APPOINTMENT in any or all of these Offices.

Address No. 6115, care of Mr. King, 11, Bolt Court,  
FLEET STREET E.C.

**ENGINEER'S-ASSISTANT, 250-**

Million Works, desires CHANGE. Exceptionally  
good All-Round Experience and Qualifications.

Address No. 5173, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**CAPABLE Draughtsman, Experienced**

in Design and Erection of Gas Plant and Con-  
structional Work, Desires POSITION in Drawing Office  
or Works. Good Experience in Operation and Con-  
struction of Carburetted Water-Gas Plant. Honours Gas  
Manufacture. For Seven Years with Large Suburban  
Gas Company. Two Years with Constructional Gas  
Engineers. First-Class Testimonials. Age 25.

Address F. G. BARKER, 34, Cranbrook Park, ILFORD.

**FOR NEW ZEALAND—Wanted, an**

ASSISTANT-ENGINEER, with First-Class all-  
round Experience, for Works with an output of about  
250,000,000 Cubic Feet per Annum.

Salary to commence at £375, with Free House  
or Equivalent allowance. Three Years' agreement.  
Passage paid.

Apply, by letter only, giving Experience, Age, and  
Present Salary, to No. 5172, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.



**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
and ELEVATING and CONVEYING PLANT, ROSE  
MOUNT IRON-WORKS, ELLAND.

### OWING to the Death of the Works

DIRECTOR of an Old-Established Firm of Gas-  
Works Engineers a VACANCY OCCURS FOR THE  
POSITION. One Experienced in up-to-date Gas-Works  
Engineering and Modern Workshop Practice essential.  
One who would be willing to Take up Shares in the  
Company preferred.

Address, in Confidence, giving fullest Particulars, to  
No. 5171, care of Mr. King, 11, Bolt Court, FLEET  
STREET, E.C.

**WANTED, a General Manager for a**  
large Commercial Company. A Grand opening  
for a Young Energetic Man with good Commercial  
Knowledge, Organizing Powers, and Engineering Ex-  
perience.

Salary, £1200 a Year to commence with. Head  
quarters in London.

Address, stating full Particulars of Qualifications,  
&c., to "S.R." care of STREETS, 30, Cornhill, LONDON.

### BECCLES WATER AND GAS COMPANY.

GAS ENGINEER AND MANAGER.

**THE Directors of this Company invite**  
APPLICATIONS for the post of GAS ENGINEER  
and MANAGER.

Candidates must possess a competent knowledge of  
Gas Engineering, and must be Conversant with the  
Manufacture and Distribution of Gas and of Sulphate  
of Ammonia and other Products.

The Person appointed will be required to devote the  
Whole of his Time to the Duties of his Office.

The Salary will be at the rate of £130 a Year.

The make of Gas for the past year was 22,603,700  
Cubic Feet.

Applications, in Writing, Stating the Candidate's Age  
and Experience, and accompanied by recent Testi-  
monials, are to be sent to the Secretary of the Com-  
pany not later than the 1st of February, 1910.

By order,

Beccles, Suffolk,  
Jan. 5, 1910.

F. S. Rix,  
Secretary.

### CAST-IRON Pipes. Spigot and Socket

or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.

A. Lowcock, Limited, SHREWSBURY.

**GASHOLDERS—Splendid, 45 feet dia-**  
meter, and New STEEL TANK fixed complete,  
to Plan and Specification. Also 50 feet Single-Lift  
and 50 feet Double-Lift. Cheap, with STEEL TANKS  
Can be seen temporarily erected.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

### FOR SALE.

**THE Mansfield Corporation have for**

SALE a Laycock and Clapham's "Eclipse,"  
WASHER-SCRUBBER. Capacity, 500,000 Cubic Feet  
per Day. In good working order. May be seen at  
Work. Reason for disposal, putting in larger Plant.

For further Particulars, Apply to ARTHUR GRAHAM,  
Gas and Water Engineer, Gas-Works, Mansfield.

### BOROUGH OF OSSETT.

(STREET LIGHTING DEPARTMENT.)

**TENDERS are invited for the Supply**  
of INCANDESCENT MANTLES for the Year  
ending Dec. 31, 1910.

Full Particulars and Form of Tender may be had  
from the undersigned.

Sealed Tenders, endorsed "Mantles," to be sent to  
the Town Clerk, Ossett, not later than Friday, Jan. 28.

By order,

H. G. Keywood,  
Borough Surveyor.

### TO ENGINEERS AND IRONFOUNDERS.

**THE Directors of the Sheffield United**  
Gaslight Company invite TENDERS for the  
Supply of STEEL and IRON WORK for Twelve Set-  
tings of TEN RETORTS at their Neepsend Works.

TENDER No. 1.

For the Supply and Delivery only of CAST-IRON  
BUCKSTAY SHOES, ASH PANS, and FURNACE  
FITTINGS.

TENDER No. 2.

For the Supply and Erection of Steel and Iron Work,  
consisting of ROLLED STEEL JOISTS, CAST IRON  
FLOOR PLATES, &c., forming Flooring and Bracing.

TENDER No. 3.

For the Supply and Erection of Steel and Iron Work  
in HYDRAULIC MAINS, ASCENSION PIPES, GAS  
and TAR MAINS, &c.

Drawings may be seen and Specification, with Form  
of Tender and Quantities obtained (on and after Jan.  
24) upon Application to the Engineer, Mr. J. W.  
Morrison, at the Company's Offices, Commercial Street.

The Directors do not bind themselves to accept the  
lowest or any Tender.

Sealed Tenders, endorsed, must be delivered by post  
to Mr. Hanbury Thomas, Managing-Director, not later  
than the First Post on Tuesday, the 8th day of  
February.

WM. HANBURY,  
Secretary.

Commercial Street,  
Sheffield, Jan. 15, 1910.

### ASHFORD (KENT) URBAN DISTRICT COUNCIL.

**THE above Council invite Tenders for**

the Supply of 50,000 Gallons of GAS OIL.

They are also prepared to receive TENDERS for the  
available Surplus COKE (about 1000 Tons) over the  
ensuing year ending Jan. 31, 1911.

Endorsed sealed Tenders to be sent to the Clerk to  
the Council, 11, Bank Street, Ashford, Kent, on or  
before Nine a.m., on Friday, the 28th inst.

Further Particulars can be obtained from the under-  
signed, to whom a Sample of the Oil offered must be  
submitted.

H. R. TURNER,  
Engineer and Manager.

Gas-Works, Ashford,  
Kent, Jan. 17, 1910.

### URBAN DISTRICT COUNCIL OF LEIGH-ON-SEA.

(GAS DEPARTMENT.)

**THE above Council invite Tenders for**

the Supply of 3000 Tons of Good GAS COAL to be  
delivered as required in quantities of about 85 Tons,  
at the Gas-Works Wharf, Leigh-on-Sea, during a period  
of Twelve Months from the 31st day of March, 1910.

Sealed Tenders, endorsed "Tender for Coal," must  
be received by me not later than Twelve o'clock noon  
on Thursday, the 27th day of January, 1910.

No Special Forms are supplied.

The Council do not bind themselves to accept the  
lowest or any Tender.

W. CARLYLE CROASDELL,  
Clerk to the Council.

Council Offices, Leigh-on-Sea,  
Jan. 15, 1910.

### BOROUGH OF EAST RETFORD.

GAS UNDERTAKING.

**THE Gas Committee of the above Cor-**

poration are open to receive TENDERS for the  
DISMANTLING and REMOVAL of an old BENCH  
OF SIX SETTINGS of RETORTS, on the Direct-Fired  
System, and the REBUILDING of a Complete New  
Stack of SIX SETTINGS of Seven RETORTS, each  
with SHALLOW TUBULAR REGENERATIVE  
TYPE OF FURNACES.

The Contract to include the Supply and Erection of  
all the necessary Steel and Ironwork for same, including  
Retort Mouthpieces, Ascension Pipes, Hydraulic  
Mains, Girders, Buckstaves, Valves, Furnace Fittings,  
Sight Boxes, Girders and Cover Plates for Subway.

The Specification may be seen, and further Particulars  
obtained, on personal Application to the undersigned.

Tenders to be sent in not later than Feb. 3, 1910,  
addressed to the Chairman of the Gas Committee,  
endorsed "Tender for Retort Settings."

The lowest or any Tender will not necessarily be  
accepted.

J. B. FENWICK,  
Engineer and Manager.

Gas and Water Offices, Grove Street,  
Retford, Jan. 5, 1910.

### SOUTH METROPOLITAN GAS COMPANY.

**NOTICE is Hereby Given, that the**

ORDINARY HALF-YEARLY GENERAL  
MEETING of the Proprietors of this Company will  
be held at De Keyser's Royal Hotel, Victoria Embank-  
ment, in the City of London, on Wednesday, the 9th  
day of February next, at Two o'clock in the Afternoon  
precisely, to receive the Directors' Report and the  
Accounts of the Company for the Half Year ended the  
31st of December last; to declare a Dividend for the  
same period; and to elect One Director and One Auditor  
in the place of those retiring by rotation.

NOTICE is HEREBY ALSO GIVEN, that, immediately after  
the conclusion of the Business of the Ordinary Meeting,  
an EXTRAORDINARY GENERAL MEETING will  
be held to elect a Director in the place of Mr. Edward  
Henry Cardwell (deceased).

Any Proprietor, duly qualified, intending to become  
a Candidate for the Vacancy on the Board must give  
notice in writing at the Office of the Company at least  
fourteen days previously to the day of Election.

The TRANSFER BOOKS WILL BE CLOSED from  
the 26th day of January inst. until after the Meeting.

By order,

F. M'LEOD,  
Secretary.

Offices: 709, Old Kent Road,  
London, S.E., Jan. 15, 1910.

### EUROPEAN GAS COMPANY LIMITED.

**NOTICE is Hereby Given, that an**

Interim Dividend of Five per Cent. will be paid,  
free of Income-Tax, on the 1st of February next.

Holders of Share Warrants to Bearer may receive  
the above—viz: Ten Shillings per Share—on leaving  
Serial Coupon No. 70 for Examination at the Union of  
London and Smiths Bank, Limited, 2, Princes Street,  
London, Three Days previously.

AND NOTICE is HEREBY FURTHER GIVEN, that the  
TRANSFER BOOKS WILL BE CLOSED from the  
17th to the 25th inst., both days inclusive.

W. WILLIAMS,

Secretary and General Manager.

Finsbury House, Blomfield Street,  
London, E.C., Jan. 10, 1910.

### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS beg to**

notify that their SALES BY AUCTION OF NEW  
CAPITAL ISSUED UNDER PARLIAMENTARY  
POWERS, and of STOCKS and SHARES belonging to  
EXECUTORS and other PRIVATE OWNERS in LON-  
DON, SUBURBAN, and PROVINCIAL GAS and  
WATER COMPANIES, take place PERIODICALLY  
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including  
other Gas and Water Stocks and Shares in these Periodi-  
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A Hand-Book on the Production, Purification, and Testing  
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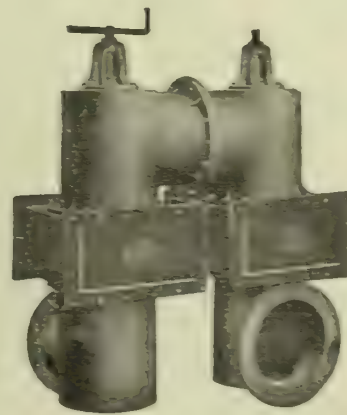
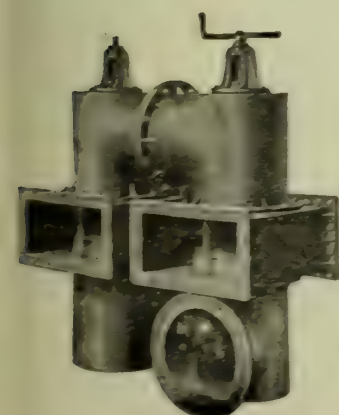
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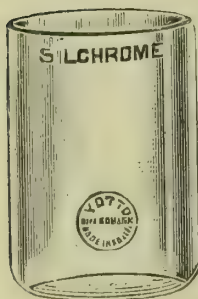
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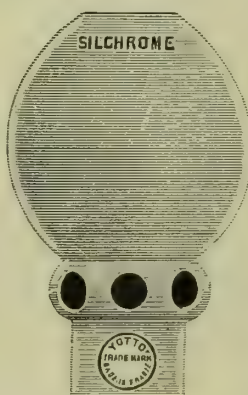
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Street Lamp Protectors.

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With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.



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## Important Improvements.

### **BURNERS.**

1. **20-Candle Power** more light without increase in the consumption of gas.
2. **Patent Gas Adjuster**; cannot get out of order.
3. **Automatic Gas Regulator**, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### **LAMPS.**

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.



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**Makers of the First Spiral Guided Holder (1889).**



Two-Lift Spiral Guided Gasholder (Clayton and Pickering's Patent Guides) with Steel Tank, capacity **150,500** cubic feet, just completed for the Napier Gas Company, Limited, New Zealand, and erected at their Hastings Works, N.Z.



## MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

**A.** The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

**B.** In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

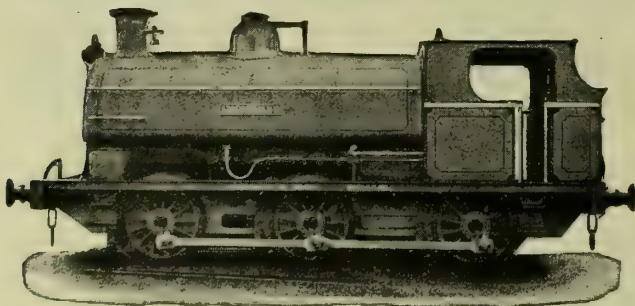
**C.** In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

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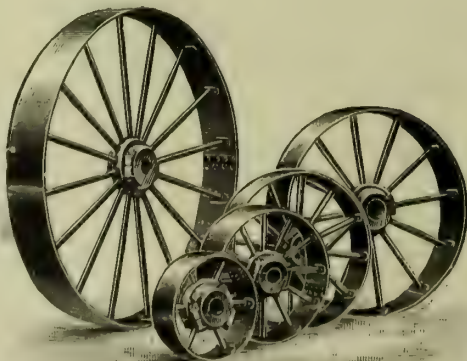
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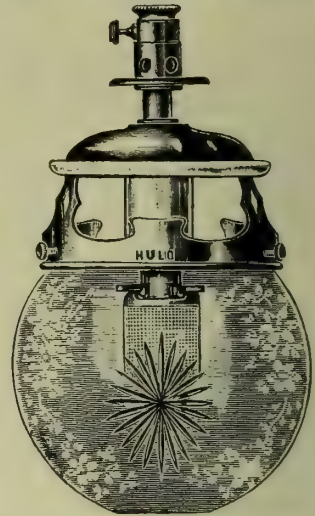
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No high pressure required.

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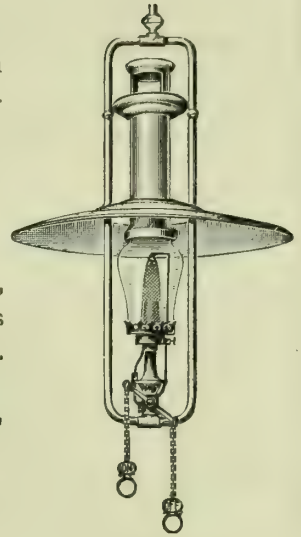
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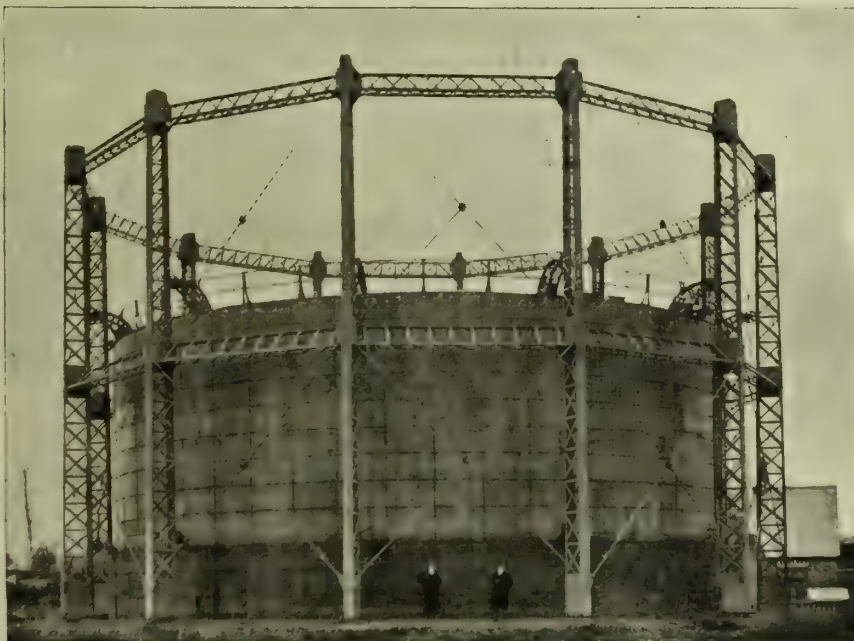


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**FOR**

## **CHARGING AND DRAWING GAS-RETORTS.**



**SIX** 20 ft. THROUGH RETORT HUNTER-BARNETT PATENT COKE PUSHERS, and  
**SIX** ARROL-FOULIS PATENT CHARGING MACHINES capable of charging up to Six cwt. per Mouthpiece.

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**PART ORDER OF TWENTY-TWO MACHINES**  
For the **South Metropolitan Gas Co.,** presently in hand.

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**FOR FULL PARTICULARS APPLY TO THIS ADDRESS.**



# Welsbach

## LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—  
for Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

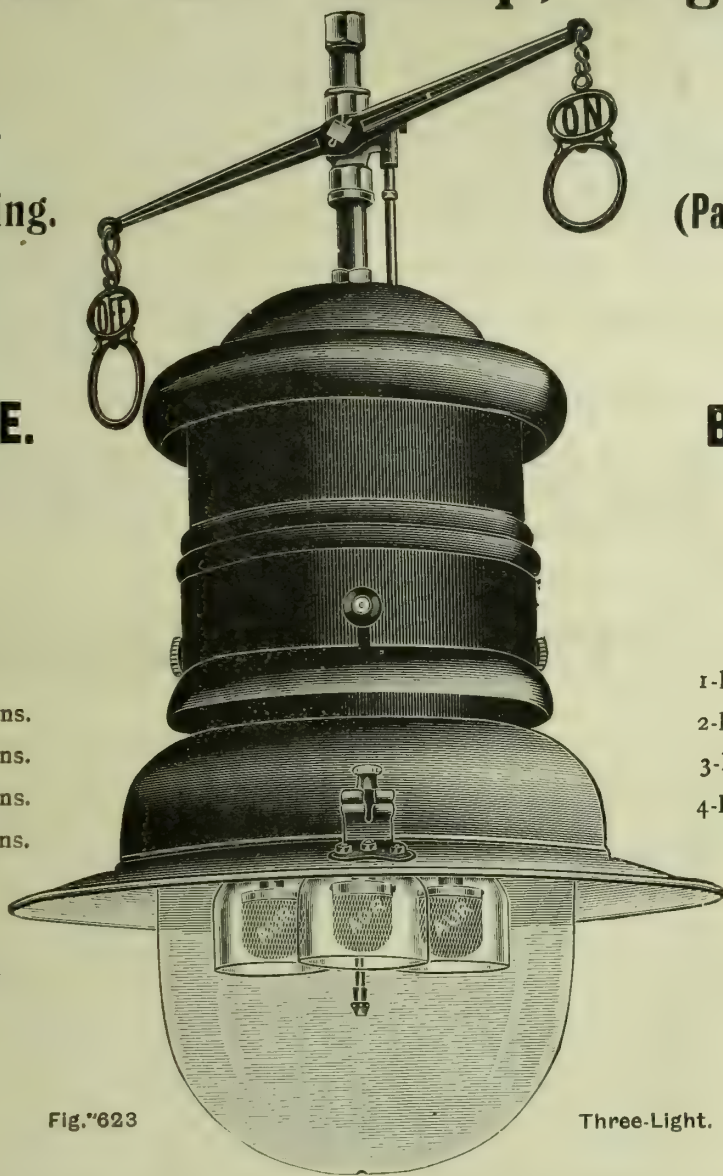


Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 36
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

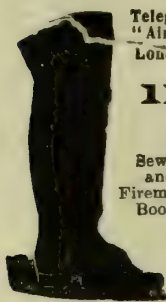
## THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.





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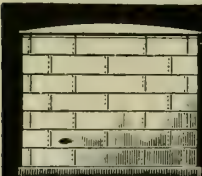
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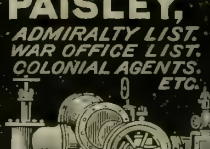
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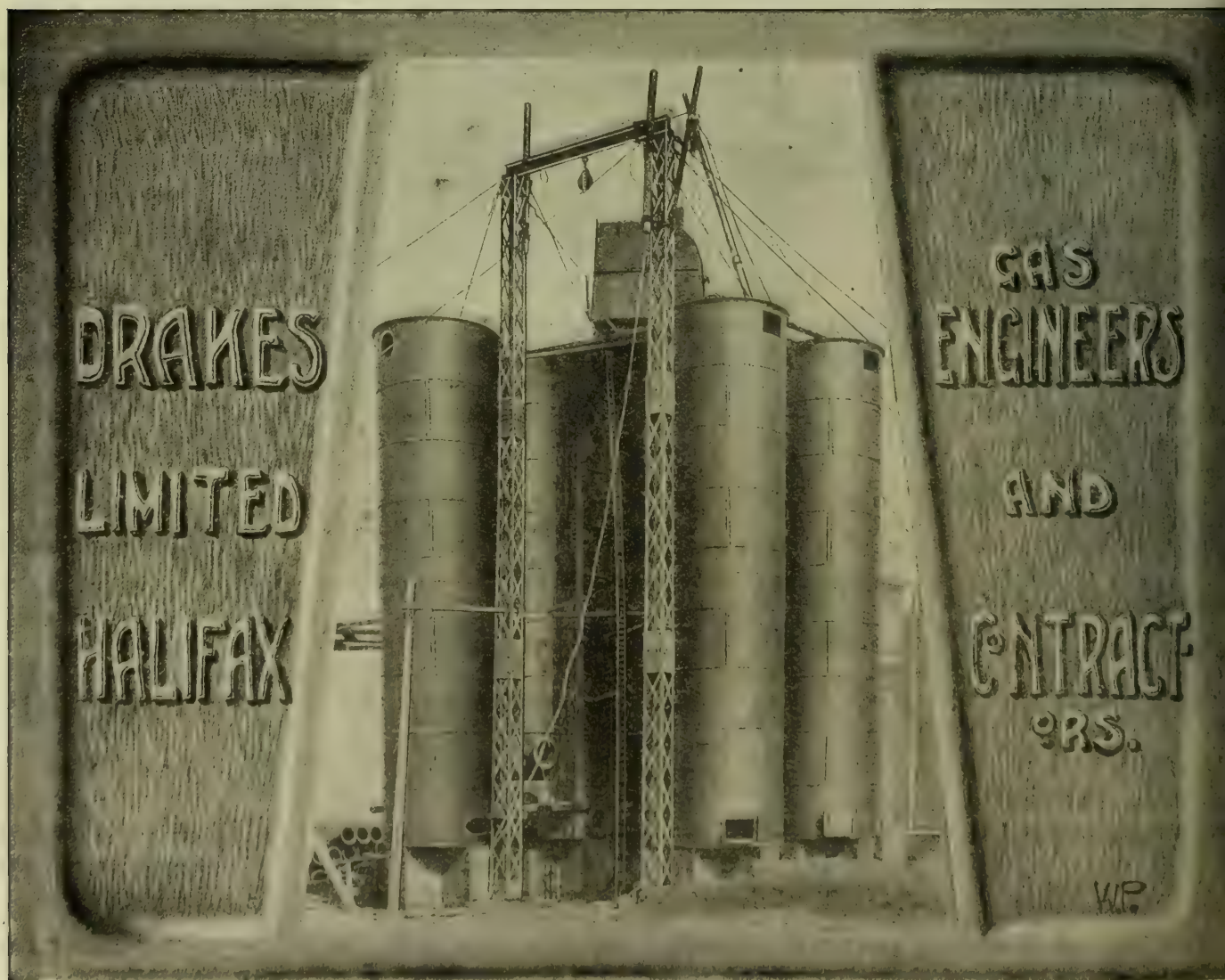
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TELEGRAMS: "ATLAS SHEFFIELD."



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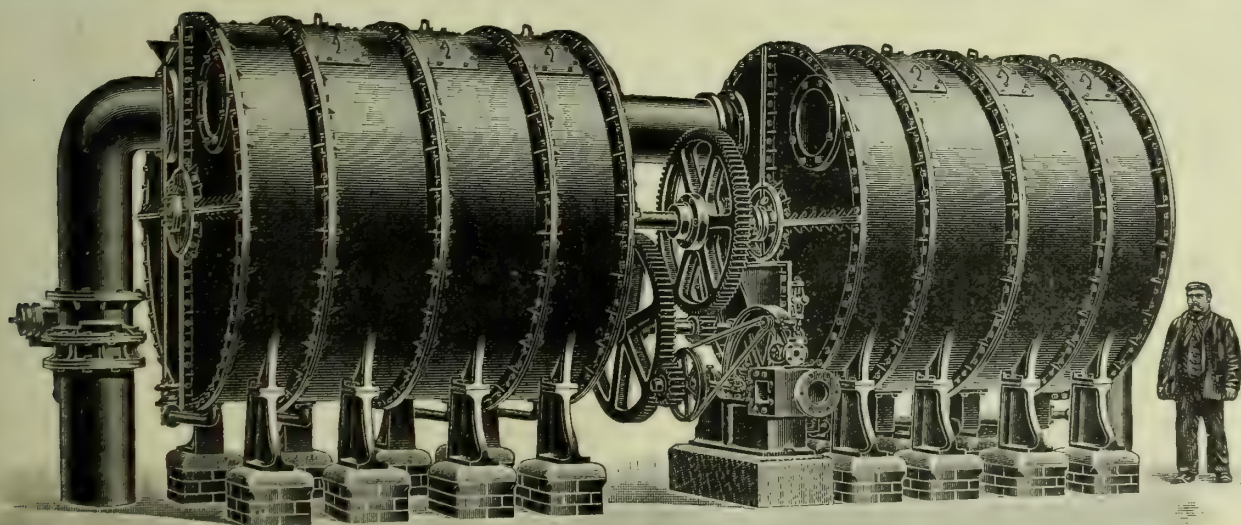
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Capacity **2,500,000** cubic feet per day,

For Gas-Works, **KINGSTON-ON-THAMES.** H. W. Packham, Esq., Engineer.



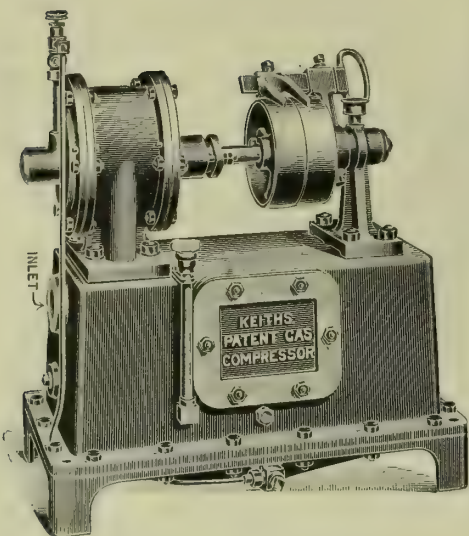
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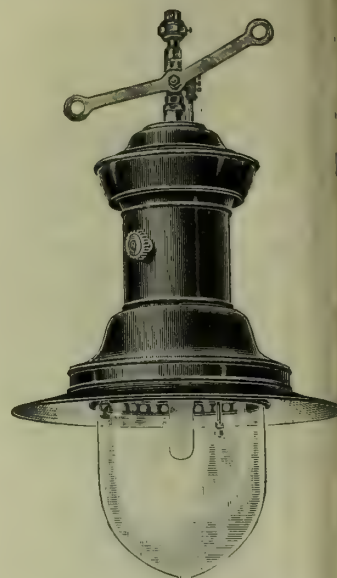
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# THE JOURNAL OF GAS LIGHTING

## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2437.]

LONDON, JANUARY 25, 1910.

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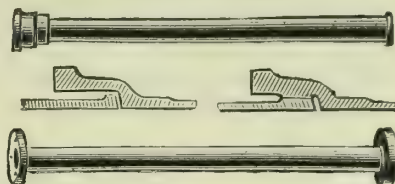
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Fig. 7.



Fig. 14.



Fig. 24.



Fig. 44.



Fig. 100.



Fig. 550.

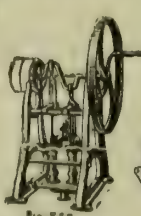


Fig. 200.



Fig. 250.



Fig. 300.



Fig. 350.



Fig. 340.

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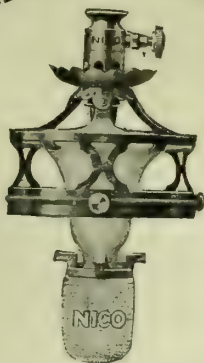
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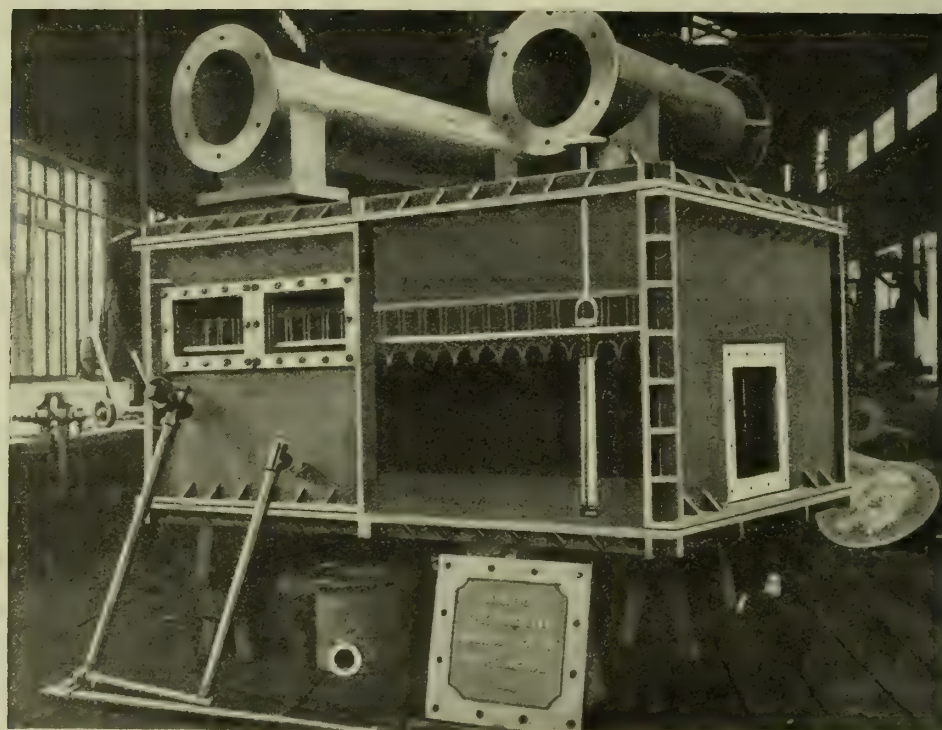
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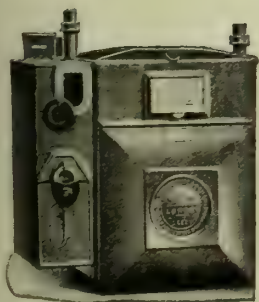
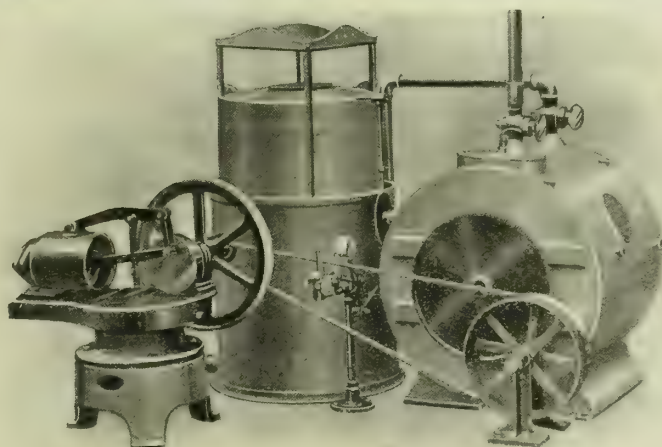
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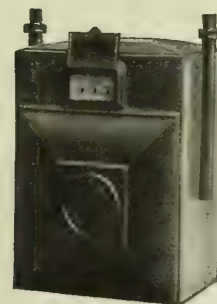


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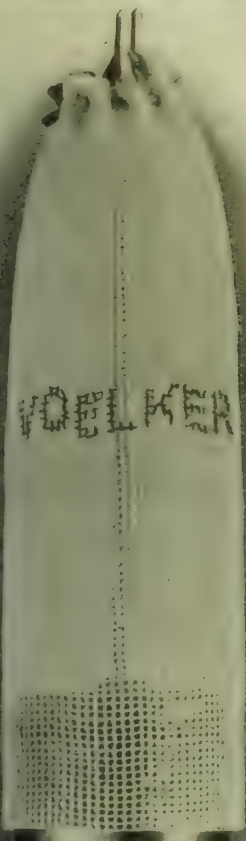
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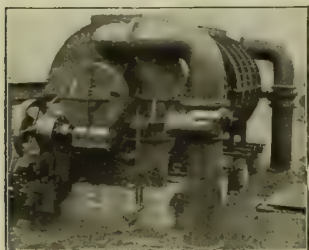
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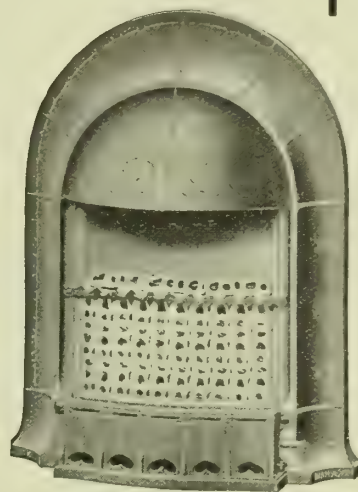
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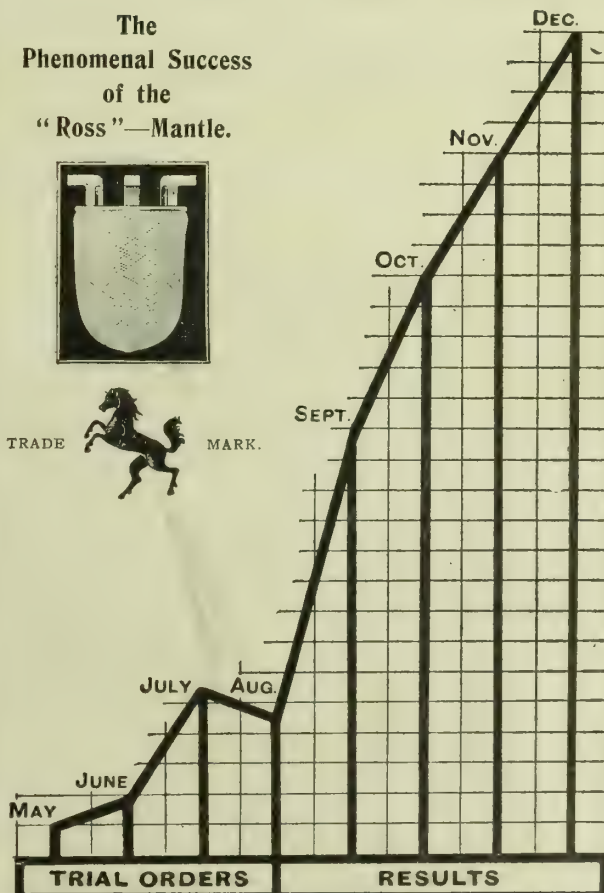
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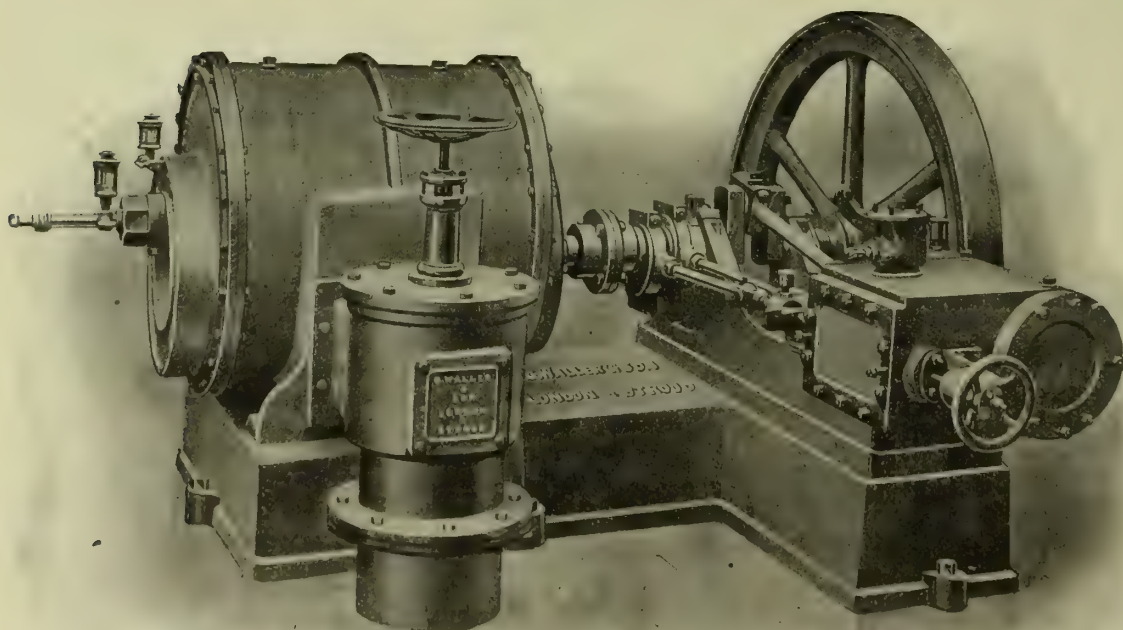
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# EXHAUSTING MACHINERY.



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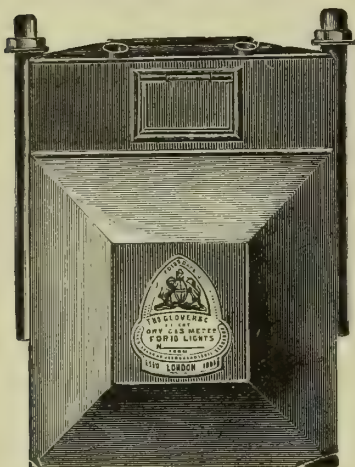
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2437.—TUESDAY, JANUARY 25, 1910.

## EDITORIAL NOTES—GAS, &c.

### Gas-Works Purchase—A Coke-Oven Gas Project.

THE Gas Bills deposited for the ensuing session of Parliament indicated quite a little eruption of purchasing enthusiasm on the part of local authorities—mostly of minor degree. The days of big gas-works transfers to municipal administration have passed, and for palpable reasons. In the larger cities and towns where the gas-works are in the hands of companies, the undertakings have grown to such size that the very idea of expropriation, with its financial responsibilities, rather staggers governing authorities and ratepayers alike. In the second place, in most of the larger cities and towns, the electricity supply is a municipal charge; and—though there are several instances of electricity and gas undertakings running in double municipal harness—where electricity is alone the object of municipal favour and possession, and particularly where electricity has not gained financial laurels, the notion requires considerable shifting that there is some incongruity in the taking of two competing undertakings of the kind under the municipal wing. We also agree that separation, where there is fair competition, is in the best interests of the people. Beyond these considerations, there is the further one that the tendency of parliamentary authorities is to grant shorter periods for the repayment of purchase loans than was their wont aforetime. And so it comes about that the purchase schemes of which we hear nowadays are mostly of minor order. In the total, there were half-a-dozen gas-works purchase proposals introduced by local authorities for the coming session; but all of them are comparatively of little account. The Bradford Corporation, in carrying forward their gas-supply consolidation policy, are asking for power to give effect to an agreement for the acquisition of private gas-works from the Trustees of the late Sir Henry William Ripley. The Bishop's Stortford District Council were requesting authority to purchase the local gas-works; so bringing themselves into conflict with the amalgamation scheme affecting certain, more or less, small Companies in Essex. The Egremont Council are desiring to be empowered to purchase, under an agreement, the local Gas Company's property, together with the mains of the Cleator Moor District Council and of the Whitehaven Rural District Council within the Egremont administrative area. The Hoyland District Council were seeking powers to give effect to an agreement to purchase the local gas-works. The Little Hulton District Council have an interesting scheme in hand (but the question of proceeding with it is for the moment in suspension) for the purchase of distribution plant in their area, through which they are proposing to distribute coke-oven gas. The Mal-low (Cork) District Council are also forward with a Compulsory Purchase Bill, which conflicts with one promoted by the Gas Company themselves for further powers.

There were thus six gas-works purchase proposals awaiting the consideration of the new Parliament; now there are four, and one of these (as remarked above) is somewhat doubtful. The reason of this reduction is that certain of the local authorities appear to have been altogether too precipitate in promoting Bills, and in incurring the expense of so doing before they had really satisfied themselves as to whether purchase would be in the interests of the district, or whether the proposals reflected the feelings of the ratepayers on the subject. As was reported last week, the Bishop's Stortford Council were, when the matter came before them, equally divided regarding the wisdom of prosecuting the scheme; and therefore a resolution to proceed could not be carried by the requisite majority. The Council, however, decided to petition against the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company's Bill; but we entirely fail to see any valid ground for opposition. Reading the speeches at the meeting on the subject of what the amalga-

mated Company will be able to do, and what they will not do, there is not found a shred of evidence in them of an educated appreciation of the position. When one reads of a councillor talking of the Company delivering gas of the prescribed illuminating power, but declaring that it "did not seem to matter much of what it was composed;" when a councillor argues in favour of a Company being deprived of the notice necessary to give them an opportunity, if they think fit, of having an official present at the penalty testings of the gas, on the ground that the notice would afford the Company time to manipulate the composition of the gas; and when, too, a councillor insinuates at uncontrolled dividends being paid by a Statutory Company—then we say that the words of such men proclaim personal ignorance on the most elementary matters affecting gas supply, and its parliamentary regulation. We do not like the innuendo conveyed by such statements as those made at the Bishop's Stortford Council meeting. Directors of Gas Companies are every whit as honest as the administrators of local government affairs, and not more prone to stoop to such mean tactics (even if it were practically possible to give them effect) as those suggested. It is a great pity that so many members of municipal authorities should make themselves appear ridiculous by encouraging the most ungenerous views regarding private enterprise. It was also hinted that the townspeople did not wish to see the Company's Bill providing for amalgamation go through. If this is so, it is because the townspeople do not appreciate the advantages and the economies of reasonable consolidation in the case of gas undertakings. The Hoyland promotion is another case in which the views of the ratepayers had not been ascertained. The purchase had been arranged between the Council and the Company; but the ratepayers have exercised their right of veto, and the scheme falls through. These withdrawals indicate an insufficient consideration of this question of local policy, which insufficient consideration is a fairly costly business.

Among the Purchase Bills, there is not one that holds more interest than that of the Little Hulton District Council—not because the Council are acquiring the portion of the distribution system of the Salford Corporation within the district for £7500, and part of that of the Farnworth and Kearsley Gas Company by agreement or by arbitration, but in view of the scheme for the supply of coke-oven gas. The project (over which the question of taking a poll of the ratepayers, in view of an adverse vote at a public meeting, is under consideration) will be dealt with more fully in our next instalment of the review of the Gas Bills. But meanwhile it may be briefly stated that the Council have entered into an agreement with the Earl of Ellesmere for the supply of gas in bulk from his coke-ovens, which agreement appears to be framed in manner giving ample protection to the ratepayers and gas consumers of the district. The gas supplied is to have an illuminating power of 14 candles tested by the "Metropolitan" No. 2 burner, to be free from sulphuretted hydrogen, and to have a calorific power of 550 B.Th.U. gross. The price to the Council of this gas—after purification, and freed from sulphuretted hydrogen, but exclusive of enrichment—is to be 9d. per 1000 cubic feet for any quantity up to 400,000 cubic feet per day; but if the daily average exceeds this quantity in any year, the price is to be 7d. per 1000 cubic feet. If the gas has to be enriched to 14 candles or any higher figure, the charge for enrichment is to be ½d. per candle power per 1000 cubic feet. There must ever be the risk, in a scheme such as this, of cessation of supply, principally through labour troubles over which the District Council would have no control; and as a protection against this, the Earl of Ellesmere is to provide retort-settings, to be worked by, and at the expense of, the Council should the need arise. In the preparation of the agreement, the respective parties appear to have been excellently advised; and, if the project proceeds and is sanctioned, the parliamentary course will not by any means end technical and commercial interest in it.



### Successful and Unsuccessful.

DURING the past week, the ordinary affairs of the country have been over-shadowed by the General Election; for everyone who has a stake, large or small, in the country recognizes that, in matters political, we have come to a turning-point from which we shall proceed for good or ill in the national interest. Our concern for the moment in the great contest is limited to the *personnel* of the candidates for parliamentary honours, and to their successes or defeats. As an industry, quite aside from party feelings, all must recognize that it is to its advantage to have in the House of Commons a fair representation. There are many men who are directly or indirectly connected with it in the membership of the new Parliament, so far as it is constituted. There are several names which are recognized as those of shareholders in gas undertakings; and there are others known to be those of men interested in divers ways in the fortunes of the industry. A few names of men well known in the industry in various capacities who have succeeded in their candidature may be mentioned. There is Sir Henry Kimber, the President of the Gas Companies' Protection Association, who has retained, by a flattering majority, his seat as a Unionist in the Wandsworth Division. Sir Daniel Ford Goddard, the Chairman of the Ipswich Gas Company, returns to Westminster in the Liberal interest. Mr. E. A. Brotherton continues his representation of Wakefield as a Unionist. Mr. J. H. Duncan, a Director of the Otley Gas Company, was successful in his fight, on the Liberal side, in the West Riding of Yorkshire. One of the Directors of the Power Gas Corporation—Mr. Alfred Mond—has come from Swansea triumphant, in the Liberal interest. Sir Philip Magnus, who has long been identified with the City and Guilds of London Institute, returns to Parliament as the Unionist representative of the University of London. The Secretary of the Gas Workers' Union, Mr. Will Thorne, who is a good specimen of the militant Socialist, goes back to Westminster as a representative for West Ham.

But there have been others associated with the gas industry who have failed in their candidature. Sir William R. Plummer, one of the Directors of the Newcastle and Gateshead Gas Company, espousing the Unionist cause at Newcastle, was unsuccessful, as was also Mr. R. J. Neville, one of the Directors of the Brentford Gas Company, in standing as a Unionist at Wigan. It was a brave fight that Mr. A. P. Main made in the Unionist cause in the Tradeston division of Glasgow. He was, on heavy polling, only 193 votes behind the victor, which augurs well for success if he enters on the struggle when occasion again offers. Mr. H. Pike Pease, as a Unionist, failed to secure a return to Westminster; but his opponent only headed him by 29 votes. A kinsman—Mr. T. H. Berridge—of the Engineer and Manager of the Leamington Gas Company, was, as a Liberal, beaten in contesting the seat at Warwick and Leamington. Through his rejection at East Bradford, the Parliamentary Bar retains the brilliant forensic powers of Mr. J. H. Balfour-Browne, K.C.; and not a few who have occasion to apply for parliamentary powers by way of Private Bill will rejoice over the fact. Lord Robert Cecil is also at liberty to take up his work again at the Parliamentary Bar, through his rejection at Blackburn. There are a few other candidates in whom we are interested whose success or otherwise has still to be announced.

### An Instructive Report on Electrolysis.

WE are sorry to learn from the report on Electrolysis published in other columns that the Special Committee of the American Gas Institute who have been dealing with this subject, and the Chairman of which was Mr. A. G. Glasgow, have been disbanded; but they have left as a memorial of their existence a good record of instructive work. The main troubles with which the Committee have been confronted have been that systematic and scientific research into this matter of the effect of stray electric currents on underground distribution systems is not carried on under different conditions, and that local interests are so interlaced that, when investigations are made, the results appear to be mostly of a confidential character, and for the good, and possibly the peace, of local interests there is a delicate reserve in making disclosures. In face of this, the Committee cannot see their course clear to the making of any further substantial headway. But they have accumulated quite

sufficient evidence in the former report and in the one now presented by Mr. A. F. Ganz, Professor of Electrical Engineering at the Stevens Institute of Technology, to show that periodical scientific and systematic electrolytic surveys of gas distribution systems should be instituted for protective purposes. Damage here and damage there is nowadays taken as a matter of course; but it would be better to make some attempt at warding off these disturbing occurrences by a proper inspection.

The report by Professor Ganz is very informative, and is written in a style that can be appreciated by practical men. It gives instruction not only from experiences, but shows what to look for, and where to look for it—treating, too, of some of the more generally applied expedients in America for preserving the subterranean pipe distribution systems from injury, and imparting ideas as to their relative value. Traction concerns can take care of their own current completely by the use of an insulated return circuit; but even without this, as Professor Ganz points out, it is possible, where serious stray currents are found flowing on underground structures, to reduce them to small and oftentimes negligible amounts by proper track-bonding, and by the installation of properly proportioned return feeders, with the addition in some cases of negative boosters. In two American cities, the installation of properly proportioned radiating return feeders has reduced stray currents on the piping systems to less than one-tenth of their former value. It is clear, however, that care must be taken, in the choice of system for preventing damage, to have respect for other underground systems. In the case of a pipe system that is a continuous electrical conductor of low resistance, and is affected only by currents from known sources, it may be protected by metallically connecting it to the negative return circuit of each source. But there are several objections to such a method of bonding; and the greatest one is the danger that it constitutes to all other underground metal systems. The dangers produced may be far greater than the danger it is sought to avoid on the protected system. Professor Ganz is emphatic in his belief that only such methods should be used as substantially prevent stray currents flowing to and from underground structures.

Much protecting work may be done within subterranean pipe systems themselves, but not, it is obvious, without considerable expense and inconvenience. The favoured systems in America are by insulating pipe-joints and insulating pipe coverings. These methods are expatiated upon by Professor Ganz; and at the close of the study of his investigations and the collected experiences, there is no doubt whatever in the mind as to the former being the preferable in the matter of smallness of deficiency. Cement joints are largely in favour; and the evidence all points to the fact that a pipe-line laid with all cement joints has such a high electrical resistance that, with the potential differences ordinarily found in the ground, no measurable current can flow along such a line. This being so, bond connections between the cement jointed mains and the return circuit of electric railways can only each protect a single length of pipe, and not the whole of a pipe system. Of course, it is not submitted that cement jointing necessarily implies complete immunity from electrolysis; but it is a protector in which a large share of reliance can be placed. As a matter of fact, cement is not an insulator. But its resistance is high compared with iron; so that the cement does practically interrupt the electrical continuity of the pipe-line. The efficiency of the cement joint, however, depends upon attention being paid to the detail of making the joint. If there is metallic connection between spigot and socket in any way, the resistance efficacy of the joint is partially destroyed; but this can be readily avoided by introducing at the end of the spigot a ring of insulating material, so as to break metallic contact with the socket. This is simple enough; but there are other considerations than electrolytic ones upon which more information is required. It may, however, be generally inferred, from the considerable trial that has been made of the cement joint in America, that it does also commend itself from other practical points of view than that of offering resistance to the flow of stray electric currents. The reports on special forms of insulating joints vary—some users speak highly of them; while the experience of others has not been confirmatory. Experiments made by Professor Ganz on a pipe-line fitted with Dresser joints did not reveal any measurable flow of current; and he is of opinion that, though the introduction into a gas distribution system of a few insulating joints will not eliminate electrolytic danger,



it may greatly reduce it in certain localities, while in others the joints may do more harm than good. Insulating coverings for mains are not particularly well spoken of in the report; and the cost is prohibitive so far as general application is concerned.

Many gas engineers in this country have had what Mr. James Swinburne once termed "gruesome" examples of electrolytic action on service-pipes in thoroughfares where there are electric tramways; and in America it would appear they get a pretty good crop of such affected services, even where there are cement-jointed mains. Though the flow of current may not be measurable along mains so jointed, the connected services are not immune from severe punishment. Professor Ganz has had a bundle of gas-services sent him for inspection that have been so affected, though connected up to a cement-jointed main; and, in his experiments on a lead-jointed water service, connected up to a cement-jointed main, he found it was carrying large stray electric current. An uncomfortable feeling might be generated if it were generally known that stray currents are entering houses *via* the water service and returning through the gas service-pipes. With electrolytic action proceeding on the gas service-pipe, one can well imagine there would be a distinct fire hazard there. Of course, this travel of the vagrant currents within houses could be prevented by making arrangements to use insulating couplings in the service-pipes.

From this general glance at the contents of the report, it will be apparent to readers that there are quite a number of interesting and instructive points bearing upon this question of electrolysis to be picked from the document. Among the miscellaneous ones, for instance, it is found that the resistance of lead-wool joints appears to be about half that of the lowest resistance of cast-lead joints. This is possibly accounted for by the fact that the lead-wool joints make contact with the iron of the pipes over a greater area than in the case of cast-lead joints. In other words, an advantage is discounted by a disadvantage. Another noticeable feature is that old pipes are much less subject to trouble from electrolysis than new pipes; the surface corrosion forming what is practically an insulating covering. Going to other parts of the report, it is regrettable that, after all his inquiry, Professor Ganz is unable to come forward, and say with confidence that there is a specific for electrolysis. He does not know of one. The electricians on this side will take refuge in the Board of Trade regulations, and suggest that Professor Ganz has possibly overlooked them. We have no doubt as to his perfect knowledge of them; and, notwithstanding that knowledge, this Professor of Electrical Engineering cautions all against any false security. A statement that a given pipe system is not suffering from electrolysis cannot, in his view, be taken as good evidence that the system is actually free from stray currents, and is immune from electrolysis, and especially is this so with cast-iron mains carrying gas at ordinary pressures. This being his well-considered opinion, a periodical systematic scientific survey is, in his judgment, very desirable—an opinion in which all will agree.

### Some Stringent Supply Conditions.

THE fusion of the Buenos Ayres (New), the River Plate, and the Primitiva Gas Companies is now an accomplished fact; and to those concerned in gas supply under home conditions, the terms of the contract (as noticed elsewhere) entered into by the Company with the Municipality of Buenos Ayres will be of interest. The Municipality have long had a reputation for driving a hard bargain with those largely dependent on their goodwill and toleration; and, in the making of the new contract, there has been no departure from that reputation. A little easing here and there of the conditions, and the consolidated gas undertaking could have been operated to much better advantage in furtherance of the common weal. The Company have been subject to a sort of tight-lacing all round. We complain in this country of the gyves forged at Westminster which hamper industrial freedom. Our restrictions, however, are light compared with those which now apply to the gas supply of Buenos Ayres. The Municipality appear to have been looking round to discover any and every limitation that they could employ; and they have made use of all they could detect. The price the Company are allowed to charge may, according to British notions, seem to be high; but sight must not be lost of the differences in respect of

conditions—particularly coal, labour, and capital. Provision is made for reductions from the maximum specified rates to the extent of 25 per cent.; and then the reductions are to cease, except in the event of the Company adopting any new invention for making gas which may allow of a saving to the extent of 20 per cent. in the cost of production. Thereupon the maximum charges are to be reduced to the extent of one-half the economy effected. This reminds of the similar stipulation (without special definition of a moiety of the economy going to the consumers) in the contract between the defunct Paris Gas Company and the Municipality, which provided for the holding of quinquennial inquiries, with the view of ascertaining whether there had been any improvement introduced into the working calculated to effect substantial economy in production; and if it were found that this had occurred, the Company were to give the public and private lighting the benefit of it, in the shape of a reduction in price, in proportions determined by the Administration, acting under the advice of the Municipal Council. But the provision might just as well have not existed for all the good it did.

Another departure from British practice is the limitation imposed on the use of straight or carburetted water gas, unless unavoidable circumstances necessitate an increase. The quantity of water gas permissible under this stipulation is not to exceed an amount that will raise the proportion of carbon monoxide in the mixed gas above 17 per cent. by volume. This means that rather more than one-third water gas may be used in the output. The allowable percentage of carbon monoxide is 1 more than was recommended in 1899 by the Home Office Committee; but no occasion has been found for acting upon the recommendation, either by legislation or agreement, in this country. Therefore the necessity of the restriction in Buenos Ayres is not supported by experience. The Company are also placed under obligation to adopt any method which, in their opinion, or in that of the Municipality, will permit of the reduction of the quantity of carbon monoxide in the gas, or will in any other way improve its quality. There are also to be penalty testings for both illuminating power and calorific value; but in respect of the latter, the conditions must be regarded as very onerous—more so than those accepted, in the interests of their last Act, by the Gaslight and Coke Company. The illuminating power of the gas in Buenos Ayres is to be 14½ candles, as tested by the "Metropolitan" No. 2 burner; and the calorific power at least 539·2 B.Th.U. net per cubic foot, as tested by a Simmance-Abady calorimeter. An illuminating power of 14½ candles and a calorific power of 539·2 B.Th.U. net have, generally, a somewhat distant relationship. Unlike the calorific standard of the Gaslight Company, this Buenos Ayres one of 539·2 B.Th.U. net is unconditional, and right away for every lapse of 5·5 B.Th.U., a penalty of \$30 is to be inflicted. The standard is altogether too high (see "JOURNAL," Oct. 5, p. 13). In fact, we fear the Company will have some difficulty in working to it; and at the same time they and the consumers will be denied the advantage of the economies that greater freedom in manufacture would have enabled them to work for. This is an instance of liberty and authority being antagonistic, and limiting (through the latter) action to the production of the best service to the greatest number.

### Mysterious and Suspicious Fires.

It has been the boast of electricians that most of the palatial buildings of the world, in which expense is no particular object, are lighted electrically. The fact may account for what is so obvious that instances of such buildings being destroyed by fire, with the attendant great monetary waste, are more frequent now than in pre-electrical days. That is a point which throws strong suspicion on the introduction of electricity. But though in some of these cases there is all but positive evidence as to electricity being the cause of the conflagration, the reporter of the occurrence who dares to throw out a hint as to where suspicion rests, is bombarded by the severest denunciation from electrical quarters. In many of these cases, the cause (if it be electrical) is effectually wiped out by the fire; and any certainty, of course, must then depend upon the evidence of those who witnessed the origin of the outbreak. *Causa latet, vis est notissima.* The Clapham, Kilburn, and other fires of recent occurrence at home are all too well embedded in memory. According to report, electricity does



not confine its claims to any class of property; its disinterestedness is one of its characteristics. Royal Palaces are said to come within its consuming scope. On the 6th inst., a royal palace near Athens was destroyed by fire. "It is believed," wrote the correspondent, "that the fire was caused by a short-circuit, or by a burning candle." The Turkish Parliament House was completely gutted by fire last Wednesday. The "Daily Telegraph" correspondent says: "The fire was caused, so far as has been ascertained, by a short-circuit in the electric lighting apparatus, though a few of the deputies and fire brigade officials say that it may have had a more mysterious origin." The estimated loss is £4,000,000. From Philadelphia came accounts last Wednesday of a big factory fire, involving the death of at least a dozen young women, and serious injuries to about twenty men and girls. The attributed cause of the disaster was the "fusing of an electric light wire." Last Sunday week, Hackness Hall—the seat of Lord Derwent, near Scarborough—was destroyed by fire. The cause "is believed to be the fusing of an electric wire in one of the bedrooms over the portico of the hall." Reverting to the Clapham Junction and Kilburn fires, it is stated that the London County Council are contemplating introducing legislation to deal with the subject of the illumination of drapers' windows by any kind of artificial light.

### The Accounts of Borough Councils.

In another part of to-day's issue, there will be found some figures extracted from Part V. of the Annual Local Taxation Returns, which deals with the accounts of Councils of Boroughs other than Metropolitan Boroughs. These statistics, which unfortunately bring us up to no later date than March 31, 1907—being for the twelve months ending at that time—relate to the affairs of the 326 boroughs (exclusive of the Metropolis) that were then in existence; and there is little else than columns of figures to be found in the 250 pages of which the Blue-Book is composed. The figures show a great deal; but perhaps the one thing above all others that they make clear is the huge importance of municipal work nowadays from a financial point of view, as well as when regarded in its other aspects. Doubtless there have since March, 1907, been substantial additions made; but even at that date the total amount of the outstanding loans was practically £244,000,000, compared with about £240,250,000 twelve months before. Of the large number of purposes for which this money has been secured, the following few may be specially mentioned: Tramways and light railways are responsible for £21,230,598; electric lighting (including public electric lighting), for £20,411,595; gas-works, for £19,499,723; water-works, for £60,083,232; public roads and streets, for £27,466,538; sewerage and sewage disposal, for £20,272,714. These are all (with the one exception of gas) increases over the previous year; and education is another heading which has also grown—from £18,240,723 to £18,734,580. With regard to the figures in reference to gas and electric lighting, it may be mentioned that, as compared with the immediately preceding returns, the gas-works loans outstanding show a decrease of about £140,000; and those for electricity have increased by some £368,000. While the decrease in the case of gas is very much the same as was shown in the accounts issued twelve months ago, the increase under the head of electric lighting has fallen from £1,250,000 to the £368,000 just stated. The total rateable value of the boroughs, it will be seen, is over £73,000,000. As was the case the previous year, the Blue-Book which is now under notice contains a table showing the transfers that have been made in aid of rates out of profits from, and the transfers from rates to make up deficiencies in revenue on account, of four classes of what are usually known as "reproductive" undertakings. The statistics in this respect show that for the year 1906-7 there was a total profit on tramway and light railway, and gas, water, and electricity supply undertakings (the four classes included in the table) transferred in aid of rates of £1,072,745; while the extent of the loss which had similarly to be made good out of the rates was £318,807. Gas-works are once more responsible for by far the largest profit (£490,767), as well as for the smallest loss (£795). With regard to water-works, the total losses taken from the rates as usual come to considerably more than the aggregate profits by which the ratepayers directly benefited; the former figure being £238,361, the latter £102,448. As to electric lighting, the profit transferred in aid of the rates is £90,899; and the loss which had to be made good, £26,798.

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 256.)

THE Stock Exchange had another animated and interesting week. The two central points round which movements turned elliptically were the elections and cheap money. The former exercised a potent influence (the returns being awaited and received with a degree of fervour which at times almost impeded business); but the steady cheapening of money had, *per contra*, an agreeably soothing effect. The opening on Monday was not over-bright. Saturday's election returns, though good, were not good enough to satisfy; and so the tendency became dull, with quiet business. Most of the markets suffered a set-back. Consols fell  $\frac{7}{16}$ ; Rails receded; and most of the rest were weaker. Tuesday began still in a dissatisfied mood. Consols fell another  $\frac{3}{16}$ , but cheered up later on; and Rails moved sympathetically. But Wednesday improved matters materially. The gilt-edged division gathered strength, while Rails made a general advance. Some speculative lines, however, were very irregular; and Americans were odd all the week. On Thursday, the Exchange became enthusiastic over the election results, to a degree almost embarrassing to sober business. But the best markets could not help rising, and Consols gained  $\frac{5}{16}$ . Friday was much the same—full of politics, and generally strong. Railways advanced by satisfactory announcements. Saturday was quiet, and for the most part unchanged. In the Money Market, the fall in the value of money was continuous and steady. The Bank of England rate was reduced from 4 per cent. to  $3\frac{1}{2}$  per cent. on Thursday; and the German rate was lowered on Friday. Business in the Gas Market was only moderate in point of volume; but there was a good undercurrent of strength, which came to the top now and then in advances of quotation. The leading item of the week was the Gaslight and Coke dividend announcement, with a carry-forward higher by £47,000 than last half-year's. This sent the quotation up fractionally; and dealings which were marked at 104 on Monday touched 105 on Saturday. In the secured issues, the maximum was  $\frac{1}{2}$  better, at from  $88\frac{1}{4}$  to 89; the preference realized 105; and the debenture, from  $82\frac{1}{4}$  to 83. South Metropolitan was quiet and strong, changing hands at from 121 to 122; and the debenture fetched  $81\frac{1}{2}$  and  $82\frac{1}{2}$ . Nothing was done in Commercial. Among the Suburban and Provincial group, Brentford old marked 254 free and 256, ditto new 191, Brighton original 219, South Suburban  $121\frac{1}{4}$ . Wandsworth and Putney debenture and Tynemouth ordinary rose 1 each. In the Continental companies, Imperial was very quiet, and was unchanged at from  $175\frac{3}{4}$  to  $176\frac{1}{8}$ . European part-paid made  $18\frac{1}{16}$ . Among the undertakings of the remoter world, Buenos Ayres changed hands at  $14\frac{1}{2}$  and  $14\frac{5}{8}$  (a rise of  $\frac{1}{4}$ ), ditto debenture at  $97\frac{3}{8}$ , Hong Kong at  $17\frac{3}{8}$ , Ottoman at 6 $\frac{1}{2}$ , Primitiva at  $7\frac{1}{2}$ , ditto preference at  $51\frac{5}{16}$  and  $53\frac{9}{16}$ , ditto debenture at 99 (a rise of 1), River Plate at 17, San Paulo at  $14\frac{3}{8}$ , and ditto preference at  $12\frac{1}{4}$ .

## ELECTRICITY SUPPLY MEMORANDA.

**How not to Counteract the Effects on Supply Undertakings of the Metallic Filament Lamps—Reducing Consumption by Them in Street Lighting—For Small Householdors on the Contract System—Metallic Filaments and Visual Degeneration—Replacing Lighting Units by Low-Price Power Ones.**

THERE was recently a paper read before the Leeds section of the Institution of Electrical Engineers by Messrs. G. Wilkinson and R. M'Court, in which were, after a manner, discussed the possible—not actual—beneficial effects of metallic filament lamps on supply undertakings. The authors hail from Harrogate; and the scheme of the paper was to give some idea of what has been done in that favoured seaside resort to counteract the effect of the introduction of metallic filament lamps. The first section of the paper deals with the positive and prospective overthrow of electric arc lamps by metallic filaments. As the latter considerably reduce the revenue derived, there is failure to see how this can be classed among the counteractive efforts to stem consumption reduction. There it is, however; and so it may be referred to. True by way of trial only, a stretch of residential road in Harrogate has been dealt with, where twenty open-type arc lamps formerly did duty. The nominal 100-candle metallic filament lamps adopted in their stead number 46; and they are suspended in couples, with two of the standards bearing four lamps each. It is admitted that the illumination given by the two-light lamps is not so good as that formerly imparted by the deposited arc lamps; but it is claimed that the effective illumination on the roadway afforded by the four-arm lamps is at least comparable with that of the old arc lamps, and much better round the base of the lamp itself. We can recall the candle power attributed to arc lamps in pre-metallic filament days, and the electrical arguments for high-power sources of light. It is now electrically considered that this stretch of road is adequately lighted by, in the major part, 200-candle power sources; the inference being that with the arc lamps it was overlighted. The cost of altering the twenty standards was £91 (an average of £4 11s. each), though no alteration to the mains was required. Then there are the annual costs for the old system of lighting and the new. For the



arc lamps, the current is put down at £169, trade account at £22, wages at £61, which three items are calculated in the print of the paper before us to amount to £270, which is not precisely accurate. Following, the cost of the 46 metallic filament lamps is put down at £91 17s. 4d.—current being estimated, at 1½d. per unit, at £56; renewals at £29 7s. 4d.; wages at £6 10s. It is stated that the lamps are switched out at 12.30 a.m. If this is so, and they are lighted up at dusk, would not the number of lighting hours per annum be 2355? and reckoning 125 watts per lamp per hour, and 1½d. per unit, would not the cost of the current for the 46 lamps work out to £84 12s. 4d. and not to £56? Before leaving the question of public lighting, there is another interesting point. The authors aver that they have made many tests of street lamps by the aid of portable photometers; and they find that a 3 feet per hour incandescent gas-mantle does not give a light of more than 30 candles, while with metallic filament lamps 30-candle power can be obtained for 33 watts! That is to say, something better than the laboratory efficiency can be obtained, using the portable photometer, from metallic filament lamps in street lighting; while, removed from the laboratory to the street lamp, the incandescent gas-burner will only give an efficiency of 10 candles per cubic foot of gas consumed, instead of double that quantity! Strange! but a pair of electricians say it's true; so what is the good of denying it, seeing that veracity is such a common trait in the electrical profession and advertising literature. The inquiry just flits across the mind as to why these gentlemen did not pit against the 30-candle power metallic filament a small inverted burner which class of burner has a higher efficiency than the old "C" burners.

In the discussion, not much notice was taken of the street-lighting section of the paper; interest being entirely concentrated round what Harrogate is doing to "counteract the effect of the metallic filament lamps" in the dwelling-house. What has been done does not strike one as being worthy of rank as particularly notable. It only amounts to a little essay at getting hold of small consumers under a contract system—that is to say, under a charge of so much per lamp per quarter. But with what degree of success is not (so far as the report before us gives enlightenment) stated. The argument in favour of the contract system is a lonely one—the reduction of the cost of installation by doing away with the protective meter. On the other hand, the arguments against have a plurality. To supply at so much per lamp is not an ideal system. It is merely a reversion to the old days of gas lighting; and the experience then will not induce the gas industry to again have recourse to the plan. There are not, fortunately for them, many electrical engineers who regard the proposal with favour. They know that it is human to err; and that laxity in operating the switch when lights are not actually required is bound to be a growing quantity. All the supply conditions that may be invented in the circumstances will not afford the central station protection in this regard, without some mechanical watcher in the shape of a meter. The terms at Harrogate are: (1) The consumer to supply his own lamps. (2) Each apartment in which a lamp is installed must be adequately lighted by windows in the daytime. (3) The maximum number of lamps to be alight at one time to be declared at the commencement of the contract. (4) The minimum number of lamps applied for to be two, and the maximum six, each taking 30 watts. (5) The charge to be 2s. 9d. per 30-watt lamp, payable in advance. Now what protection is there here for the electricity undertaking, and for the consumers who use and pay for electricity for lighting on the ordinary terms, or who under the contract system are honest in their employment of the current. This contract system is to say the least a clumsy device, and for the consumers not a cheap way of obtaining light.

Supposing a small householder has half-a-dozen of the 30-watt lamps installed (each representing about 24 candles), at 2s. 9d., these would represent an expenditure of 16s. 6d. per quarter, or £3 6s. per annum, in addition to which there would be the metallic filament lamps to pay for. A bijou inverted gas-lamp will give as much light as, or more light than, a 30-watt metallic filament; and 1000 cubic feet of gas, according to quality, will suffice for such a lamp for from 800 to 1000 hours. So where, from the point of view of economy, is the small consumer to gain from turning over from gas to electricity? There is another aspect of the question. Mr. Wilkinson himself does not see how electrical stations are going to get cooking and heating into small houses where there is competition with gas. Prepayment gas consumers are, generally speaking, excellent patrons of the cooking-stove and boiling-ring; but gas undertakings would be very glad if they could say that their prepayment consumers averaged a payment of £3 6s. a year for both lighting and cooking, and not for lighting alone, as is proposed for the six 30-watt light man. Another point is that if this contract system is to succeed, even in a small way, the principle should be extended, so as to include the maintenance of the metallic filament lamps. The small householder does not like unexpected expenditures of a few shillings. His present solid disbursements on necessities are quite sufficient for him, without adding to them. He much prefers—it is the habit of his class—to buy in small quantities, as he goes. Once he has bought his incandescent burner, the expenditure does not recur for years. He has merely a few pence to spend occasionally on the renewal of a mantle, instead of shillings on the metallic filament lamp. One of the speakers in the discussion of the paper was Mr. R. H. Campion; and he made this very point as to lamp renewals. He confessed that his

experience in the lighting of cottages had not been very successful. He obtained a few cottage consumers by inducing the landlord to charge his tenants 1s. extra per week for lighting. There are but few landlords who would be prepared to jeopardize the letting of their cottages by adding 1s. to the rent for the benefit of someone else. But these cottages were not connected for long; and the lamps used were of such a description that the department were not sorry when they were disconnected. The cottagers would not replace a lamp costing 9d., no matter the condition it was in. In Mr. Campion's opinion, upon this experience, he is afraid that the extra cost of metallic filament lamps is going to be a serious thing in obtaining the patronage of the small householder. Of course, it is the excellent business that gas undertakings under their conditions (which are not identical with those of electricity supply) can do with small householders through the prepayment meter system that raises the envy of electricians. Electric prepayment meters have not proved successful; and some electricians who have got them would now rather be without them. As Mr. Wilkinson says, their cost is heavy; and they are troublesome to maintain. They soon become full of coppers if a "large" amount of light is used; and then it is necessary to send someone to remove the coins, seeing that otherwise the meters become jammed, and the supply is either cut off, or, worse still, the circuit is not broken, and the users get a further supply free. The reason they become jammed so quickly is that, if a consumer is using simultaneously (say) four 30-watt metallic filament lamps, and the covering charge on the prepayment system is 8d. per unit, he has to drop a penny into the box every hour; if the covering price is as low as 6d. per unit, he has to part with a penny every 1½ hours.

There is not the slightest doubt that the metallic filament lamp is considerably worse for the eyesight than the old carbon filament lamp—though that was bad enough. We know of workers pursuing their daily vocations in places where metallic filament lamps are used pretty constantly, through the absence of proper provision of natural light, who complain bitterly of the aching and strain experienced by their visual organs since the new lamps have been brought into use by their employers on the grounds of economy. Money saving by the employer on his electricity bill will not compensate the employee for degeneration of his eyesight, owing to the great intensity of the hair-like filaments. The matter ought to be kept well in mind by those who are responsible for lighting schools, as there may be more damage occasioned there to the eyesight of the nation than anywhere else. In one of its editorial articles, the "Electrician" has been referring generally to the subject of the metallic filament lamp; and it is noticed that, now the "turmoil" associated with the introduction of the metallic filament lamp has settled down, our contemporary is able to perceive that one of the two principal differences which have been caused by its introduction is "that greater care will be taken—in fact, will have to be taken, if we are not to suffer optically by the abuse of the light." We agree as to the danger; and compliment our friends on recognizing it. The means of suppressing it is by the judicious employment of shades. But this has the effect of depreciating the amount of useful illumination afforded by the lamps on a given consumption of electricity, and, on the illumination basis, renders the electric light still dearer. While our contemporary's interest is at a high pitch on this subject, it would be well if it would urge the issuing of a warning to shopkeepers who make metallic filament lamps the most prominent feature of their shop windows, instead of the goods they wish to dispose of. The result is that the would-be buyer is blinded to such an extent that the virtues of the tradesmen's wares are hidden from him. The glare—"glare" is a subject that was well forward in our columns last week—is too much for him; and he passes on to windows that are lighted in a more prudent manner. Illumination with discrimination is not always practised by the shopkeeper; and what cares the electrician so long as he retains a consumer, or gets a new one?

The "Electrical Times" has given, through concrete figures, confirmation to the generally recognized fact that the majority of central stations in the matter of the demands upon them have latterly been practically merely marking time, and that some have actually suffered decrease, while others have enjoyed increased outputs, but (as has been frequently pointed out in the "Memoranda") at power and not lighting rates. The data supplied refer to the maximum loads at electricity works for the past three years; and looking down them, it is easy to pick out, from the figures alone, the towns where the power load has come in, if not remuneratively, conveniently to swell the load, as well as the residential towns where lighting is really the only class of business obtainable. The comments of our contemporary may be reproduced here: "That station revenues have suffered a set-back from tungsten and tantalum lamps is a fact only too well established. But we believe that electrical manufacturers will be agreeably surprised to find that, on the whole, maximum loads have gone up. There have been sad fallings-off here and there; but in the majority of cases the worst that has happened has been a slowing-down in the rate of growth." The aggregate of maximum loads represents a growth at the rate (roughly) of 5 per cent. per annum. "Probably this is a slight over-estimate, since a certain number of stations have omitted to send in their loads; and no doubt some of these are reticent because they have retrogressed. But it can, we think, be taken for granted that in any case the aggregate demand on the stations of the country has not diminished, but is increasing. The rate of growth has slowed-down



greatly, but still we have neither come to a standstill nor receded. What has happened is fairly obvious. The drop in demand, owing to the replacement of carbon by wire lamps, has been slightly off-set by the accelerated accession of new lighting customers, but the big countervailing item is the rapid increase in the power business. *Financially, there has been a wholesale replacement of high-price lighting units by low-price power units; and we fear that some little time must elapse before the proportion of lighting to power units will increase.*" In the last portion of this quotation, it is evident that there is recognition of the fact that the metallic filament lamp is not working marvels in bringing in new consumers. It is remarked that the replacement of carbon by metallic filament lamps has only been "slightly off-set" by the accession of new lighting consumers; and the fear has taken root that "some little time must elapse before the proportion of lighting to power units will increase." It is quite a change to have a reasonable recognition of the position.

### THE LATE MR. JOHN ROMANS.

IN the "JOURNAL" last week (p. 151), we recorded the death, in his 91st year, of Mr. John Romans, of Newton Grange, Dalkeith. The funeral took place last Wednesday, at Newbattle Churchyard, and was attended by a large number of mourners, including representatives from the Mid-Lothian County Council and various other public bodies. A correspondent has sent us a newspaper containing an account of deceased's life-work, from which we are able to amplify the few particulars already given.

Mr. Romans was born at Newbattle on March 1, 1819, and was educated in the parish school, and afterwards at a school in Dalkeith. He was brought up as a millwright with a firm in Loanhead; and on the completion of his apprenticeship he came to London, and was employed by Messrs. Hunter and English, at Bow. While working for them, circumstances, mainly arising from the active part he took in trade disputes (he was a Chartist and a Cobdenite), led him to decide on emigrating to Canada, where he had a prosperous relation who had sent him an invitation to go over. At that time, however, the Directors of the Commercial Gas Company, at whose works he had been erecting some machinery, engaged him as one of their engineering staff. While discharging the duties of his new position, he married the daughter of Mr. Thomas Samson, an accountant in the service of the East India Company. He remained in London till 1851, when he was appointed Engineer and Secretary of the Devonport Gas Company. During his residence in that town, he was successful in obtaining from the War Office and the Admiralty a grant to assist in the erection of a church and the provision of a clergyman for Scottish soldiers, sailors, and artisans.

In 1863, Mr. Romans returned to Edinburgh, and took an active part in the municipal affairs of the city; subsequently becoming a member of the Town Council. The subject of the acquisition of the water supply was then under consideration; and, after prolonged opposition, it was decided to purchase the works of the Water Company. The question then arose as to where the city should go for an additional supply. After personally surveying all the sources recommended, Mr. Romans considered St. Mary's Loch was by far the most suitable; and a Bill to sanction its appropriation was submitted to Parliament. It was passed by the House of Commons, but thrown out by the House of Lords. The municipal elections followed shortly after; and as it appeared to him that his views were not in harmony with those of the majority of the electors, he retired. During the time he was a member, he vigorously advocated the purchase of the undertaking of the Gas Company, which, as is well known to most of our readers, was accomplished in 1888.

In 1891, Mr. Romans, accompanied by one of his daughters, made a tour of Canada and the United States, where he delivered lectures, and was most hospitably entertained in all the cities he visited. He was a member of various societies in the Dalkeith district, and for a long time Chairman of the Newbattle School Board and representative in the Mid-Lothian County Council.

**Sinking and Lining Shafts.**—A method for sinking and lining shafts simultaneously is outlined in the contract drawings for some of the work of the Board of Water Supply of the City of New York in constructing the Catskill aqueduct. The scheme consists in suspending in the shaft a wooden lining platform, in the centre of which is a hole large enough to allow a "muck" bucket to pass through it. The full or empty buckets may be hoisted or lowered through the hole in the platform without interrupting the concreting operations.

**Inverted Burner Anti-Vibrators.**—In last week's issue (p. 158), illustrated reference was made to a new type of anti-vibrator for inverted burners which is being put upon the market by Messrs. J. & W. B. Smith, of Farringdon Road. The firm also draw our attention to a new pattern of anti-vibrator inverted burner pendant; the anti-vibrator in this case consisting of a coil spring (to the top and bottom of which the gas-supply pipe and the pendant respectively are attached) and a flexible tube connection. This is an attractive looking, inexpensive, and very useful fitting, suitable for all positions where much vibration and severe shocks are to be anticipated.

### GAS BILLS FOR 1910.

#### [FOURTH ARTICLE.]

THE review of the Bills promoted by Statutory Gas Companies is concluded this week, and a commencement is made with those promoted by Local Authorities.

The Bill deposited by the Exmouth Gas Company is mainly a financial one. From the preamble, it is gathered that the existing share capital of the concern is made up of £3600 ordinary £10 shares (1865 Act) entitled to a dividend of 10 per cent., £3000 ordinary £10 shares (1865 Act) entitled to a dividend of 7 per cent., £4000 ordinary £10 shares (1882 Act) entitled to a dividend of 7 per cent., and £12,200 preference £10 shares (1882 Act) entitled to a dividend of 5 per cent. The premiums upon the sale of shares amount to £1742 10s. in respect of the ordinary shares and to £2790 7s. 6d. in respect of the preference shares. Under the 1865 Act, the Company have borrowed £1650, entitled to interest at the rate of 5 per cent.; and under the Act of 1882, they have borrowed £5000, entitled to a dividend of 4 per cent. Turning to the clauses of the Bill, it is seen that the Company desire to extend the limits of supply, so as to include the parishes of Lympstone and Woodbury. Certain plots of land are scheduled which the Company need for manufacturing purposes. It is intended to convert the existing ordinary and preference capital on a 5 per cent. basis; and additional capital powers are sought to the extent of £24,000, of which not more than £16,000 is proposed to be raised by way of preference stock. To the issue of the additional capital, the new auction clauses are to apply. The Company ask for sanction to borrow, inclusive of the sum of £6650 already raised, £9000 in respect of the consolidated ordinary and preference stocks, and in respect of the additional capital up to one-third. The sliding-scale provisions of the Act of 1882 are to be amended on the ordinary lines, to comply with the altered conditions through the conversion to 5 per cent. stock. Power is to be taken to form a special purposes fund. The prescribed illuminating power of the gas supply is proposed at 14 candles, tested by a No. 2 "Metropolitan" burner. A stand-by clause is inserted to meet the cases of consumers having private supplies. The ordinary prepayment clause appears. It is also contemplated that, after the passing of the Bill, the Company shall not be liable to forfeiture by reason of the presence in the gas of sulphur compounds other than sulphuretted hydrogen. [Parliamentary Agents: Messrs. Torr and Co.]

The terms of the three Bills promoted, under the auspices of the Gas Companies' Protection Association, and dealing with the joint application regarding the adoption of the "Metropolitan" No. 2 test-burner, were dealt with in the "JOURNAL" for Dec. 21, p. 823. The names of the Companies joining in the promotion were published on Nov. 23, p. 548. [Parliamentary Agents: Messrs. R. W. Goofer and Sons.]

In principal part, the Bill promoted by the Great Grimsby Gas Company is for capital purposes; but opportunity is taken to secure several currently customary powers. It is requested that the limits of supply may be extended, in order to include the parishes or townships of Ulceby, North Killingholme, and South Killingholme, and the parishes of Aylesby, Habrough, Healing, Immingham, and Stallingborough. Within this extended area, the Company desire to be empowered to charge 6d. per 1000 feet in excess of the price for the time being within the present limits of supply; but any sum so charged is not to be taken into account in calculating the rate of dividend payable under existing powers. The Company ask for authority to create and issue additional capital to the amount of £120,000, of which not more than £40,000 is to be raised as preference shares or stock. The new auction and tender clauses are to apply to the additional capital. Borrowing powers to the extent of one-third of the additional capital are desired. The Company seek to adjust their reserve fund powers on modern lines, and form a special purposes fund. Land is scheduled which the Company wish to utilize for the storage of gas and residuals. In regard to the gas supplied, it is proposed that the prescribed illuminating power shall be 14 candles, tested by the "Metropolitan" No. 2 burner. A stand-by clause is inserted for the protection of the Company in respect of gas consumers with private installations. Power is desired by the Board to appoint one or more members of their body to be Managing Director or Directors of the Company, in terms similar to those included in the Bristol Bill (noticed last week). They also request to be invested with the right to determine the salary of the Secretary. Concerning the Auditors, it is proposed to enact that, as from Jan. 1 next, no person shall be appointed as an Auditor of the accounts who is not either a chartered accountant or an incorporated accountant; and it will not be necessary for such person to be a shareholder. [Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.]

Mainly for the purpose of extending their limits of supply, the Shirebrook and District Gas Company are approaching Parliament. It appears, from the preamble of the Bill before us, that the Mansfield Improvement Commissioners (now Corporation) were, by their Gas Act of 1878, empowered, *inter alia*, to supply gas within the whole parish of Warsop; but there has been no exercise of the powers. Further by the Bolsover Gas Order of 1894, the Bolsover Gaslight and Coke Company, Limited, were authorized to supply gas within the parish of Bolsover; but there are portions of the parish still unsupplied. It is desired that the existing powers in regard to Warsop and the unsupplied parts of



Bolsover be repealed, and that the limits of supply of the promoting Company be extended, in the county of Nottingham, to the parishes of Cuckney and Norton, and the remainder of the parish of Warsop not already included in the area of supply of the Company as defined by the Act of 1899; and in the county of Derby, to specified portions of the parish of Bolsover. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

Coming now to the Bills promoted by Local Authorities, there are in all eleven which refer to gas in whole or in part.

Taking them in alphabetical order, the first is the Bill of the Bishop's Stortford District Council. It is a purchase measure; and (had the Council not themselves discarded it, as reported last week) its chief interest would have rested in the fact that it conflicts with the scheme for the fusion of certain Essex Companies as noticed in our first article on Bills for the session (*ante*, p. 23). Before the abandonment of the Bill was resolved upon, the following indication of the principal provisions had been drafted. The preamble of the measure recites that the Bishop's Stortford and District Gas Company were, by an Act passed in 1904, incorporated and authorized to supply gas within the urban district of Bishop's Stortford and certain adjoining parishes. The issued ordinary and preference capital (including £771 17s. 6d. premiums) amount to £35,391 17s. 6d.; and there has also been borrowed £11,400. The Council believed it was now expedient they should be authorized to acquire the Company's undertaking. They also took the opportunity of asking that the period prescribed by their Electric Lighting Order within which they are to supply electrical energy should be extended, and that additional electrical powers should be conferred upon them. Examining the clauses of the Bill, it is seen that the Council required to purchase the undertaking either by agreement or arbitration under the Lands Clauses Acts; and there followed all the customary clauses affecting transfer and the conduct of the business. Succeeding were the clauses to confer on the Council the powers of gas manufacturers and suppliers. The price of gas was proposed to be limited to 4s. per 1000 cubic feet; and the excess charges for prepayment supply beyond the ruling ordinary ones were on the usual lines. The illuminating quality of the gas was to be prescribed at 14 candles, as tested by the "Metropolitan" No. 2 burner. The Council requested power to borrow money necessary for the purchase of the works together with the cost of the Act, and such other money as might from time to time be required, under the sanction of the Local Government Board. The period asked for within which to repay the purchase money was 45 years. [*Parliamentary Agents: Messrs. Baker and Co.*]

In an Omnibus Bill, the Bradford Corporation seek for the confirmation of an agreement dated Dec. 19, 1907, made between Henry Ripley, Hugh Ripley, and Edward Guy Ripley, as Trustees under the will of the late Sir Henry William Ripley, of the one part and the Corporation of the other part. The agreement is set out as a schedule to the Bill. Under it, it is seen that the Corporation are purchasing the private gas-works in possession of the Trustees, and situated at Ludlam Street, for the price of £15,000. Stocks of coal, coke, gas, liquor, &c., are to be taken over on a valuation by Mr. Alfred E. Grainger and Mr. Charles Wood, the Corporation Gas Engineer; and in the event of disagreement, they will have power to choose a third person. The Corporation ask for the necessary borrowing powers to give effect to the agreement; the money to be repayable in a period not exceeding twenty years. In regard to electricity supply, the Corporation desire power to attach, with the consent of the owner, to any building, brackets, wires, and apparatus as required for street lighting. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Egremont District Council are proposing the purchase of the undertaking of the Egremont Gas Company, under an agreement already entered into. The Cleator Moor District Council have powers of, and do, supply in certain portions of Egremont; and the Whitehaven Rural District Council have also mains in other parts. These mains the Council desire to acquire. The preamble also states that estimates have been made of money requirements beyond those for purchase. They are: For new works and extensions, £3700; for the construction of a new road, £100; for the purchase of cookers, engines, stoves, and meters, such sum as may be required from time to time not exceeding £500; and for the construction of further works, as necessary, a sum not exceeding £10,000. The agreement between the Council and the Company is dated Nov. 2 last; and it shows that the consideration for the sale is to be the payment by the Council of the sum of £6500, and also of such amount as shall be agreed upon, or in default of agreement fixed by arbitration, as the price of the coal, coke, gas, lime, and residuals. The Bill provides for the confirmation of this agreement; and there follow all the usual essential clauses relating to transfers and winding-up. Provision is also made for the purchase of the gas-mains of the Cleator Moor Council in the Egremont Council's territory—the price to be decided, failing agreement, by a single arbitrator appointed by the Local Government Board. If the power is granted, the rights of supply of the Cleator Moor Council in the district are to be repealed. Similar clauses appear in relation to the mains of the Whitehaven Rural District Council in the parish of St. John Beckermeth. For the purposes of the undertaking and the construction of a new road, the Council desire compulsory powers of purchase over certain specified lands. The ordinary prepayment clause is included. The price of gas is limited to 5s. 6d. per 1000

cubic feet. As to discounts, the old 10 and 15 per cent. clause is inserted. The illuminating quality of the gas is proposed at 14 candles, tested by the "Metropolitan" No. 2 burner. Authorization to borrowing the money required is asked, with repayment in thirty years of money spent in purchase, new works, and extensions; in forty years for lands; in ten years for cookers, engines, stoves, and meters; in five years for the costs of the Act. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

The Hoyland Nether District Council were coming for confirmation to an agreed transfer of the undertaking of the Elsecar, Wentworth, and Hoyland Gas Company, and for powers of supply; but, as reported last week, the ratepayers have rejected the scheme. Prior to this, the following reference to the provisions of the Bill had been prepared: The limits of supply were Wentworth, so much of Brompton-Bierlow as is not included in the area of the Wath-upon-Deane and District Gas Order, part of Worsbrough, and Tankersley. The terms of transfer were: The payment of £27,000, and of the amount which the Company, with the consent of the Council, might expend on capital account between Nov. 30, 1909, and Dec. 31, 1910, together with the determined value of the consumable stock. The purchase was to be completed on Dec. 31 next. All necessary provision in regard to transfer and winding-up was made in the Bill. It was also stipulated that, on the transfer, the Council should take into their employ Albert Frank Hall and William Stenton, being respectively the Secretary and Manager of the Company, for a period of at least three years, and otherwise upon terms and conditions of service substantially the same as those on which they were respectively employed by the Company on Nov. 30 last, provided that they first entered into an agreement to faithfully and efficiently serve the Council for the period named. Following were clauses containing powers essential to the conduct of the business by the Council. The Council desired that they and the Earl FitzWilliam might enter into agreements for the purchase and sale, or lease, of the gas-works lands. In connection with the fittings clause, the provision was inserted as to the adjustment of the charges in such manner so as to meet outgoings. The prepayment clause was in ordinary form. The limit of the price of gas was proposed at 5s. 10d. per 1000 cubic feet, for a prescribed 14-candle gas, tested by the "Metropolitan" No. 2 burner. Open power was contemplated in regard to the terms and conditions on which, under agreement, other authorities might be supplied with gas for public purposes. Authorization to the borrowing of the purchase money was desired, as well as to a sum not exceeding £8000 for the extension and improvement of the works—the respective repayment periods being proposed at 40 and 30 years. [*Parliamentary Agents: Messrs. Durnford and Co.*]

### The New Society of Engineers.

There was a large and distinguished gathering, which included a number of ladies, at the Waldorf Hotel last Wednesday evening, on the occasion of the dinner held, in accordance with the announcement previously made in the "JOURNAL," to celebrate the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society. Mr. E. J. Silcock, M.Inst.C.E., and Mr. W. N. Twelvetrees, M.I.Mech.E., Presidents of the two Societies, occupied respectively the chair and the vice-chair. Mr. Silcock, in proposing "The New Society," remarked that though the two organizations constituting it had for more than half-a-century been running on parallel lines, with similar objects and in very friendly relationship, it was not until after the death of the Secretary of his Society, Mr. Perry F. Nursey, and the appointment as his successor of the Hon. Secretary of the other Society (Mr. A. E. E. Ackermann, B.Sc.), that, owing largely to his good offices, an *entente cordiale* had been established, and an amalgamation of the two Societies was eventually brought about. He expressed the hope that by this union the usefulness of both might be increased. Mr. Silcock briefly sketched the history of the Society of Engineers; and Mr. Twelvetrees, in supporting the toast, gave some particulars as to the origin and work of the body he represented. He mentioned that the combined membership was 750. The President of the new Society (Mr. Diogo A. Symons, M.Inst.C.E.), who was temporarily absent, expressed through Mr. Ackermann his gratification that the amalgamation had taken place. After the speeches coffee was served; and the performance of a selection of vocal music brought to a close a very pleasant evening.

**Natural Gas, Coal, and Petroleum in Canada.**—It appears from a report which has been issued by the Canada Department of Mines that the production of natural gas is greatly on the increase. In 1907, the total value of the production was £163,000, an increase of 39·7 per cent. as compared with 1906; whereas in 1908 the production reached a value of about £202,550—this figure being by far the largest ever recorded, and showing an increase of 24·2 per cent. as compared with 1907. In 1908, the gas was produced entirely by the provinces of Ontario and Alberta. The production of coal in the two years named was respectively 10,511,426 and 10,886,311 tons, against 9,762,601 tons in 1906; about one-eighth of this being made into coke. The figures relating to petroleum show a decrease of nearly 33 per cent. for 1908 as compared with 1907; the actual production in the two years being 527,987 and 788,872 barrels, each containing 35 gallons.



## PERSONAL.

Herr RICHARD PINTSCH, the head of the firm of Julius Pintsch, of Berlin, with its affiliated businesses in London and Vienna, has had the honorary degree of Doctor of Engineering conferred upon him by the Technical College of Berlin, in recognition of his eminent services in gas lighting, especially in connection with railway carriages and buoys.

In succession to Mr. A. CLEMENT HOVEY, who some time ago tendered his resignation, but continued to occupy the position pending the selection of a successor, Mr. E. P. STEVENSON has been appointed Engineer of the Milan works of the Continental Union Gas Company. Mr. Stevenson is a son of the late Mr. G. Ernest Stevenson, who was Gas Engineer to the Manchester Corporation; and his most recent engagement has been at the Belgrano works of the River Plate Gas Company.

Rather more than two years ago, Mr. R. ST. GEORGE MOORE, M.Inst.C.E., who was then President of the Society of Engineers, left England to fulfil an important professional engagement in China. It comprised the construction of the Hankow Water-Works, and the supervision, as Engineer-in-Chief, of the carrying out of the Hupeh section of the Canton-Hankow Railway. The water-works having been completed, and Mr. Moore's agreement with respect to the railway terminated, he is returning to England, and is expected to arrive next month.

## OBITUARY.

We regret to record the sudden death on Wednesday last, at Groveside, Teddington, at the age of 72, of Mr. JOSEPH QUICK, the well-known water engineer. According to some particulars contained in the current number of "Engineering," Mr. Quick early in life passed through a course of study specially arranged to prepare him for the profession of a civil engineer; and in 1853 he entered the office of his father, who was then prominently known in connection with the construction of water-works. Next year the son was sent to the Berlin Water-Works, which were then being constructed by Messrs. Aird. Returning to England, he entered his father's office, and was occupied on the new works of the Grand Junction Water Company at Campden Hill, Kensington, and at Kew, as well as on the Hampton and Battersea works of the Southwark and Vauxhall Water Company. In 1858, he became Assistant-Engineer to the latter Company, but at the same time was permitted to practise on his own account. In this way he was able to give the advantage of his experience to many companies and communities owning water-works. In 1863, he became a partner with his father, and, in conjunction with him, carried out many extensive works, not only for the two London Companies already named, but at Portsmouth, Amsterdam, and elsewhere. He retired some years ago; but the firm of which he was the head are still the Consulting Engineers of the Portsmouth Water-Works Company. Mr. Quick was elected a member of the Institution of Civil Engineers in 1870.

**Gas for Store Lighting.**—At the last annual meeting of the American Commercial Gas Association, Mr. R. R. Young read a paper on "The Future of Gas for Store Lighting," in the course of which he said: "The correct way theoretically to light a store is to have the regular inverted incandescent gas-lamp fitted with the proper diffusing shade placed in single units over the counter, spaced and hung so as to have the light evenly distributed; but experience has taught us that, with stores of the usual width of 18 to 20 feet, the larger units of the inverted type of fixtures, such as the reflexolier fitted with the proper shades, and the inverted arc lamp, are far more satisfactory to the customer. In the case of the larger units, we reduce the number of parts to be taken care of, such as glassware, where there is one globe with the arc as against eight or ten pieces of glassware, to the single lamps, and one pull instead of four or five when lighting, and only one pilot-light to look after. The installation is more convenient to light and extinguish, and at the same time meets one of the arguments advanced by the electric solicitor for his wares—that of convenience."

**Frankfort Gas Supply.**—It is announced by the "Journal für Gasbeleuchtung" that the amalgamation which was arranged last year between the Frankfort Gas Company and the local works of the Imperial Continental Gas Association has involved a rearrangement of the staffs of the respective works at Frankfort-on-the-Maine. Herr Karl Kohn, who was Manager of the old Frankfort Gas Company, retires by his own desire from management, but places his services in an advisory capacity at the disposal of the new joint Company. The management of the latter will be in the hands of Mr. William W. Drory, "the senior of the German gas industry," and Herr Ludwig Schiele, the son of the departed "Nestor" of that industry. The Board of Management will be under the chairmanship of Herr L. Delbrück, a banker and member of the House of Representatives. The new Company will work the two gas-works of the Imperial Continental Gas Association on the Ober-Main Quay and at Bockenheim, as well as the Gutlentstrasse works of the Old Frankfort Gas Company. A new gas-works is, however, shortly to be erected on the Osthafen, and equipped with all modern apparatus.

## STATISTICS OF WORKMEN'S COMPENSATION.

THERE were noticed in last week's issue of the "JOURNAL" some of the principal points from the first part of the Home Office Blue-Book for 1908 on the Workmen's Compensation and Employers' Liability Acts. These, however, dealt only with statistics of compensation under the newest Act (that passed in 1906) in cases occurring in certain specified industries. Part II. of the Blue-Book furnishes the customary information with regard to the general administration of the different Acts; and from this portion some figures may, as usual, now be extracted. The matters referred to in this part of the returns are: Cases coming for arbitration before the County (in Scotland, the Sheriff) Courts; those in which memoranda recording agreements or awards by committees or private arbitrators under the Workmen's Compensation Acts are registered in the County or Sheriff Courts; those under the Employers' Liability Act of 1880; those taken to the Appeal Courts; and the use made of the services of Medical Referees. The "contracting-out" schemes certified by the Chief Registrar of Friendly Societies are set forth in the annual report dealing with Friendly Societies; and an opportunity may be taken next week of making some brief reference to them. The part of the Home Office compensation statistics now under review is divided into three sections, covering respectively England and Wales, Scotland, and Ireland.

Taking first England and Wales, it is found that in 1908 the number of cases actually dealt with under the Workmen's Compensation Act of 1906, by County Court Judges and by County Court Arbitrators was 3795; and of these 3602 were decided by Judges, and 47 by Special Arbitrators, while 146 were settled by acceptance of money paid into Court. In addition to the cases adjudicated on, there were 1563 that were withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the officials of the Court to state definitely the results. This makes the total number of cases taken into Court, under the 1906 Act, 5358—as against 3330 in 1907, and 2532 in 1906, under the earlier Acts. In 96 of the cases last year compensation was claimed for incapacity due to industrial disease. With regard to the decisions come to, it may be remarked that of the claims settled within the cognizance of the Courts, the decision in 2050 cases was in favour of the applicant, and in 453 in favour of the respondent. Thus the proportion of successful claims was 82 per cent., which compares with 84 per cent. in 1907, and 83 per cent. in 1906. The number of cases in which compensation was awarded (under the 1906 Act) on account of the death of workmen leaving dependants was 772, in addition to 30 cases under the earlier Acts; the corresponding figure for 1907 having been 537, and that for 1899 (the first complete year during which the first Compensation Act was in operation) 219. The total amount of compensation awarded last year in the 772 cases of death in which the deceased left dependants was £128,340, or an average of £166 per case. The total sum involved in the 30 cases under the earlier Acts was £4004, or an average of £133 per case. These figures compare with £174 9s. and £180 12s. 8d. respectively for the previous year. The average figures for the last five complete years under the earlier Acts (exclusive of the few cases in which the deceased left no dependants) were: Number of cases, 426; total compensation, £78,097; average compensation, £183. Of the 772 cases settled last year in which compensation was awarded to dependants under the Act of 1906, there were 268 in which sums of less than £150 were awarded (cases of partial dependency); the total amount being £18,275, or an average of £68 3s. 10d. per case.

With regard to the cases of injury, the assignment of a weekly sum was the most general method of compensation adopted; there having been, under the 1906 Act, 1009 cases in which a weekly payment was fixed, as compared with 263 in which the compensation was returned as consisting of a lump sum. In 33 of the cases in which a lump sum was paid, the claimants accepted amounts paid into Court; while in most of the remaining instances, a lump sum was apparently awarded by consent of the parties. The average amount of the compensation was £24 17s. 6d.; whereas the average figures for the last five complete years under the earlier Acts were: Number of cases, 113; average amount of compensation, £34. In the instances last year in which a weekly payment was awarded, the average compensation was for cases of total incapacity 12s. 9d., and partial incapacity 10s. 4d. per week. Under the Acts of 1897 and 1900, there were seven classes of employment included—railway, factory, mine, quarry, engineering work, building (part only), and agriculture; but the cases which were taken into Court last year, within the much wider basis of the 1906 Act, are classified under no less than seventeen heads, the grouping of occupations being as far as possible that adopted in the Census returns. It may be of interest to reproduce the list and the number of cases taken into Court during 1908 under each head: Professional employments, 19; commercial occupations, 19; shop assistants, 121; domestic servants, 368; seamen, 326; fishermen, 17; agriculture, 284; building, 543; factories and workshops, 1440; docks, wharves, and quays, 275; mines, 1057; quarries, 66; constructional work (excluding building), 129; railways, 250; inland transport by road, 362; inland transport by water, 29; miscellaneous, 53. These figures are eloquent.

Instances in which memoranda were registered in County



Courts, having reference to cases settled by agreement or private arbitration, form the subject of the next table. The number on the present occasion shows a very large increase over preceding years. This is attributed partly to the much wider scope of the new Act, but mainly to the provisions therein for enforcing registration. The number, however, it is stated, is only a small proportion of the cases in which compensation is settled by agreement. According to the table, the registrations under the 1906 Act of cases settled were: By agreement, 20,414; by committee of employers and employed, 164; by an arbitrator, 2. The corresponding figures for the last complete year under the earlier Acts were 5096, 68, and 7. In these agreed cases in 1908, the average compensation to dependants in connection with fatal accidents was £169; and the average weekly payment in cases of incapacity, 13s. 3d. For the last five complete years under the earlier Acts, the average payment in the event of death was £160; and in cases of incapacity, 13s. 1d. per week. The number of accidents involving incapacity under the Act of 1906 in which the memorandum registered was for a lump sum and not a weekly payment, was 10,201, as compared with 5964 cases in which a weekly payment was agreed upon. The average lump-sum payment over the 10,201 cases was £18 19s. 2d.; but the figures under the different classes of employment show wide variation. It would seem that the accidents in connection with docks, wharves, and quays were generally of the least serious character, as the average lump sum commutation in this section was no more than £12 15s. 5d. Next in order are domestic servants, £13 2s. 11d.; and then agriculture, with £13 17s. 7d. The highest average is in the case of mines (£34 4s. 3d.), quarries (£28 4s. 11d.), and railways (£28 4s. 3d.). Factories and workshops, under which are classed 4079 of the 10,201 cases of commutation, have an average of £19 7s. 6d.

Now we come to the Employers' Liability Act of 1880, which is dealt with in the report upon as nearly as possible the same lines as the Compensation Act, but in a simpler fashion—owing to the facts that all cases except those removed to the High Court are decided by the County Court (there being no arbitrators), and that the damages awarded can always be stated as a lump sum. Since the passing of the first Compensation Act, there has been a continuous falling off in the number of actions brought under the Employers' Liability Act. The figures were: 1897, 688; 1907, 393; 1908, 260. Of last year's actions, 67 ended in judgment for the plaintiff, 45 in favour of the defendant, and 148, or more than 50 per cent., were "otherwise disposed of." The total amount of damages awarded was £4535. Of the 67 cases in which judgment was given for the plaintiff, only two related to fatal accidents; the total compensation awarded being £406. There were 31 cases of total incapacity, with compensation of £2042, or an average of £66 a case; and 34 of partial incapacity, with total compensation of £2087, or an average of £61 per case. The average amount of damages recovered last year in case of death under the Employers' Liability Act was thus £203, compared with £165 under the Compensation Acts. To proceed under the former Act is, however, apparently more expensive; the average amount of solicitor's costs having been £23 13s. 5d. under the Employers' Liability Act, and £11 2s. 10d. under the Workmen's Compensation Acts.

In England, during 1908, the number of actions under the Compensation Acts carried to the Court of Appeal was 112, which was just below 2 per cent. of the cases that came before the County Courts. Of these, 47 were appeals by workmen, and 65 by employers. Of the former, 11 were successful, and of the latter 28; while 20 appeals were abandoned, withdrawn, or else settled out of Court before the hearing. There were three appeals to the House of Lords—all unsuccessful; the workman being the appellant in one case. There were five appeals under the Employers' Liability Act; but of these only one (which was by a workman) was successful. One appeal to the House of Lords under the Compensation Act of 1897 turned on the meaning of the words "accident arising out of, and in course of, the employment;" another under the Act of 1906, upon the definition of the word "accident." Of the 112 cases carried to the Court of Appeal, five were in reference to the definition of the term "average weekly earnings," and no less than eighteen to the meaning of the words "arising out of, and in the course of, the employment." In several more, the point was the definition of either the word "factory" or the word "workman."

Dealing with the Scottish returns, it is stated in the report that during 1908 the number of cases taken into Court under the Compensation Acts was 1026 (compared with 417 in the previous year); and under the Employers' Liability Act, 140. The average amount of compensation paid in case of death where dependants were left was £144 15s. 10d. in cases decided in the Sheriffs' Courts under the Compensation Acts, and £184 15s. 5d. where memoranda were registered. In cases of incapacity, the lump-sum figures were respectively £18 1s. 7d. and £16 4s. 9d., and the weekly payments 13s. 10d. and 13s. 5d. In Ireland last year there were 718 cases taken under the Workmen's Compensation Acts, and five under the Employers' Liability Act. The average amount of compensation in cases of death where dependants were left was £139 16s. 8d. when decided in the County Courts under the Compensation Acts, and £156 4s. 1d. where memoranda were registered. In connection with claims for accidents causing incapacity, the lump-sum figures that were awarded were respectively £34 2s. 2d. and £32 15s. 5d., and the weekly payments were 9s. 2d. and 11s. 6d.

## MUNICIPAL INCOME AND EXPENDITURE.

### Statistics from the Annual Local Taxation Returns.

THERE has just been published in the form of a Blue-Book Part V. of the Annual Local Taxation Returns, dealing with the accounts of the Councils of Boroughs other than Metropolitan Boroughs for the year 1906-7. It is needful, as usual, to lay special stress upon the period to which the figures refer, as they are, of course, by this time somewhat out-of-date. Presumably, however, the work entailed in the compilation of the returns is too heavy to permit of earlier publication—seeing that the date of issue is just about the same as was the case last year—and so the best that can must be made of them.

The number of boroughs in existence at the end of the year 1906-7, excluding the City of London and the Metropolitan Boroughs constituted under the provisions of the Local Government Act of 1899, was 326, of which 72 were county boroughs. The receipts (including transfers from one account to another), other than from loans, which are shown in the abstract of the accounts of borough councils for the year 1906-7, not being the exchequer contribution accounts of county boroughs, nor accounts relating to tramway, light railway, or water, gas, or electricity supply undertakings, amounted in the aggregate to £33,206,954. Of this sum, £18,861,607 was from rates; £27,895, the grant under the Agricultural Rates Act, 1896; £1,072,745, sums transferred to relief of rates from accounts relating to tramways and light railways and water, gas, and electricity undertakings; and £5,725,646, on account of education. The expenditure (exclusive of that defrayed out of loans, and of exchequer contribution accounts and accounts relating to tramway, light railway, water, gas, or electricity undertakings), including money passing from one account to another of the same corporation, amounted to £32,596,189, including £9,990,701 spent on account of education. Some of the principal items here were: Public roads and streets £5,042,989; sewerage and sewage disposal, £2,225,965; public lighting (including expenditure on public electric lighting not represented by loan charges), £1,188,490; police (not including payments out of police pension funds), £1,587,018; scavenging, £1,206,539; salaries, &c., and superannuation allowances of officers, and certain establishment charges, £1,386,263. There was also a sum of £318,807 transferred to make up deficiencies in revenue on account of tramway, light railway, gas (£795), water, and electricity undertakings.

The expenditure during the year by the councils which was charged, or was intended ultimately to be charged, to loan accounts, excluding expenses in respect of the undertakings just mentioned, amounted to £4,922,168. The individual headings were: Education; public roads and streets; sewerage and sewage disposal works; harbours, piers, docks, &c.; housing of the working classes; public offices and buildings; parks and open spaces; lunatic asylums; hospitals; bridges and ferries; baths, washhouses, and open bathing establishments; depôts, stables, wharves, yards, and refuse destructors; other purposes. The total amount of loans actually raised during the year, excluding tramway, railway, water, gas, and electricity undertakings, and money borrowed under the Education (Provision of Working Balances) Act, 1903, was £5,421,185; while the repayments of principal and redemption of stock or annuities, and the total sum paid for interest, was £7,442,059. The amount outstanding at the close of the year under review in respect of the loans owing by councils (excluding tramway, &c., undertakings, but including education) was £122,764,730. Of this, £27,466,538 was for public roads and streets, £20,272,714 for sewerage and sewage disposal works, and £18,734,580 for education. The sums standing to the credit of sinking funds, loan funds, and redemption funds in connection with such of the outstanding loans of the councils as were repayable by means of such funds amounted at the close of the year to £7,880,500 in the case of county boroughs, and £1,440,009 in that of non-county boroughs.

Attention may now be given to the statistics with regard to accounts of councils in connection with the undertakings excluded from the figures already quoted—namely, tramway, light railway, and water, gas, and electricity undertakings. The receipts for the year 1906-7 (excluding sums withdrawn from reserve, &c., funds, and amounts transferred from other accounts to make up deficiencies in revenue), other than from loans, and the expenditure not defrayed out of loans, in the different branches, were as follows: Tramways and light railways—Receipts, including £35,627 received from other accounts of the councils, £5,522,555; and expenditure, including loan charges, £5,040,720. Water undertakings—Receipts, including £166,251 received from other accounts of the councils, £4,032,214; and expenditure, including loan charges, £4,150,378. Gas undertakings—Receipts, including £479,968 received from other accounts of the councils, £6,712,062; and expenditure, including loan charges, £6,039,243. Electricity undertakings—Receipts, including £1,012,544 received from other accounts of the councils, £3,302,576; and expenditure, including loan charges, £3,130,082. This gives a total income for the four classes of undertakings of £19,569,407; and an expenditure of £18,360,423. It should be noted that the expenditure excludes sums paid to reserve, &c., funds, and amounts transferred in relief of rates, or to meet deficiency in revenue of another undertaking; but expenditure out of sums withdrawn from reserve, &c., funds is included.

The total amounts expended by the councils out of loans (



intended ultimately to be charged to loan account), and the total amount of loans raised by the councils, during the year under review, for the purposes of the four kinds of undertakings now being considered were: Tramways and light railways—Expenditure out of loans, £1,239,975; and receipts from loans, £901,373. Water undertakings—Expenditure out of loans, £1,517,299; and receipts, £1,516,179. Gas undertakings—Expenditure out of loans, £313,932; and receipts, £255,124. Electricity undertakings—Expenditure out of loans, £1,206,141; and receipts, £990,049. Thus the total expenditure out of loans was £4,277,347; the receipts were £3,662,725. The sum applied by the councils in the repayment of principal and the redemption of stock or annuities, in connection with loans raised for purposes of the undertakings referred to, was £2,049,104. The total expenditure (including interest and dividends) on account of loan charges was £6,590,970. The loans outstanding were: Tramways and light railways, £21,230,598; water, £60,083,232; gas, £19,499,723; electricity, £20,411,595—making a grand total of £121,225,148. The sums remaining in sinking funds, loan funds, and redemption funds at the end of the year, to provide for the repayment of outstanding loan debt, was £5,671,645. The reserve funds, depreciation funds, and insurance funds established in connection with the undertakings named, was at March 31, 1907, £3,335,568.

According to the Census of 1901 (after taking into account all alterations of area between that time and March 31, 1907), the total population of the 72 county boroughs was 9,622,799, and that of the 254 other boroughs was 4,295,684—making an aggregate of 13,918,483. The total rateable value of agricultural land and other property was £73,265,136. The rates raised during the year by councils of county boroughs averaged 5s. 7½d. in the pound. In the case of the non-county boroughs, the average was 3s. 9½d. in the pound where the councils were not the local education authorities, and 4s. 8½d. where they were. The total amount raised was in the county boroughs £14,037,316; and in the non-county boroughs, £4,824,291.

It has been already stated that the total transfers from the accounts of tramway, light railway, and water, gas, and electricity concerns in aid of rates amounted to £1,072,745; while there were total transfers from borough, district, or other funds to make up deficiencies in the revenue of such undertakings to the extent of £318,807. The former amount was made up as follows: Tramways and light railways, £388,631; water, £102,448; gas, £490,767; electricity, £90,899. The deficiencies which had to be made good were: Tramways and light railways, £52,853; water-works, £238,361; gas, £795; electricity, £26,798. It will thus be seen that gas still remains far and away the most profitable, from a rate-aiding point of view, of the four classes of municipally managed undertakings referred to; for in addition to showing the greatest aggregate amount so transferred, it also exhibits a negligible deficiency to be made good, whereas the other three figure substantially in the last-named category.

Gas, therefore, occupying the premier position in this respect—as, of course, it does in others—it may fairly be dealt with first. Of the gas-works profits transferred in aid of the rates in the year under review, the several amounts over £10,000 were: Birkenhead, £11,050; Birmingham, £58,546; Blackpool, £15,081; Bolton, £20,000; Burnley, £11,778; Leeds, £15,273; Leicester, £34,159; Manchester, £60,000; Nottingham, £28,415; Rochdale, £17,693; Salford, £23,760; Southport, £13,000; Stockport, £13,000; and Warrington, £14,550. With regard to the electric light undertakings, picking out profits of £10,000 and over is once more a simple task. The only instances are Liverpool (£20,827) and Nottingham (£10,851). In the case of water-works, large profits are not to be anticipated; but Leeds comes out with £14,979.

On the point of losses, there is little to be said with regard to gas undertakings; the total amount involved being so absolutely trivial. At Morecambe, it is stated, a sum of £95 was transferred to meet a deficiency in revenue, and at Chard £700; these two instances making up the already-mentioned sum of £795 which represents the aggregate losses for the year 1906-7 on gas undertakings owned by the councils of county and non-county boroughs. Gas was supplied free to the public street-lamps at Oldham, Lancaster, Abergavenny, and Dewsbury; while at Colne part of the expenditure on street lighting was borne by the Gas Department. Deficiencies had to be met in the case of no less than twenty-nine electricity undertakings; but in only ten instances was the amount over £1000, and none of these exceeded £2000. Water-works always, in the nature of things, provide a numerous list of losses; but often they are only small. On the present occasion the sums over £10,000 are: Birmingham, £65,000; Halifax, £13,218; Huddersfield, £12,661; Swansea, £25,322; and Middlesbrough, £12,403.

In a recent number of the "Comptes Rendus," M. Meunier dealt with the subject of the incandescence of platinum in mixtures of coal gas and air. According to an abstract of the article in the "Journal of the Society of Chemical Industry," the author noticed, in the course of his experiments on the incandescence of platinum wires in the interior of a bunsen flame, that if the wire be perfectly clean, it no longer glows in the mixture of coal gas and air in the tube of the burner. When, however, the wire is passed between the fingers before being plunged into the gaseous mixture, incandescence is produced. Dipping the wire in ordinary drinking water also produces the same phenomenon; and the author comes to the conclusion that it is not the platinum itself but the saline substance upon it which causes incandescence.

## MODERN COKING PRACTICE.\*

THERE is much in this work by T. H. Byrom and J. E. Christopher which cannot fail to be both interesting and instructive to those whose experiences have been confined to gas-works. The book is well illustrated to the number of 109 plates, and covers a good deal of ground common to both industries. Chapters on the "Sampling and Valuation of Coal and Coke," "Cooling and Condensing Plant," "Gas-Exhausters," "Composition and Analysis of Ammoniacal Liquor," "Working-up of Ammoniacal Liquor," "Treatment of Waste Gases from Sulphate Plants," "Valuation of Ammonium Sulphate," all concern the gas engineer as much as they do his confrère of up-to-date coke-oven works.

The author commences by giving a short summary of the history of iron manufacture and allied industries, showing, by means of diagrams, the enormous increase in the production of pig iron since 1850. In that year, the world's output was only 4½ million tons; while in 1906, the output was no less than 60 million tons, of which Great Britain was responsible for 10 millions. This vast increase in the iron industry has been followed by an equally great development in the coke-oven industry, though, from the point of view of progress, it is somewhat unsatisfactory that no less than 80 per cent. of the coke is even now produced without recovery of the bye-products—representing, as the author points out, an annual loss of 220,000 tons of sulphate of ammonia and nearly a million tons of tar. This shows how great will be the competition gas-works will have to face in years to come.

The author passes on from a "General Classification of Fuels," in which he deals with the various impurities contained in coal, to a chapter on "Coal Washing," wherein we are introduced to six different types of machines, all of which are examples of inventive ingenuity. This is a subject which, without actually concerning the gas engineer, must yet appeal to his engineering instincts. Some gas coals contain a considerable amount of slaty material, for which they are earning an unenviable reputation; and it is conceivable that this useless matter will, in some cases, amount to fully 5 per cent., which, by means of the washing process, is all removable, and which, it may be pointed out, is equivalent to a loss of 500 cubic feet per ton. Further, this admixture of dross with the coal is a source of waste throughout the process, for its extra bulk must be paid for from the pit's mouth to the retort; and, again, it must be heated, thereby wasting fuel and reducing the capacity of the retorts; and, lastly, its presence in the coke to the extent of 7 or 8 per cent. seriously reduces the value of this fuel. This question of "Coal Washing," which is now a matter of importance to the coke-oven manager, may well eventually become one of moment to the gas engineer.

The calorific power of coal and coke, with a description of the best-known calorimeters, comes in for some consideration. Then follow three chapters on the various coke-ovens, from the beehive to the Collin. These chapters are excellently illustrated by photographs and reproductions from drawings, giving the reader a very good idea of the scientific development which has taken place in the construction of coke-oven plant. That this is considerable is proved by the fact that the production of coke per ton of coal has increased from about 58 per cent. to an average of about 66 per cent.; while the gas for disposal now amounts to nearly 60 per cent. of the entire production, as compared with a total loss in the beehive oven.

An interesting chapter is that on "Charging and Discharging Coke-Ovens." In up-to-date coke-oven practice, it is well known that the coal is first crushed in a disintegrator and is then compressed by stamping machines in a box of similar shape to the oven. It is then, while still in a compressed form, charged into the oven. The advantages of dealing with the coal in this manner are stated by the author to be: (1) Output is increased at least 10 per cent.; (2) denser coke; (3) the amount of coke breeze is reduced; (4) saving in labour; and (5) less wear on oven lining. The method of quenching the coke on its discharge is explained, as are also the means whereby undue breakage of the coke is prevented. This matter is not dealt with so fully as the importance of the subject warrants.

There is nothing in any way novel in the three chapters on "Cooling and Condensing Plant," "Gas Exhausters," and on the "Composition and Analysis of Ammoniacal Liquor," though the subjects are treated in an adequate manner. A good deal of consideration is given to the recovery of ammonia and the manufacture of ammonium sulphate. One or two types of saturators are described; while the question of the formation of blue and yellow salt is briefly discussed. A description is given of the Claus plant for sulphur recovery, and also the plant for manufacturing concentrated liquor, which latter process appears to obtain greater favour in coke-oven plants than in gas-works.

Chapter XVI., on the "Recovery of Ammonia Direct from Coke-Oven Gas," is a very interesting one, giving as it does descriptions and illustrations of three successful plants for the recovery of ammonia by means of an acid bath. More attention should be given to these processes in gas-works, eliminating as they do much unnecessary plant. In the first place, scrubbers are dispensed with, and the amount of cooling water is greatly reduced. Moreover, the two chief troubles of the sulphate plant—the purification of the waste gases and the disposal of the waste effluent—are by this means reduced very considerably, or

\* "Modern Coking Practice." By T. H. Byrom and J. E. Christopher. London: Crosby Lockwood and Son; 1910.



are avoided altogether. The Otto-Hilgenstock patented method of sulphate manufacture would appear to be a perfect marvel of simplicity.

The author's concluding chapter, on the "Use of Surplus Gas from Coke-Ovens," includes a couple of illustrations of the Koppers and Collin types of inclined ovens, designed on the lines of gas-works practice. A brief description is also given of the plant erected at Bargoed by the Powell Duffryn Steam Coal Company, who have laid themselves out to provide a good gas-making as well as coke-making plant.

The best feature of the work is the excellence of the illustrations, greatly adding to the value of the descriptive matter, which is well and lucidly written. As the author points out, there is a prospect of a combination of coke-works and gas-works practice in the near future, whereby good, hard, metallurgical coke will be produced as well as gas suitable for lighting purposes. It is this fact, which is undoubtedly true, that makes the book of special interest to gas engineers; and it certainly behoves them to become *au fait* of the methods of an allied industry.

## WORKMEN'S COMPENSATION CASES.\*

ABOUT a year ago,† we reviewed the first volume of the new series of "Butterworth's Workmen's Compensation Cases," and to-day we notice Vol. II. of that useful and instructive compilation of these important decisions under the Workmen's Compensation Act, 1906.

The volume under review is edited by his Honour Judge Ruegg, K.C., and Mr. Douglas Knocker, Barrister-at-Law. The arrangement of the reports has been changed, and, we think, improved. The cases here collected are those decided between September, 1908, and September, 1909. The decisions given in various County Courts are now properly relegated to the end of the book; while the judgments of the High Court, whether of England, Scotland, or Ireland are placed, as far as possible, in the order in which they interpret the successive sections of the Act. Thus, we begin with section 1; and the first authority (*Tomalin v. Pearson and Son, Limited*) defines the words of that section, "any employment," as not operative outside the confines of the United Kingdom. Then various decisions on the words "personal injury by accident" are given, and the difficulties of defining what is and what is not an "accident" are considered. Apparently, Lord Macnaghten's definition of it as some "unlooked-for or an untoward event which is not expected or designed" is generally approved. So, a rupture caused by tightening a nut with a spanner is an accident, though the workman was previously suffering from an aneurism; but cardiac breakdown through repeated excessive exertion is not an accident. Nor is paralysis caused by the long continued strain of the employment; for as Lord Justice Fletcher Moulton put it: "Waste over-running repair is not an accident" (*Walker v. Hockney Brothers*, p. 21).

Next are the cases which turn on the phrase "arising out of, and in the course of, the employment;" and some curious efforts on the part of applicants have been made to bring their accidents within the scope of these words. Following on, decisions under section 4 (1) relating to the liability of principals for accidents to workmen in the employ of sub-contractors, are dealt with; but no new principle seems to be involved. Similarly several other sections and points, as to agreements, payments, casual employment, &c., are interpreted and decided in this volume of collected cases.

The complete index to this and all previous volumes dealing with the same subject-matter greatly adds to its utility as a work of reference. We would suggest the possible advisability of still further classifying the cases, so that the Scotch and Irish decisions might be collected together, and each kept separate from those of the House of Lords or English Court of Appeal. To all interested in this important branch of our laws, this volume will prove a handy compilation and guide.

\* "Butterworth's Workmen's Compensation Cases, Vol. II. (New Series). Containing Reports of Cases decided under the Workmen's Compensation Acts during the period September, 1908, to September, 1909." Edited by His Honour Judge Ruegg, K.C., and Douglas Knocker, Esq., Barrister-at-Law. London: Butterworth and Co.; 1910. [Price 7s. 6d. net.]

† See "JOURNAL," Vol. CV., p. 521.

## High-Pressure Gas Lighting in Paris.

In the course of a discussion which took place in the Paris Municipal Council on the 31st ult., a full report of which is given as a supplement to the current number of the "Journal des Usines à Gaz," it was stated that the Paris Gas Company are about to place some high-pressure lamps in certain prominent positions, in order to show how powerful a light may be obtained by means of gas. On the Boulevard des Italiens there will be 13 Graetzin lamps fitted with single burners of 1000-candle power; in the centre of the Place de la Concorde 12 "Pharos" lamps; in the Avenue des Champs Elysées 12 Keith lamps; and on the Boulevard du Grand Palais 10 "Soleil d'Or" lamps—all of 1000-candle power. In the headquarters of the Company, in the Rue Condorcet, there will be installed four Keith lamps, of the 1909 model, with inverted burners, of 1500-candle power; also two similar lamps, which will eventually be replaced by two lamps on the same system, but each of 4500-candle power.

## HEATING AND VENTILATION OF BUILDINGS.

There was a crowded attendance of members of the Association of Engineers-in-Charge and invited guests at St. Bride's Institute, E.C., on Wednesday the 12th inst., when Mr. T. W. Aldwinckle, F.R.I.B.A., read an exhaustive paper on the "Heating and Ventilation of Public Buildings." The general subject, though of first-rate importance to his audience, is hardly one that need be dealt with fully here; but perhaps just a few points may be given from the paper as well as from the discussion which followed it.

At the outset, the author said that his aim would be to deal mainly with general principles; and he took ventilation first. He pointed out that the cubic space per head was not so important as might be imagined, so long as the requisite amount of fresh air was supplied without draughts and at a suitable temperature. A room might have a large cubic space per head; and yet, owing to imperfect ventilation, the amount of carbonic acid might be found to be unusually high. No rigid system could be successfully applied to all buildings alike. The nature of the building and the purposes for which it was intended must be separately considered in each case; and there were numerous methods of ventilation, both natural and mechanical, to select from. For rooms and offices open fireplaces were much preferable to radiators as a means of warming, as they were exhaust ventilators, and induced a current of air to flow in through open windows. As regarded staircases and corridors, radiators with open windows would be found quite sufficient. For a hospital ward, he suggested hot-water radiators, combined with a cheerful open fire. He regarded the Plenum system as unsuitable for the mechanical ventilation of a hospital ward; exhaust ventilation was more suitable. The warming and ventilation of churches and chapels were seldom satisfactory; and it was a good plan, whatever the warming apparatus might be, to keep it going constantly throughout the winter. One of the disadvantages of the exhaust system of ventilation was the risk of external air being drawn in through walls, chinks in windows, &c. In calculating the heating surface for warming buildings, allowance must be made for this cold air. This was a drawback from which the Plenum system was free.

The primary advantage of Plenum ventilation was that it put into the hall or room a specific and measurable quantity of fresh air, in specific positions, at definite and ascertained velocities, and at definite temperatures, and that this air could be filtered, moistened, and warmed at the main air-inlet. No other system admitted of these advantages. Its disadvantages were that as a rule long ducts were necessary for the distribution of the air, and that as the air had to travel a considerable distance along these ducts, the initial temperature as it left the heating battery was generally arranged somewhat high, in order to compensate for the cooling in the ducts. This caused a baking or drying of the air. It was when the Plenum system was coupled with auxiliary exhaust that he considered it most effective. The incoming air generally required some kind of filtration; and there should also be a good water spray to prevent drying of the air. He had used a filtering screen consisting of a large number of galvanized steel rods placed to break-joint about  $\frac{1}{4}$ -inch apart, all being removable. A water-trough was placed above these, from which water trickled down the rods.

The ventilation of factories was a subject by itself, as not only had the rooms to be warmed and ventilated, but noxious matters arising from many of the manufactures had to be separately removed, as near as possible at their point of origin, so as to prevent them from mixing with the general air of the room. As regards general ventilation, the majority of factories were content with open windows and skylights with steam heating; there being usually steam available. This was satisfactory, where there was a fairly large cubic space per worker. The Factory Act only required a cubic space of 250 feet per worker, except during overtime; and the inspectors would pass a maximum of 12 parts of carbonic acid in 10,000 during daylight, and 20 parts when gas was used as an illuminant. These were not very exacting standards. With a small cubic space mechanical ventilation was absolutely necessary; and satisfactory results had been attained in many factories where both Plenum and exhaust fans had been used. The removal of local impurities was, however, quite a different matter, and required special treatment.

Turning to methods of warming buildings, the author remarked that these would vary with the system of ventilation. With the simplest form of natural ventilation, they had the open fire—"that extravagant, much abused, but really cheerful and healthful method." For single rooms in a public building they were still the most comfortable and the most wholesome form of warming, and formed excellent extraction ventilators, provided always that there were suitable air inlets, or partially open windows. Leaving the subject of open fireplaces, they came to artificial warming; and the first method was direct heating by hot-water or steam radiators, which in some systems of natural ventilation took the place of open grates. Large improvements had been made in radiators. The heating surfaces had been better designed, and their efficiency thereby increased. Whenever possible, the radiators should be placed against an external wall, so that an air-channel could be formed at the back; and in all cases, whether against an inner or outer wall, a baffle should be fixed to the wall



immediately above the radiator, to prevent the deposit of blacks and dust on the wall above, caused by the convection air currents set up. It was preferable for the radiator to stand upon wall-brackets, and not on feet. Exposed or "direct" radiators heated both by radiation and convection, but principally by the latter; and the efficiency of the heating surface was considerably increased by fresh air currents passing across them. The freer the circulation of air round the surfaces of the radiator, the higher the efficiency; and for this reason low radiators were more effective than high ones, and single-column radiators than those with two or three columns. There should, therefore, be a good air-space between the loops. Ribs or other like extensions of the heating surfaces were of little value—at all events, in hot-water radiators. It was necessary to paint radiators; and it had been found that bright and glossy paints reduced the amount of radiation, and that a dull dark paint was preferable. The colour or brightness of the paint did not affect the convected heat.

On the author resuming his seat, the President (Mr. Henry Adams) remarked that the paper was so complete that it did not seem to lend itself very much to discussion. All the different systems had their advocates and their opponents; and he would define as a "successful installation" one about which there were no complaints. In America, they had had much greater opportunity than had been the case here to study the question; but they had had difficulties, one of which was in connection with scale in boilers, which caused a loss of power. Another trouble was sluggish circulation, due to friction in the pipes from scale, rust, sediment, &c., and possibly also to insufficient capacity at the beginning.

A discussion then ensued in which some eight or nine speakers took part; the first being the Hon. Secretary (Mr. Henry Capsey), who expressed disagreement with the simultaneous use of open fires and a hot-water system in a hospital ward. In fitting up hot-water systems, he said, mains and branches leading to radiators should be sufficiently covered, with a view to getting the greatest heat where it was most required. Mr. A. E. Wheeler pointed out that ventilation was a subject which in the past had not received the attention it deserved. The first object should be to provide a supply of air, and then have means of heating this air. There was one thing against open fires which all the discussion in the world would not remove. The author advocated admitting into the air any quantity of smoke; and yet he called the open fire a healthful method of heating. He might supply air to a building; but what about the smoke in the air that was so admitted? How could pure air be secured? If every radiator was fixed with a fresh-air inlet behind it, and sufficient openings were provided for the vitiated air to escape, nothing would be heard of stuffiness accompanying the use of radiators; but at the same time a chimney was a most efficient ventilator. Mr. Coleman inquired whether the author found a water spray efficient in removing all the dust and dirt from air. He thought a cotton wool filter was necessary, if it was desired to clean the air to any great extent. Mr. C. Adams thought that warming and ventilation appliances were difficult subjects to generalize upon. Every building ought to be considered on its own merits. The Plenum system of ventilation was adopted at the Birmingham General Hospital; and there was a very elaborate arrangement for moistening the air. He had heard of no complaints regarding this installation. Very little attention was given to the ventilation of dwellings, workshops, and similar places.

Electric heating was touched upon by Mr. A. E. Penn—just by way of seeing what members had to say about it. He quoted from the notice in "The Engineer" of the past year's progress, where it was stated that electric heating was being used to a greater extent; and the supply companies were giving somewhat better terms. A case had "been cited of an office, which is now heated by electricity for £2 10s. per annum, where the landlord used to charge £4 to £5 per annum for heating by steam." Mr. Maclean admitted that the Plenum system required attention, but thought it was so important that the requisite attention to make it a success should not be grudged. Referring to Mr. Penn's remarks, he said electric heating cost very much more than hot water. It had been stated by one authority to be more than twenty times as expensive. Mr. F. H. Broadbent expressed the opinion that now the electrical companies were bringing down their cost to 1d. or less per unit, electricity was going to be a formidable opponent of other systems of heating.

Replying to the discussion, Mr. Aldwinckle remarked that the great advantage of the open fire was that it formed a very powerful exhaust, and removed foul air just where it was very likely to be dangerous, which was 2 or 3 feet above the floor. When he spoke of open fires being healthy, he meant in relation to the occupants of the room. People outside must take care of themselves. He did not think the open fires in London would render the air injurious to health. A good many of the impurities in the air were disagreeable, but not harmful. With reference to electric heating, he did not go into this because he regarded it as being at present in its infancy—though he thought it would come on in time.

The proceedings concluded with hearty votes of thanks to the author and the Chairman.

The London and Southern District Junior Gas Association will hold the fourth meeting of the session at Cripplegate Institute next Friday. Mr. C. E. Rosevear, of Hythe, will submit some "Notes from Hythe;" and these will be followed by "Questions."

## ESTIMATION OF FERROCYANIDES.

At the last Meeting of the Manchester Section of the Society of Chemical Industry, Dr. F. W. Skirrow read a rather long paper containing some laboratory notes on the estimation of ferrocyanides. Pending the publication of the paper in the Society's "Journal," we take from the "Chemical Trade Journal" the author's conclusions and a few notes of the discussion to which it gave rise.

In the Feld method for the estimation of ferrocyanide, some loss of hydrocyanic acid takes place on boiling the ferrocyanide solution with caustic soda with excess of magnesium chloride under the conditions of the test. A 99.5 per cent. yield of hydrocyanic acid may be obtained on distilling mercuric cyanide with sulphuric acid in presence of chlorides, if the concentration of the sulphuric acid be not allowed to become too great. If this distillation, however, be carried out in presence of the other products of the decomposition of the ferrocyanides which are present, a less yield than the above is obtained. Furthermore, it seems probable that under the conditions of the test the ferrocyanide is not completely converted into mercuric cyanide. In the zinc method for the estimation of ferrocyanide, it is advantageous to use much more concentrated solutions of ferrocyanide and zinc sulphate than those generally adopted. With the more concentrated solutions, a sharper end-point is obtained; and the effect on the presence of excess of alkali sulphate is minimized. In the estimation of ferrocyanide in the extractions obtained by extracting spent oxide of iron with carbon bisulphide, it is shown that high results are obtained if the solution be boiled and filtered before proceeding with the estimation. Lastly, caustic soda does not extract the whole of the blue from the oxide; there being some ferrocyanide residue and blue which is with difficulty soluble in caustic soda, and which is in the form of calcium iron ferrocyanide.

In the discussion on the paper, Mr. R. H. Clayton said that to him the principal point of the paper was the fact that, in the estimation of ferrocyanides in working spent oxide of iron on a large scale, certain losses occur. Certain quantities of ferrocyanides seemed to disappear, and the manufacturing results were not up to 100 per cent. It was evident from the paper that examination of the various methods of analysis showed that certain errors had crept in which had not been noticed before. As regards the Feld method, he had seen this being used in gas-works for estimating the yield of products obtainable from washing gas. He had not previously heard the accuracy of the method discussed in the manner in which Dr. Skirrow had treated it. The method was taken as absolutely reliable, and he was astonished that the little errors pointed out by Dr. Skirrow had crept in. The zinc test was to his mind the most useful one to be employed in ferrocyanide works, unless there was an excess of impurities.

## Central Station Gas Engineering in the United States.

We have received from the Trustees of the Gas Educational Fund, through the Secretary (Mr. A. E. Forstall), a copy of the "Catechism of Central Station Gas Engineering in the United States," which has just been published. The matter is a compilation by the Secretary from the questions and answers sent out to the members of the Practical Class, which has been taught by correspondence since 1895—first by the Committee on Education of the American Gaslight Association, and since 1899 by the Trustees of the Gas Educational Fund. The questions and answers have been printed in the "Transactions" of the Association and its successor, the Institute; but many requests were made that they should be arranged according to subjects, and published in one volume. The book under notice has been prepared in compliance with these requests. The Trustees hope that, though primarily intended to give the younger workers in the gas business a fuller knowledge of the principles involved and the apparatus employed, and to aid them in doing better work, the collected questions and answers will be of some service to the seniors, in recalling to them the reasons for methods of operation which have come to be generally accepted. We may take an opportunity of noticing the volume more fully in a subsequent issue.

Mr. Thomas Wood, ex-Provost of Portobello, died last Sunday week at the age of 86. He was for over forty years a prominent man in Portobello, of which place he was Provost from 1867 to 1879. He was elected to represent Portobello upon the Education and District Water Trust when that body was formed forty-one years ago, and remained a regular member of it until his death—having been for many years Convener of the Finance Committee.

The first ordinary meeting for this year of the Society of Engineers is to be held on Monday, the 7th prox., in Caxton Hall, Westminster. The premiums awarded for papers read during 1909 before the Society of Engineers and the Civil and Mechanical Engineers' Society will be presented; and Mr. Diogo A. Symons, M.Inst.C.E., the first President of the new Society, will then deliver his Presidential Address.



## HIGH-PRESSURE SUBMARINE GAS-MAIN.

Among the "Wrinkles" contributed at the last meeting of the Pacific Coast Gas Association was one on the laying of a high-pressure submarine gas-main. The San Diego (Cal.) Consolidated Gas and Electric Company were solicited very strongly to supply with gas the city of Coronado, on the opposite side of the bay on which San Diego stands. Coronado is quite a small town; and the probable greatest number of consumers in view was only some 300, with the possibility of an additional 500 for three months each summer. Several proposals were brought forward to supply these customers; and finally a submarine high-pressure main from San Diego to Coronado was decided upon. When the capacity of this main and the necessary obstacles to be overcome were borne in mind, two propositions were considered—one being the laying of two 1½-inch heavy lead pipes across the bay in different localities, to avoid possible interruption of service from the anchors of boats. These two pipes were to be brought ashore at the same point, and to be virtually one from there onwards. This scheme was finally abandoned on account of the small capacity, which, while great enough for the present, would not, it was thought, be adequate during the life of the pipe.

A 4-inch extra heavy cast-iron ball-and-socket pipe was used for the work; and the danger from the pipe being broken by anchors was avoided by running to a point on the bay where the ferry crosses from San Diego to Coronado. This particular line between the ferry slips is held by the Harbour Commissioners free from anchorage. The distance from shore to shore is about 4000 feet; and 500 feet of it was what the Company's staff were able to deal with at low tides. The rest was laid from a specially constructed shoot on a lighter moved across the bay by windlasses attached to anchors shifted periodically by a launch.

The pipe used for the line was made in ordinary lengths of 12 feet, with a standard joint on one end, and either a ball or a socket joint on the opposite end; that is to say, two lengths with a standard joint put together left a ball on one end and a socket on the other end of the 24-foot length—thus giving a flexible joint every 24 feet. The standard joints were lightly yarned but were heavily leaded. The ball and socket were cleaned only, and the ball then placed in the socket and leaded and caulked. This was all done on the lighter—in fact, all the material for the work was placed on it before it was moved from the wharf. It required about two weeks to construct and arrange the shoot on the lighter; this being 24 feet wide and 90 feet long. The shoot was built up from one end of the lighter at an angle of about 50°.

The capstans and windlasses were fastened to the four corners of the lighter, and a steam hoist was installed on it for the double purpose of pulling it ahead by the use of headlines and anchors, and also hoisting all the pipe to the work benches and shoot on the incline. An important part of this construction was carried out under water. It consisted of two 100 feet piles placed about 4 inches apart and bolted together and hinged at the upper end to supporting timbers bolted to the lighter. These piles had at the lower end a pair of iron trucks, securely bolted to the lower side of the piles, for the combined purpose of rolling on the bottom of the bay to carry the weight, and also to act as anchors that would not allow these piles and the pipe (when it was being lowered) to be swung sideways by the tide. The line of this pipe passed across the channel of the bay, which was about 40 feet deep at this point, and the tides were very swift. At one time during the laying of the pipe, seven 800-lb. anchors were required on one side of the lighter to hold it against the wind and tide, which were in the same direction.

Another advantage in the piles extending down to the bottom of the bay from the lighter was that, if it shifted even 50 or 100 feet, or twisted from the line of the shore points established, the wheels would get only a slight distance out of the true line which it was desired to follow—acting like a long tail to the lighter. As proof of this, the divers reported that in no place, so far as they could see, were there any bends in the pipe that were more than 18 inches out of a straight line. It required three days to lay the pipe across the bay, and eight days, at \$40 per day, for the divers to caulk the pipe until it was absolutely tight. The divers were employed part of the time during the laying of the pipe in following the line as it was laid, and in watching for any breaks or interference with cables in the bay. Each time work ceased for the day, air pressure was applied from the shore end by plugging the end on the lighter, which proved in the first place that there were no broken lengths, and allowed the divers to see any bad leaks.

The shoot built on the lighter was constructed of two 80-foot piles, spaced 4 inches apart and bolted together, and erected on a framework to give them the necessary angle. On each side of this piling were arranged work-tables where four or six 72-foot lengths of pipe could be made up, and be in readiness to roll into the centre shoot at short notice after the lighter had been moved ahead 72 feet. These lengths had the standard joints made up on the floor of the lighter, and then hoisted by the use of a steam hoist to the work-tables on the shoot, where two ball-and-socket joints were made up. After the lighter was moved ahead until only 3 or 4 feet of the pipe was above the water, another length of 72 feet was rolled into the shoot and lowered carefully into the socket. These joints were run and caulked in 10 to 15 minutes, when the lighter was again ready to be moved ahead.

The different angles which the piling, extending from the end of the lighter, took for the various depths of water caused considerable movement of the joints (both the ball-and-socket and standard) during the time of laying—in fact, at some times the angles of the pipe just as it was leaving the lighter were quite sharp. But no trouble was encountered in making these joints absolutely tight later on. At several times two or three joints would stand clear in the air, not touching the shoot for 30 feet. This probably could not have been handled that way except for the extra heavy pipe, which was 25 lbs. per foot, or 300 lbs. per length of 12 feet. The ball-and-socket joint was of the class in which the lead is embedded in the ball end, and the ball end of the pipe carefully machined.

After the pipe was laid to the opposite shore, the pressure was kept on the line all day, allowing the divers to see any leaks, and caulk them either by hand or with an air hammer. To use this hammer, a gasoline air compressor capable of delivering 80 lbs. of air was placed on board the diving outfit's lighter. This, with the necessary hose and a small caulking air hammer, enabled the divers to do much more rapid work, as the air could be used to clear the sand from about the joints, and then the rapid work of the hammer completed the job quickly and solidly. Eight days were required with this diving outfit to make the pipe-line tight. It was tested up to 75 lbs., and dropped only 10 lbs. in twelve hours.

At the Coronado shore end a 30-gallon drip-pot was installed, with arrangements made for blowing the water from it by the pressure of the gas. A similar one was placed in the Company's yard, near the governor-house. In this yard also a steel tank, 90 inches in diameter and 30 feet long, was provided, primarily for storage, but with an arrangement that if any water came through with the gas it would be separated in this tank. From the storage-tank the gas was piped to a double district governor, there reduced from 20 lbs. (the pressure carried on the line) to 4 inches of water pressure, and distributed by means of 8 miles of mains to 250 customers through 4 and 2 inch steel pipe. The cost of the installation was about \$5800 (£1160).

## ARCHITECTURE AND ILLUMINATION.

In the course of a paper on "The Measurement of Illumination: Daylight and Artificial," recently read by Mr. P. J. Waldram before the Society of Architects, he stated that his chief object was to show that the measurement both of artificial and daylight illumination was so simple a matter, requiring neither special skill nor expensive apparatus, that it ought to be largely undertaken by architects. The photometry of lamps and other light sources demanded delicate and expensive apparatus, specially constructed laboratories, and the exercise of technical and mathematical ability of no mean order. But the photometry of illumination, both daylight and artificial, could be performed with instruments of about the same size, weight, and cost as a good hand camera, and demanded neither technical skill nor mathematical knowledge.

The author described by the aid of a diagram a Preece-Trotter daylight illumination photometer, one of which was on view at the recent exhibition of the Physical Society of London, and gave some examples of inside and restricted outside illumination. He concluded by saying that a rough approximation of a standard well-lit room would be one enjoying an average of 1 candle-foot—in other words, a fair reading light—at half-an-hour after sunrise and at sunset on a clear day, which was given by a proportion of about 1-1000th of the outside illumination. The great present-day need was that architects should take an active and intelligent interest in this subject. They could at least insist that gas and electric sub-contractors should guarantee a given illumination at table height in candle feet. The demand would soon create the supply; and instruments for testing the results were neither expensive nor difficult to use. But, above all, workers were needed who would record data and results. Architects, and architects alone, could do this satisfactorily; and their labours would benefit not only their own profession, but the whole of the working community.

As bearing to some extent upon the subject of the paper noticed above, reference may be made to one on "Modern Gas Lighting in the Store, Office, and Home," submitted to a joint meeting of the American Commercial Gas Association and the New York Section of the Illuminating Engineering Society a few weeks ago by Messrs. Van Rensselaer Lansingh and Edward B. Rowe. It was an illustrated description of the central appliance house maintained by the Consolidated Gas Company of New York City. Between the reception-room and library, on either side of the passage, are located booths or small rooms for demonstrating the great effect of the colour of walls on the illumination of any given plane by any given unit of light. Each booth is lighted by one inverted mantle burner with clear distributing reflector and clear cylinder in the centre of the ceiling. The control is pneumatic, from a push-button on the wall. The curtains for the booths are all faced on the inside with material of the same shade as the wall paper, and the colours adopted for the latter are as follows: (1) Salmon, (2) red, (3) cream, (4) green, and (5) blue. The wall papers are of nearly the same texture; and any difference in the



illumination obtained can be considered as due to absorption by colour alone.

Readings were taken in all the five booths, to obtain some comparative figures for this absorption. In each booth the mantle was adjusted to give as nearly as possible the same candle power value directly below the centre of the lamp, as measured by the illuminometer used as a photometer. Since the equipment was the same in all the booths, the distribution and total flux of light would be approximately the same when the candle powers at any one angle were equal. Then with the illuminometer disc 2 ft. 6 in. from the floor, foot-candle values were obtained at the point directly beneath the lamp as follows:—

Colour.	Foot-Candles.	Per Cent. of No. 1.
Salmon. . . . .	3'34	100
Red. . . . .	1'87	56
Cream. . . . .	2'93	88
Green. . . . .	1'67	50
Blue. . . . .	2'36	71

The authors say that not only does the intensity vary greatly with the colour of the paper, but the character of the reflected light is quite different. This was very noticeable in making the illuminometer settings, where the colour of the two fields in the prism varied greatly in the different booths. Very nearly a perfect colour match was obtained in the test in booth No. 1, which showed the highest foot-candle reading. In a measure, these readings, as are all illuminometer readings, in fact, are only indicative, since so much depends on the personal equation in setting for a colour match, rather than for intensity. The authors consider that the question of light absorption by colour, and its effect on efficiency, as well as its physiological and psychological importance, justify the illustration and explanation of these colour effects to the general public. The effect of different illuminants on the same colours has been repeatedly demonstrated; but this is the first instance they know of where prominence has been given to the effect of one illuminant on different colours.

### HOIST FOR FILLING PURIFIER-BOXES.

Some time ago, Mr. F. C. Millard, of Los Angeles (Cal.), devised a successful scheme for converting a cement hoist into an oxide hoist—galvanized iron buckets being employed. A steel tower was built, with adjustable clutches at the top so as to deposit the material at any point desired. The bucket was pulled up the tower by means of a windlass driven by a motor, and when it reached the desired point the clutches tripped it up, and it emptied its contents into a galvanized iron shoot placed there for the purpose. The shoot was about 18 inches deep, and open on top. It ran directly into the centre of the purifier-house, and its course could be diverted into any box desired by means of another shoot attached to the first one by the help of a swing joint. With this system it only took about an hour to fill a box, compared with five hours by the old system. The life of the oxide was found to be much longer, as it did not break up into fine powder as is the case when using the ordinary conveyor.

While this system was a vast improvement on the old conveyor, Mr. Millard found that he could improve upon it. He has communicated the result in a "Wrinkle" to the Pacific Coast Gas Association. When the plant increased to such an extent that he was obliged to double his purifier capacity, and he found it imperative to instal another apparatus for conveying oxide to the boxes, he had plans and specifications prepared, and gave an order for another hoist similar to the one just described, but with the shoot made of 15-inch galvanized iron pipe, and having three different stations, as it were, for the discharge of the oxide. These stations or platforms are located about one-third, half, and nine-tenths of the way up the tower. From the nearest platform there is a pipe running to the nearest boxes to the tower; at the second platform, the pipe runs to the middle boxes; while at the top platform, it runs to the boxes farthest from the tower. By this improvement Mr. Millard says it is possible to have a pipe run directly from the discharge platform to each and every box, instead of having one shoot for the whole set of boxes. He also finds that, by having the 15-inch pipe instead of the shoot, there is no loss of oxide from the wind blowing it out.

### Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company, Mr. H. Rayner, that the accounts for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 13s. 4d. per cent. per annum, carrying forward to the next account £456,993 4s. 8d. This compares with a dividend of £4 10s. 8d. per cent. per annum, and a carry-forward of £423,323 this time last year. For the June half year, the dividend was at the rate now recommended; and the amount carried forward was £409,893.

**Annual Meeting of the Institution of Gas Engineers.**—We are asked by the Secretary, Mr. Walter T. Dunn, to announce that it has been decided to hold the annual meeting of the Institution this year in London; to commence on Tuesday, the 14th of June.

## AMERICAN GAS INSTITUTE AND ELECTROLYSIS.

### Memorandum by Professor Ganz.

In the summary of the proceedings at the last annual meeting of the American Gas Institute, it was mentioned that the Committee on Electrolysis, of which Mr. A. G. Glasgow is Chairman, submitted a memorandum on "The Protection of Underground Pipes from Electrolysis." It had been prepared at their request by their Consulting Electrical Engineer—Mr. Albert F. Ganz, Professor of Electrical Engineering in the Stevens Institute of Technology—and was intended to set forth, as far as practicable, the views and work of the Committee. In their brief report prefacing the memorandum, the Committee stated that the chief obstacle to effective progress which continued to face them was the very reasonable objection on the part of the various interests concerned to making public the results of important current investigations, owing, in the first place, to the fact that present conclusions are of necessity of a more or less tentative nature, and, secondly, to the fact that the present phases of these specific investigations are invariably of a confidential and generally of a delicate local character. These considerations had, they said, largely hampered Professor Ganz in the preparation of his memorandum, and had made it impossible for the Committee to secure other communications which they had anticipated would be at their disposal. They further expressed the opinion that no useful purpose would be served by the continuance of a Standing Committee on Electrolysis. They considered it preferable, at any rate, for the present, that the General Technical Committee should, as opportunity offered, obtain communications from experts specially qualified to instruct or guide the members in some particular line of this work. They therefore jointly and severally tendered their resignations, together with their best thanks for the confidence reposed in them.

The following is Professor Ganz's memorandum.

### PROTECTION OF UNDERGROUND PIPES FROM ELECTROLYSIS.

At the annual meeting of the Institute two years ago, I presented a brief paper in which the general methods of making tests for stray electric currents on underground piping systems were discussed.\* Since then I have had considerable opportunity of using the methods described. While it has been found necessary to extend these methods, and also to use a number of special methods to meet particular cases, particularly for the purpose of identifying sources of stray current, the general plan outlined in my previous paper is sufficiently complete for ordinary requirements. I will, therefore, not discuss methods of testing, but consider measures for the protection of underground pipe-lines from electrolytic corrosion, where they are found to be endangered by stray railway currents. The natural solution is, of course, to remove the cause of the danger—that is, to get the railway companies to take care of their own currents. This is completely accomplished by the use of an insulated return circuit. Even without this, I believe that in almost every case where serious stray railway currents are found flowing on underground structures, it is possible to reduce such currents to small and oftentimes to negligible amounts by proper track-bonding, and by the installation of properly proportioned return feeders, with the addition in some cases of negative boosters.

The possibilities which can be accomplished in this direction have only recently been appreciated in America by railroad engineers. An excellent investigation of this subject is presented by Mr. George I. Rhodes, in a paper entitled "Some Theoretical Notes on the Reduction of Earth Currents from Electric Railway Systems by Means of Negative Feeders," published in the "Transactions" of the American Institute of Electrical Engineers for 1907. This investigation clearly brings out the great reduction of stray currents which can be accomplished by insulating the negative bus-bar at the power-station, and running out properly proportioned insulated return feeders to various points in the track network. This is, in fact, the plan which has already been very successfully carried out in Europe, and which was described in the report of the Committee on Electrolysis presented to the Institute in 1906. I am informed on excellent authority that in two American cities the installation of properly proportioned radiating return feeders, as referred to above, has reduced the stray currents on the piping systems to less than one-tenth of their former value. In some cases where a road owns its own private right-of-way, it is perfectly practicable to substantially insulate the rail return circuit, and eliminate serious stray currents.

If the underground piping system is a continuous electrical conductor of low resistance, and is affected only by currents from known sources, it may be protected by metallically connecting it to the negative return circuit of each source. Such a bonding method, however, greatly increases the current flow on the system and produces other dangers, as, for instance, at a high resistance point, which may develop in a joint. Here the current may shunt around such a high resistance point and produce corrosion. The greatest objection, however, lies in the danger that such a bonded system constitutes to all other underground metal systems. If we connect one piping system to the negative bus-bar, we render it highly negative to all other underground metallic structures, and induce current to flow to this piping system, thereby increasing

\* See "JOURNAL," Vol. CI., p. 293.



the electrolytic dangers to other systems, and producing also other dangers, such as a fire hazard from sparks or arcs. Such a bonded piping system becomes, in fact, a part of the trolley return circuit, and the owner becomes a party to any damage that may result in the other underground systems. I have myself found various cases where actual danger and damage were caused to one underground system by the bonding of a second system. I know of one case where a large piping system was bonded to the negative return circuit of the railway by heavy copper cables in order to protect it from electrolysis. Serious trouble arose, however, from arcs produced by the large currents carried on the pipes, and explosions and fires resulted—in one case also severely burning a mechanic who was making repairs to the pipes. After two years of trial, all bonds were removed, as the dangers produced by them were considered more serious than the possible protection from electrolysis afforded. I firmly believe that only such methods should be used as will substantially prevent stray currents flowing to and from the underground structures.

In regard to means which can be applied to piping systems to rid them from stray railway currents, there are two possibilities to be considered which have been tried—viz., insulating pipe-joints and insulating pipe-coverings. I have had some experience with, and have made some tests in regard to, each one of these methods. In order, however, to collect the experience from as many sources as possible, I addressed a circular-letter and question-blank several months ago to each member of the Institute, with the authorization of the Committee on Electrolysis, asking for his experience, especially with reference to the above means for the protection of pipe-lines. In all, 1308 question-blanks were sent out and 138 replies were received. Of these, 74 do not give any useful information at all, while the remaining 64 answer some or all of the questions, or give other definite information. I have made a careful study of the replies as received; and where the answers given did not enable me to get all the information desired, I have endeavored to get this by further correspondence. A number of the members were good enough to furnish me with copies of electrolysis surveys made upon their systems; and I have also studied these in connection with the answers furnished. In this way, I have collected experiences with about 60 piping systems located in 32 different States scattered all over the United States. I have prepared extracts giving the important facts of such answers as describe characteristic conditions, and these are tabulated under three headings: "Experience with Cement Joints," "Experience with Insulating Joints," and "Experience with Insulating Coverings."\*

#### DISCUSSION OF EXPERIENCES WITH CEMENT JOINTS.

Thirty-nine replies report experiences with cement-jointed mains in the vicinity of electric trolley roads. Thirteen of these replies state that no trouble whatever from electrolysis has been found. In most of these cases, however, no actual tests have been made; the statement being merely based on general experience. Seven replies report some electrolytic corrosion of the cast-iron mains; one of these reports corrosion at joints and the complete destruction of the structure of the cast iron. One other reply reports signs of pittings near the joints at a number of points. In twenty replies the electrolytic destruction of service-pipes from cement-jointed mains is reported; and in some of these cases this trouble is said to be very severe.

I have examined two systems in which services from cement-jointed mains have been quite destroyed. It was found that the destruction had been caused by electrolysis from stray railway currents, and that these currents had reached the gas service-pipes from the water-mains through house-service connections—that is, current was found entering by the water service-pipe from the water-main, reaching the gas service-pipe through the house piping, leaving it through ground to return to the railway tracks, and producing corresponding electrolytic destruction of the gas-pipe. Tests also showed that the water-main, which was laid with lead joints, in these instances, was carrying large stray railway current; while no measurable current was found flowing on the cement-jointed gas-mains.

I want to report one case of damage relating to a lead-jointed gas-main, where current was also found entering a building from the water-main through a water service-pipe, and leaving the building through the gas service-pipe. The existence of this current on the gas-pipe was discovered when a meter was to be replaced, by the production of a severe arc when the pipe was disconnected. An examination showed that current entered by the water-pipe and reached the gas-pipe through contacts with a metal ceiling. This current was very large, reaching maximum values of 16 amperes. This condition was found in a district where the gas-piping is highly negative to the railway return conductors; the current from the gas service-pipe flowing to the gas-main, and passing along it to leave it at some other point. Electrical tests indicated that the water-piping system was in metallic contact with the railway return conductors. This is an example of a distinct fire hazard produced by stray railway current entering and leaving a building through the service-pipes; and I have found similar cases elsewhere. This same dangerous condition is, in fact, likely to occur wherever there enter a building services from two piping systems, one of which is bonded to the return circuit of the electric railway.

In order to obtain the approximate electrical resistance of

cement joints, I have measured the resistance of a large number of joints on different sizes of mains in actual use. The resistance values found vary from a fraction of an ohm to several hundred ohms; the majority of joints showing high resistance values.

Two cement joints on 8-inch cast-iron pipes were also subjected to tests in the laboratory of the Stevens Institute. These joints were tested for resistance after having been made-up for several months with currents varying from 0.02 ampere to 5 amperes. One of these joints showed a practically constant resistance of about 40 ohms. The second joint showed a variable resistance for different current strengths. With 0.02 ampere it was 28 ohms; with 1 ampere it was 4 ohms; and with 5 amperes it was only 0.7 ohm. This phenomenon of variable resistance with different currents is characteristic of imperfect contacts. It is therefore likely that in the cement joint showing the variable resistance the end of the spigot is in mechanical contact with the interior of the bell, but forming an imperfect electrical contact; while in the first joint, showing a constant resistance, the end of the spigot and the interior of the bell are out of contact altogether. Six additional cement joints on 8-inch cast-iron pipes were also subjected to laboratory tests after having been made-up for about a month. Three of these joints showed low resistances varying from 0.01 to 0.05 ohm; while the remaining three joints showed resistances varying from 5 to 10 ohms. Each of these six joints showed some variation in resistance for different current strengths, but the variations were not large. It appears that in the three joints showing low resistance the pipes must be in metallic contact; while in the three showing high resistance there is no metallic contact. It is probable the resistance of these cement joints will increase with age.

All the cement joints tested except those which show such low resistance values as would indicate metallic contact, showed a polarization voltage varying from 1.5 volts immediately after the current was removed to about 0.1 volt after 24 hours. This means that a voltmeter connected across one of these joints gives an indication after the current has been interrupted. While this polarization voltage cannot produce any substantial current flow, its existence is nevertheless significant, and may give rise to misleading conclusions from tests upon cement-jointed mains. As an example of this, I would cite an experience which I had about a year ago. On a cement-jointed main, no readable deflection could be obtained on a sensitive millivoltmeter in 11 feet of continuous pipe. Across one cement joint a potential difference of 0.22 volt was indicated, however, and across the adjacent cement joint a potential difference of 0.13 volt; while across both joints the potential difference was nearly 0.4 volt. The measurement of the potential difference over 750 feet of this main, including about 60 cement joints, gave a value of 0.5 volt; but an ammeter connected across these two points by copper wires did not indicate any measurable current. It is therefore clear that this main, though showing substantial potential differences across individual joints, was not carrying any measurable electric current.

So far as being effective in breaking up the electrical continuity of a pipe-line laid with all cement joints, it does not matter whether the joints have a resistance of a few ohms or of thousands of ohms. Considering that the resistance of cast-iron pipe is only a few hundred thousandths of an ohm per foot of length, it will be seen that, compared with the pipe itself, the resistance of a cement joint is generally so high that it may be classed with insulating joints. It follows, therefore, that a pipe-line laid with all cement joints has such a high electrical resistance that, with the potential differences ordinarily found in the ground, no measurable current can flow along such a line. Numerous tests made by myself confirm this. An interesting and valuable test is also reported in one of the replies. A cement-jointed cast-iron main paralleling a trolley track was metallically connected to the track at its two ends with an ammeter inserted in one of the connecting wires. No measurable current was indicated on the ammeter. In this same system the cement-jointed mains are connected to the return circuit of the railway at the sub-station. An ammeter was connected in this bond wire, but no current flow could be detected. Similar results were obtained in a series of tests made upon a cement-jointed water-main in Los Angeles (Cal.), and reported by Mr. E. F. Scattergood in a paper published in the Sibley "Journal of Mechanical Engineering" for March, 1905.

Bond connections from cement-jointed mains to the return circuit of electric railways, as reported in a number of the replies, can therefore protect only that single length of pipe, and the services connected to it, to which the bond wire is attached, but cannot possibly serve to protect the piping system.

#### DISCUSSION OF EXPERIENCES WITH INSULATING JOINTS.

Nineteen replies report experiences with special forms of insulating joints. Most of the pipe-lines where the use of insulating joints is reported are individual high-pressure lines to which no service-pipes are connected. In four of these pipe-lines every coupling is made an insulating joint, and it is reported that they do not carry stray currents, and that there is no trouble from electrolysis. In twelve of these pipes, a comparatively small number of insulating joints are used, variously spaced, depending upon local conditions; and it is also reported that there is no trouble from electrolysis. Most of these lines have, however, been in service for an insufficient time to warrant the conclusion that no electrolytic action is going on.

In two high-pressure lines where insulating joints were spaced 500 feet apart, serious electrolytic damage resulted; and it is

\* These are given in an appendix to the memorandum.—ED. J. G. L.



reported that these pipe-lines have since been connected to the negative return of the railway, and the insulating joints bonded over by copper cables, thus eliminating the insulating feature of the couplings. A wrought-iron pipe-line paralleling a poorly constructed trolley road for 34 miles, with three power-houses located along the line, and with Dresser expansion sleeves located every half mile, is reported to have suffered from electrolysis in the neighbourhood of the power-houses. In one reply it is reported that an entire city gas-supply system is laid with wrought-iron pipe with nearly all the couplings insulated joints, and that after six years of service no trouble from electrolysis has developed. I have also had occasion to test one high-pressure wrought-iron main laid with all Dresser joints several miles long, and paralleling and running close under trolley tracks for a considerable distance. This main did not show any measurable flow of current, and a temporary copper wire connection with an ammeter in series between the pipe and the rails at a number of points did not produce any flow. This pipe-line has been in service for more than five years, and so far has given no trouble from electrolysis.

#### EXPERIENCES WITH INSULATING PIPE COVERINGS.

Sixteen replies report experiences with insulating pipe coverings, and all but two of them refer to service-pipes. One of the two mains provided with an insulating covering is a 2-inch high-pressure line a mile long, and connected at one end to a gas-works and at the other end to holders. This pipe was boxed and filled with pitch; but electrolytic trouble developed at several points, at some of which the covering was found to be defective. By breaking up the line into insulated sections by insulating joints in addition to the covering, the trouble is stated to have been overcome. The second main is also a high-pressure line, of 3-inch wrought-iron pipe. The attempt to protect this by boxing it and filling with concrete, failed. A portion of this line which was boxed and filled with 2 inches of pitch also developed electrolytic trouble at a few points; but it is stated that at these points the covering was found mechanically damaged. Examination of the pipe under a good coating of pitch showed the pipe to be bright and without signs of corrosion. Five of the service-pipes protected by coverings were painted with some form of compound, usually containing tar. These coatings are found to prolong the life of the services, but do not generally prevent electrolysis. Five services were boxed and filled with pitch, which proved effective in four cases but failed in one case. Four services are reported boxed and covered with cement or concrete; and this appears to have prolonged the life, but has not prevented electrolysis.

In regard to cement or concrete as a protection from electrolysis, I know of one case where an 8-inch pipe was boxed, leaving from 4 to 5 inches between pipe and box, the space being filled with concrete. This main was in a location where currents were leaving the main, and where previously there had been considerable electrolytic action. It was found that the corrosion went on at least as rapidly with the main embedded in concrete as before; and the main was destroyed in a comparatively short time. When the box was broken open, the iron pipe was found to be very badly corroded and pitted, and the rust had penetrated more than an inch into the concrete. Investigations made by Knudson and by Langsdorf also show that iron and steel embedded in concrete will be corroded by electric currents passing from the iron or steel through the concrete.

I have had occasion to examine a steel main which had been dipped in a tar pitch compound before being laid, and which had been in service for about five years. The coating in most places was found to be apparently intact and firmly attached to the steel, and varying from about 1-32nd to 1-8th of an inch in thickness. At other places the coating appeared cracked and was brittle, or was entirely removed for considerable areas. In a locality where the main was lying in a marsh, and was subject to electrolysis from stray currents, deep pittings were found in the steel under apparently good, heavy coating, which in some cases had to be scraped away with considerable force. Electrolysis appears in this case to have gone on under an apparently perfect insulating coating.

In reply to my question-blank, Mr. Robert B. Harper, the Chief Chemist of the People's Gaslight and Coke Company of Chicago, kindly sent me a copy of a paper on "The Comparative Values of Various Coatings and Coverings for the Prevention of Soil and Electrolytic Corrosion of Iron Pipe." This paper was read by him before the Illinois Gas Association on March 18, 1909, and contains the results of an exhaustive investigation of a large number of commercial pipe coatings and coverings. The results given are of great value in the study of the problem of pipe protection.\* The conclusions drawn by Mr. Harper are so to the point, and agree so well with my own experience, that I will quote them in full:

- 1.—That paints, as a rule, do not prevent electrolysis, but some no doubt have a beneficial effect in curtailing soil corrosion.
- 2.—That the appearance to the naked eye of a paint film is no indication of its permeability to water.
- 3.—That corrosion of metal may take place beneath a paint film without apparently affecting its appearance.

\* Mr. Harper's remarks on the value of coal tar as a protective covering for pipes were given in the "JOURNAL" for July 20 last (p. 185).—ED. J.G.L.

- 4.—That the metallic body, before being covered, must be smooth and free from rust, moisture, loose scale, and foreign matter in order that it be preserved.
- 5.—That, in general, dips applied hot are better than paints, and probably furnish the key to the solution of the prevention of corrosion.
- 6.—That concrete of itself is not an efficient protection against electrolysis.
- 7.—That ingredients such as rubber, tallow, lime, &c., usually have a deleterious effect upon the efficiencies of coal-tar pitch.

#### SUMMARY AND CONCLUSIONS.

The statement that a given piping system is not suffering from electrolysis cannot always be taken as evidence that the system is actually free from stray currents and is immune from electrolysis, and especially not when reference is made to cast-iron mains carrying gas at ordinary pressures. The effect of electrolytic corrosion of cast iron is to oxidize the iron, leaving the iron oxide and the graphitic carbon in place, whereby the form of the pipe is kept intact. I have seen cast-iron pipe which was apparently in good condition, and carrying gas without leaking, which, upon being tested with a hammer, was found to be pitted entirely through the iron in more than one place. I have seen such cases where the blow of a hammer caused a plug, as large as a silver dollar, of these graphitic remains from electrolysis to drop out, exposing a hole through the pipe. Some of the replies which report that there is no trouble from electrolysis, and where no proper examination has been made, do not, therefore, afford conclusive evidence of immunity from electrolysis.

Cement joints, as ordinarily made, do not generally produce metallic electrical connection between the two pipes; and such joints may practically be classed with insulating joints. A pipe-line laid with all cement joints or with insulating joints is therefore a discontinuous electrical conductor, and is not capable of carrying stray electric currents. Such a pipe-line cannot, therefore, pick up current in an extensive negative area to discharge it in a restricted positive area, which is generally the cause of the most serious electrolytic danger. For this reason, a piping system with all cement or insulating joints is, on the whole, much less likely to be affected by electrolysis than a piping system with all lead joints or with screw couplings. Experience has shown, however, that a cement-jointed piping system is by no means immune from electrolysis; and we have abundant reports which show that cement-jointed mains, and especially service-pipes from such mains, can suffer severely from electrolysis. In these cases the stray currents reach the mains and service-pipes from other pipes or by other paths.

Where the current which reaches a service-pipe connected to a cement-jointed main can be definitely traced as coming from house services, it is possible to stop this flow of current by introducing an insulating coupling in the service-pipe inside the building or in the riser connecting to this service-pipe. It is also conceivable that a pipe may lie in ground in the path of earth currents of sufficient density to produce electrolytic action upon the pipes. Such a high density of earth currents may exist in the immediate vicinity of electric railway power stations having a poorly constructed return circuit. A reasonably good construction of the return circuit of the railroad should, however, prevent the existence of any such dangerous current density in the ground, as this current would be a source of great danger to all underground metal lying in its path, including steel building foundations.

The question of whether a pipe-line can be protected from electrolysis by installing a limited number of scattered cement or insulating joints, depends entirely upon local conditions. There are undoubtedly cases where the installation of even a few insulating joints at proper places will greatly reduce, if not eliminate, electrolytic danger. Experience has shown, however, that a few individual insulating joints may do more harm than good; and they can only be applied in special cases, and then only at points where electrical tests have indicated that they will do good.

As to the cause of the high resistance of cement joints, this is probably due to the fact that though in laying cast-iron pipe every attempt is made to push the spigot end home into the bell, as a matter of fact in most cases the two pipes are not in metallic contact. Even where there is contact, it is probably over a comparatively small area, if not at a point. As the end of the spigot is always heavily coated with scale, such metallic contact generally forms a poor electrical contact of comparatively high electrical resistance. It is a simple matter to positively prevent metallic contact by inserting a ring of some cheap insulating material, such as fibre or cardboard, between the end of the spigot and the interior of the bell; and this has been done in some cases. The resistance of cement joints is then the electrical resistance of the cement intervening between the spigot and the bell; and while cement is not an insulator (but, on the contrary, is probably as good a conductor as ordinary ground), compared with iron the resistance is so high that the cement joints practically interrupt the electrical continuity of the pipe-line.

In the case of lead joints, I have had occasion to measure the resistance of several hundred joints in use on various sizes of pipes. These joints generally have a comparatively low resistance—being equivalent, as a rule, to the resistance of 10 or 20 feet of continuous pipe. Occasionally, however, I have found lead joints which have resistances equal almost to 1 ohm, and equivalent to upwards of 10,000 feet of continuous pipe. I have



made special tests, in the laboratory of the Stevens Institute, upon two cast-lead joints and upon two lead-wool joints made on 8-inch cast-iron pipes. These joints were made in every respect as is done in practice, and without taking any special precautions; and the resistance tests were carried out a couple of months after the joints had been caulked. The resistances found were as follows: 0.0002 ohm for the first cast-lead joint, 0.00006 ohm for the second, and 0.00003 ohm for each of the two lead-wool joints. The resistance of the latter joints appears to be about half that of the lowest resistance cast-lead joint. The resistance of a lead joint is almost entirely that of the surface contact between the lead and the iron. The lower resistance of the lead-wool joint is, therefore, probably due to the fact that the lead of the joint makes contact with the iron over a greater area than in the case of the cast-lead joint. Since the resistance of a lead joint is that due to the surface contact, it is clear that such joints are likely to increase in resistance with age; and this appears to be borne out in practice. I remember testing one lead joint in a very old pipe which gave a value of about 0.4 ohm. By standing on one of the pipes, the resistance was reduced to one-tenth of its former value, due probably to the fact that under the strain better surface contact was made between the lead and the iron.

Where a cast-iron lead-jointed main has been in the ground for a number of years, it is probable that many of the joints have reached such high resistance values as to effectively break up the electrical continuity of the pipe. I have also found that very old pipe, especially early pipe that was imported from Scotland, is coated with a surface scale or oxide which has such a high surface resistance as to be practically an insulating covering. I have found cases where it was necessary to apply chisel and hammer, and cut through a thick and very hard coating, before electrical contact to the iron could be made. Where such old pipes were in the ground before electric traction was started, they are very much less subject to trouble from electrolysis than new pipe, affected immediately by stray current; the effect of the electrolysis being to produce a condition around the pipe which aids corrosion, and prevents the formation of a self-protecting insulating covering.

In regard to the use of insulating pipe coverings, experience shows that embedding a pipe in cement or concrete, even if this is several inches in thickness, does not protect the pipe from electrolysis, and in some cases it has even been found that the pipe in concrete is destroyed at least as rapidly as when it is buried in ground.

As to the use of paints or dips for protecting pipes, the first difficulty is the mechanical one of applying the paint so as to form an absolutely perfect coating, and then to prevent mechanical damage to the coating. Where imperfections exist or develop, aggravated trouble always ensues. Experience further seems to show that even where paints or dips are apparently intact and perfect, electrolytic action is not prevented—in fact, very serious electrolytic pittings have been found under apparently quite good coatings.

The only kind of insulating covering which appears to afford certain protection is a layer of at least one or two inches of a material like coal-tar pitch or asphaltum, of such a grade that it is not brittle and so will not crack, but yet is hard enough to remain in place. The best way to apply such a layer is to surround the pipe with a wooden box, support the pipe upon creosoted blocks of wood or upon blocks of glass, and then fill the space between the box and the pipe with the molten material. As a further protection, an insulated coupling should be introduced at each end of the section, covered so that, even if the covering should become defective at any point or points, no current can reach these points to corrode them by electrolysis. A pipe treated in this way, with the work done so as to be mechanically perfect, would undoubtedly be protected from electrolysis. However, the cost of carrying out such an installation is absolutely prohibitive, except in a few cases, such as in the case of service-pipes in very bad localities, or of some very important individual pipe-lines of small size. It is not sufficient to apply the covering only in the positive district; nor, on the other hand, is it always necessary to cover the entire length of line. The portions which must be insulated can only be determined by properly conducted electrical tests.

Regarding the use and value of an electrolysis survey, it must be remembered that the object of the survey is to indicate the existence or non-existence of stray electric currents upon a piping system, and to determine where such currents flow on to the pipes and from the pipes. I have had occasion to examine a large number of electrolysis surveys, some of which were kindly lent to me by members in reply to my question-blank. Most of these surveys consist, however, exclusively of voltmeter readings. Such readings by themselves do not afford a measure of electrolytic danger; they merely indicate where the greatest danger is likely to exist. Measurements of current flow on pipes are essential in an electrolysis survey, because all current which flows on a pipe must leave it; and the amount of damage produced is proportional to the total current which leaves the pipe. I have seen some reports, on the other hand, where it is stated that the current on a given pipe is zero, but where the instruments and methods employed were not sufficiently sensitive to detect currents as large as 2 or 3 amperes, and where, therefore, the conclusion of zero current is not warranted.

From a complete and properly analyzed electrolysis survey, a great deal of good can generally be accomplished. It will not

always be possible to remove all stray currents from the pipes; but measures will be indicated by which the conditions can be much improved, and points of greatest danger will be located. If then trouble does occur at a later time at these points, the electrolysis survey may be most valuable in affording proof of the destruction of the property from railway currents, and may be the means of compelling the railroad company not only to pay for the damage, but also to make improvements in its return system so as to avoid the recurrence of such damage. I know of a number of electric railroad companies who are regularly paying for damage caused by electrolysis to piping systems. The knowledge that a pipe-owning company is making electrolysis tests and is keeping watch on the situation, also has a strong moral effect on the electric railroads.

In conclusion, I wish to say that I have no doubt some of the members will be disappointed in my paper because I have not been able to present a simple cure-all for electrolysis. I am afraid that the only possible cure-all is an insulated railway return system. I am convinced, however, that in nearly every case where serious stray railway currents flow on piping systems a very great reduction of these currents can be accomplished by improvements in the return circuit of the railways, and in many cases these stray currents can be reduced to a small fraction of their former amount. And this should in every case be the first step. After this has been done, there are many cases where insulating methods judiciously applied to the piping system will further greatly reduce the stray currents which still remain.

Appended to the memorandum are a large number of extracts from the replies received by the author to his questions.

## GAS DISTRIBUTION IN SAN FRANCISCO.

By W. R. MORGAN.

[Extracts from a Paper read before the Pacific Coast Gas Association.]

The distributing system of San Francisco is the result of about sixty years' growth, and represents the efforts of eight Companies which have flourished for longer or shorter periods since the year 1852, when the San Francisco Gas Company was incorporated. Subsequently, the following Companies came into existence: Citizens (1862), City (1870), Metropolitan (1871), Central (1872), Pacific Gas Improvement (1883), Equitable (1898), and Independent Gas and Power (1901). All these Companies have been absorbed by the original San Francisco Gas Company, now known as the San Francisco Gas and Electric Company, who have inherited from them some 300 miles of mains. Each system has contributed its advantages and defects—its services, valves, drips, and leaks. A complete plan of the mains would be practically a map of the city. Nearly every house is reached by the services, and every gas street-lamp is supplied from the mains.

The entire low-pressure system is of the arterial type—i.e., open from end to end to the free passage of gas. Considering its hazardous growth and lack of comprehensive design, it is better adapted to its purpose than might be supposed. The various independent lines have been so tied together that individual deficiencies are supplied by the strength and completeness of the whole. In localities where consumption is greatest, two mains are used—one in either side of the street. This double arrangement affords advantages that cannot be secured when only a single main is available—for example, shorter services, greater storage capacity, lighter drag at peak hours, and insurance of uninterrupted service, as either main will suffice temporarily should a stoppage or a serious break occur in the other.

In outlying districts there is a scarcity of large mains—2-inch and 4-inch being commonly used. The former are being replaced gradually with larger sizes, and no more 2-inch pipe is being laid, except in ungraded and unpaved streets, where the number of services to be installed will not exceed four or five. The problem involved is not the theoretical capacity of the main according to Pole's formula, but the great uncertainty regarding its condition after a few years' use. Unless there is a fall of at least 5 per cent., a trap is likely to occur; moreover, 2-inch pipe is easily choked by naphthalene, and a long run is not readily cleared. Invariably, such mains have been prolific sources of complaints, and are maintained only at an expense unduly great compared with larger ones.

The city of San Francisco is built upon the northerly end of a narrow peninsula, lying between the Pacific Ocean and the bay of San Francisco. On the north is the well-known "Golden Gate"—a narrow, picturesque channel, connecting the ocean and the bay. Regarded as a field for gas distribution, the city is approximately square, with boundary lines conforming closely to the cardinal points of the compass. The area to be supplied is 36 square miles. Elevations range as high as 450 feet above sea level; and the nature of the soil varies from alluvial deposits and sand to a fairly hard granite. Dividing the area by centre lines into four equal squares, the north-easterly section is occupied by the business district and western addition, the north-westerly by the Richmond district, the south-westerly by the Sunset and Park-side districts, and the south-easterly by the Mission and Potrero districts.

Gas is supplied from the Potrero station, located on the bay



shore at about the middle of the easterly boundary. From this point the two principal trunk lines (24 and 30 inches) extend westerly and northerly a distance of  $4\frac{1}{2}$  miles to the North Beach station, on the northerly boundary line of the city. No gas has been made at this station since April, 1906; but a 2 million cubic feet storage holder is still utilized; being filled during the day and gas delivered at night by a blower and compressor.

The north-easterly quarter section of the city includes the original mining town of early San Francisco, where, in 1852, Peter Donohue started his infant gas-works. This section is amply provided with large mains well connected, and having a good circulation. The sizes run from 10-inch to 20-inch in the trunk lines, and in turn supplying a grid-iron of smaller mains running through every street and alley, and connected at every crossing. Richmond, in the north-westerly corner, has presented a serious problem. In 1906, this was a sparsely-settled district, provided only with 2-inch and 4-inch mains. It is three miles from the North Beach station, and six miles from Potrero. Dead-ends were the rule, and services were small—mostly 1-inch. Shortly after the fire, the population was increased fully four-fold by an influx of people who had been burnt out. Every vacant house was filled, and many new houses and stores were quickly built. The combination of small mains, long distance, and sudden increase of consumption, developed a deplorable "no gas" condition. A 4-inch auxiliary high-pressure line, from the North Beach station, furnished the principal supply, though with a 14 in. by 16 in. by 12 in. compressor it was difficult to keep a pressure of 20 lbs. per square inch at the station. Lately the situation has been relieved by the extension of a 12-inch low-pressure main for a distance of two miles through the principal thoroughfare, with direct connection to a 20-inch feeding-line. All laterals have been connected, thousands of feet of 2-inch mains replaced with 4-inch and 6-inch, and many dead-ends eliminated. A new 16 in. by 17 in. by 20 in. compressor has been installed; and during peak hours a pressure of 30 lbs. is maintained at the station. Two Chaplin-Fulton district governors are located at suitable points and set to keep a pressure of not less than 5 inches in the distributing system. The service now is very satisfactory, and complaints have dropped to normal.

Sloping to the ocean beach, south of Golden Gate Park, lie the Sunset and Parkside districts. The soil here and in Richmond is composed of clean, wind-blown sand, which has been swept in from the beach over barren dunes, and piled in shifting drifts and ridges. During the season of westerly trade winds, a trench left open at night in any exposed location will be filled with sand, and all traces of its existence obliterated before the following morning. Pipe laid in this ground lasts about as long as when stored in a warehouse. Near the beach, however, unprotected wrought-iron pipe is affected by the corroding action of both salt and fog.

The Sunset district is supplied by means of a low-pressure system, boosted at peak hours by high pressure from a 2-inch main extended from the high-pressure line in Richmond. This main also runs on southerly to the newly-built settlement of Parkside, which is the only exclusively high-pressure district in San Francisco. About 75 houses are supplied by means of  $\frac{3}{4}$ -inch services, No. 1 Equitable governors, and ordinary 5-light meters. The installation gives less trouble, and the district is the source of fewer complaints, than any other of equal area in the city.

The Mission is a densely-populated residential district. This and the Potrero, in the south-easterly corner, are supplied from the 24 and 30 inch trunk lines by 10, 12, and 16 inch feeding-mains and the usual network of smaller pipes. Lead joints are used exclusively throughout the whole system of cast-iron mains.

House services vary in diameter from 1 inch upwards. Nothing less than  $1\frac{1}{4}$ -inch has been installed during the past ten years, though thousands of smaller services (relics of former times) are still in use. Present practice favours generosity in regard to sizes. The constantly increasing use of gas appliances demands  $1\frac{1}{2}$  and 2 inch pipe in houses which formerly could be supplied by means of 1 to  $1\frac{1}{4}$  inch. Where water-heaters are in use in addition to the customary burners for illumination, it has been found advisable in many cases to instal separate services to supply heaters which require a rapid flow of gas. When lights and heaters are supplied from a single service, the irregular demands of the heaters cause quick variations of pressure and flickering lights unless the service is extravagantly large. Two  $1\frac{1}{2}$ -inch services are cheaper to instal, and give better results, than a single 2½-inch service. A  $1\frac{1}{2}$ -inch service costs only 10 per cent. more than a  $1\frac{1}{4}$ -inch; while the difference in capacity is 40 per cent. The larger service, moreover, has advantages apart from mere capacity. It is not so easily choked or trapped as the smaller sizes, both pipe and fittings are stronger, leakage is reduced, and the life of the service lengthened.

During the last few years, particular attention has been devoted to the matter of meter locations. It is required that in every new building a suitable place shall be provided for gas-meters in the part near the street, and not higher than the ground floor, where light and ventilation are good, where the meters may be reached easily by inspectors, where they are accessible in case of fire, and where the service-pipe can be run to them without elbows, bends, or traps. About 200 old services are being overhauled per month and larger pipe installed, bends and drips removed, and meters reset in accordance with the conditions just outlined.

Meters range in size from 3-light to 200-light; and the 3-light, 5-light, and 10-light sizes are set with lead connection—all larger

than the last named having iron connections. The use of 3-light meters is being discontinued in favour of 5-light ones. Under average conditions, the life of a meter is six years. If kept in commission for a longer period, it is liable to become inaccurate and leaky, or break down altogether. After six years' use, the leather diaphragms are generally dry and hard, the oil having been evaporated, and the meter becomes "slow," or possibly fails to register. To simplify the regular changing of meters, they are painted a different colour each year.

Street-lamps have 1-inch services and  $\frac{3}{4}$ -inch rising pipes. They are provided with Welsbach mantles, which are supplied and maintained by the Welsbach Company under a contract with the Gas Company. Of the 5000 lamps in use, 340 are "triple tops"—i.e., a cluster of three lamps supported by a single post.

The subject of complaints is the liveliest storm-centre in all the affairs between a gas company and the general public. This is a remarkable condition, in view of the fact that the desires of the complainants and the interests of the company are identical. However far apart the principals may be regarding rates, or whatever differences of opinion may exist between them concerning the accuracy of a meter or the equity of a bill, they meet on common ground when it comes to the complaint question. Nine times out of ten the consumer wants more gas and ten times out of ten the company are eager to accommodate him. The only difficulty hinges upon their ability to furnish a satisfactory supply quickly enough.

Ninety per cent. of consumers' complaints are on account of poor pressure, caused by naphthalene in the service-pipes or the meter connections. A little gasoline blown through the service with a force-pump is ordinarily sufficient to clear the pipe. Particularly stubborn cases require that the services shall be overhauled and thoroughly cleared by mechanical means. Some months ago, a 6-inch service supplying a local cannery became badly choked, and was cleared by disconnecting the pipe at the main and blowing it out with steam by means of a hose connected to the boiler.

Climatic conditions in San Francisco are particularly favourable for the rapid formation of naphthalene in service-pipes and meters that are exposed to the air. From May until October the forenoons are usually warm and clear, followed by a cool sea breeze with banks of fog in the afternoon. The change of temperature is sufficient to affect exposed services, and start an avalanche of complaints of poor pressure.

In the congested district of San Francisco, street conditions below the surface are somewhat discouraging. From kerb to kerb, to a depth of from 6 to 10 feet, the space is filled with iron, brick, and concrete structures. The street railroad right-of-way covers 18 feet. Into the remaining space are packed telephone, telegraph, electric light, and power conduits, with manholes up to 10 feet square; gas and water mains and services, with valves and drips; sewers and manholes, catch-basins and laterals; an occasional steam line; and numerous abandoned pits formerly used in connection with cable railways. In crossings, the city authorities are building water-cisterns 34 feet diameter; and the Gas Company have been politely advised by the City Engineer to remove their mains from the areas of the cisterns.

During the last half century, fewer changes have been made in the distributing system than in any part of the Company's plant. The construction of the works, the material used, and the methods of manufacture, have all undergone radical changes; even the office methods have been revolutionized. With gas made from a new material, by a new process, and consumed in burners embodying newly discovered principles, the means used for delivery have remained practically the same for a period of fifty years. In all probability, before the next meeting of the Association, this apparently unchangeable equipment will have joined the general march of development towards greater efficiency.

Plans have been prepared for the installation of a 16-inch high-pressure gas-main from the Potrero station to the North Beach station, designed to carry gas under a pressure of 40 lbs. per square inch. Five district governors are to be located at points from which the Mission, Sunset, Richmond, western addition, and business districts can all be furnished with a supply of gas far in excess of present demands, and this without adding to, or materially altering, the existing low-pressure system. The plan is to change the catenary curve of a long chain to practically a horizontal line by means of equi-distant supports between the abutments. When this has been accomplished, peaks will lose their terrors, and the increase of gas consumption in San Francisco will be anticipated for fully fifty years to come.

**Conversion of Ordinary into Prepayment Meters.**—In the course of a paper on "Experience with Prepayment Meters" read by Mr. Frank Hellen, the Superintendent of Gas Distribution for the Rochester (N.Y.) Railway and Light Company, at the last annual meeting of the Empire State Gas and Electric Association, he stated that they had 5000 old three-light meters which had been practically set aside as worthless. Since adopting the prepayment system, they had converted these meters into slot-meters, and they were being set up for small consumers. He pointed out to his hearers that if they considered the fact that the Company had installed 6000 prepayment meters since Jan. 1, 1908, they would readily understand that a great saving was effected by the conversion of the 5000 old meters.



BENZOL ENRICHMENT OF GAS.

As mentioned in the course of the notice of the proceedings at the last annual meeting of the American Gas Institute which appeared in the "JOURNAL" for the 9th of November, the Committee on Benzol Enrichment presented a report on the result of their labours. We have received from the Secretary (Mr. A. B. Beadle) a copy of the report, and take therefrom the following observations.

On investigating the use of benzol as an enricher of illuminating gas, the Committee found that, as the result of its being manufactured mainly in bye-product oven plants, by far its most important use in America as an enriching material had been to raise the candle power of the coal gas obtained in the manufacture of coke. The companies producing bye-product oven gas made a careful study of the practical conditions governing the enrichment of their product by the use of commercial benzol; and the Committee received communications from Mr. Warren S. Blauvelt, at Detroit, and from Mr. L. M. Whitwell, at Milwaukee (Wis.), both connected with the Semet-Solvay Company and members of the Committee, giving some of the results of such study. These communications are appended to this report as an appendix. The Committee say that perhaps the most important work done by the Company was the confirmation, in practical work, of Dr. Bunte's figures showing the varying enrichment value realized from benzol in candle-feet per gallon depending upon the quantity of benzol carried by the gas.\*

The Committee call particular attention to the fact that enrichment by benzol adds but little to the heating value of the gas enriched. The addition of 0.1 gallon of benzol to 1000 cubic feet of gas increases its heating value by only about 12 B.Th.U., even when no low-tension vapours are thrown down; and, since the heating value of gas is to-day at least as important as its illuminating power, the first essential for the successful use of benzol enrichment is that the gas must already have a satisfactory thermal value. For this reason benzol can never entirely replace gas oil for the enrichment of water gas; the approximate quantity of 1 gallon required to raise 1000 cubic feet of "blue" water gas to 21 or 22 candle power would only bring up the heating value to about 425 B.Th.U. per cubic foot. On the other hand, coal gas, whether made in coke-ovens or in retorts, is comparatively low in illuminating power, but possesses the necessary initial heating value to make it suitable for enrichment by benzol. The Committee consider that benzol may have an important value as an enricher for water gas in cases where sufficient oil has been used in the manufacture of the gas to give it the necessary heating value, but where the candle power has been reduced by the loss of hydrocarbon vapours due to cooling or compression.

Practical results confirm theory in condemning the use of benzol to enrich at the works any gas already saturated with hydrocarbon vapours. The low-tension vapours will be deposited in transmission to a greater or less extent, depending upon the temperature and pressure conditions; and the final candle power reaching the consumer is likely to show that a very disappointing enriching value has been realized for the benzol used.

The Committee received a report from a works manufacturing one-third water gas and two-thirds coal gas, covering a full year's use of benzol to replace a portion of the gas oil formerly used. The enriching was done at the works, and the report showed an average enriching value of about 28,000 candle-feet per gallon of benzol. However, as the quantity of street drip was increased by the use of benzol, it is probable that the enrichment value, measured by the candle power at the point of consumption, was much less than that shown by the candle-power readings at the works.

The Committee point out that to ensure a permanent and commercially successful increase in candle power by the use of benzol, it is usually necessary to prepare the gas by removing a portion of the low-tension hydrocarbon vapours. This may be done by compression, by cooling, or by washing the gas with an absorbent oil. Mr. Blauvelt in his paper describes the latter method as it is carried out at Detroit; Mr. Whitwell gives the results obtained at Milwaukee in the enrichment of coke-oven gas after compression to from 1½ to 2 lbs.

The conditions controlling the commercial success of benzol enrichment are, the Committee state, the comparative costs of this material and gas oil, and the quality of benzol available; the initial candle power and heating value of the gas to be enriched, and its condition with respect to saturation with hydrocarbon vapours and the character of such vapours; and the conditions of temperature and pressure to which the gas will be exposed after enrichment. These factors having been determined, they consider there are sufficient data available, both practical and theoretical, to make it possible to give a close estimate of the probable results to be obtained by enrichment with benzol. They conclude by expressing their conviction that there are many cases where such enrichment has practical and economic advantages over any other method, but that each case constitutes a separate problem requiring careful study.

In the course of his paper, Mr. Whitwell gives the following figures to show the amount of enriching benzol required to produce various ultimate results from certain initial candle powers.

To Produce 16-Candle from 10-Candle Gas.

Initial Candle Power.		Quantity of Benzol to be Used per 1000 Cubic Feet.	Candle-Foot per Gallon.
Due to Benzol.	Not Due to Benzol.		
10	0	0.310 gallon	19,300
8	2	0.230 "	26,000
6	4	0.190 "	31,500
4	6	0.160 "	37,500
2	8	0.140 "	42,900

To Produce 18-Candle from 14-Candle Gas.

Initial Candle Power.		Quantity of Benzol to be Used per 1000 Cubic Feet.	Candle-Foot per Gallon.
Due to Benzol.	Not Due to Benzol.		
14	0	0.300 gallon	13,300
12	2	0.240 "	16,600
10	4	0.165 "	24,200
8	6	0.135 "	29,600
6	8	0.120 "	33,300
4	10	0.105 "	38,000

Referring to the second table, Mr. Whitwell says: "The above case of raising 14-candle to 18-candle gas may explain some of the widely different results which have been obtained in various works where benzol enrichment has been experimented with, even though no troubles were experienced with deposition of oils after enrichment. For instance, assuming that a mixture of equal parts of coal gas and water gas of 14 and 22 candles respectively was yielding a finished gas of 18 candles, and it was desired to reduce the candle power of the water gas by substituting benzol enrichment, the measure of the success of the change would, of course, depend on the candles obtained per gallon of benzol. Assuming that 14-candle instead of 22-candle water gas is made, then the enrichment is to be 4 candles of benzol added to a half-and-half mixture of coal gas and water gas of 14-candle power. Upon the composition of the 14-candle gas, as to the ratio of the candle power due to benzol to that due to true gases, would depend the enriching value of the benzol used. From the above table it is seen that this enriching value may vary from 13,000 to 38,000 candle-feet per gallon. If the water gas is such that a large portion of the 14-candle power is due to its content of condensable oils, much lower results would be obtained than if a large portion of the 14-candle power is due to the gases, ethylene, &c. The same is true of coal gas. It is therefore very apparent that the quality of the gas to be enriched is of quite as much importance as the quality of the benzol to be used. Apart from the carrying properties of the benzol, the proportions of the candle powers of the initial gas which are due to oils and to true gases are to be taken into account."

In the course of some further remarks, Mr. Whitwell says: "Considering the above figures of the possibilities of benzol enrichment of 14-candle to 18-candle power gas, it is seen that there are opportunities for realizing very cheap enrichment. For instance, in the case of a half-and-half mixture of coal gas and water gas, in which the water gas is so made that the mixture contains 8-candle power due to oils and 6-candle power due to true gases (ethylene, &c.), it is possible to realize 29,000 candle-feet per gallon of enriching benzol. These conditions show that it is essential, in attempting to use benzol enrichment, to investigate very carefully the gas to be enriched, and that the process can be a success or failure dependent on the quality of the gas, regardless of the quality of the enriching benzol to be used. It is thus not rational simply to reduce the oil used in water-gas machines, and substitute benzol enrichment, but very careful work should be done to make the water gas best suited to the conditions. In the enrichment of coal gas alone the same conditions are essential—viz., that, to secure the best results from benzol enrichment, those methods should be employed in retort and condensing house practice by which the maximum ratio of the candle power due to true gases to that due to oils will be realized."

In a subsequent part of his paper, Mr. Whitwell refers to the benzol enrichment of high-pressure gas. He points out that such enrichment at the delivery end of high-pressure lines is simply a proper application of fundamental principles, as the benzol is added under the condition in which it will be retained according to physical laws, and as it is found to be retained in actual practice. At Milwaukee, benzol is added to the gas after 1½ miles of transmission under about 2 lbs. pressure, so that a small portion of the tension oils has been deposited before enrichment. The gas is then tested two miles beyond the point of enrichment. Mr. Whitwell gives the following operation results, obtained during four months last year, as being of interest:—

Month.	Initial Candle Power at Ovens.	Enriching Benzol Used per 1000 Cubic Feet of Gas.	Candle Power after Trans- mission.	Candle- Foot per Gallon of Benzol.
February	9.14	0.40 gallon	17.19	20,201
March	9.59	0.39 "	17.40	19,876
April	10.02	0.42 "	17.00	16,517
May	10.15	0.40 "	17.42	17,915
Average	9.72	0.40 gallon	17.25	18,627

The enriching values of the oil used at Milwaukee are determined from the candle power of the gas as it leaves the condensing house at the ovens, as compared with that possessed by it after transmission. That is to say, the enriching value represents the enrichment of the gas, not as put into a holder at the works, but as delivered over two miles at a temperature of 35° to 40° Fahr.,

\* See "JOURNAL," Vol. LXII., p. 717.



and pressures up to 2 lbs. per square inch. Mr. Blauvelt presented the results at Detroit, which show that, with gas better prepared for benzol enrichment, but still carrying a total benzol content about the same as Milwaukee, considerably higher enriching values can be realized, and practically no loss sustained in transmission.

Mr. Whitwell concludes by saying that a fair consideration of the possibilities of benzol, with due consideration of the conditions which affect the retention of this enriching medium, brings out very clearly the conclusion arrived at by Mr. E. H. Earnshaw, in his paper on "The Theory of Benzol Enrichment," read at the meeting of the Institute in 1908,\* "that every case in which it is desired to use commercial benzol as an enricher must be treated as an independent and separate problem, and considered in the light of known laws." It is evident that practically no two operations need the same treatment in order to give the most economical results. In one case a small loss in transmission might be more economical than the cost of the removal of the low-tension oils at the works, whereas in another case exactly the opposite might be true. Similarly, the costs of obtaining the desired results must be set one against the other in any case; but Mr. Whitwell considers that the results which have been obtained surely indicate that, if properly handled, there are opportunities in many instances for remarkably economical enrichment by the use of benzol.

The following particulars in regard to the enrichment operations carried on at Chester (Pa.) were furnished by Mr. C. Rodman Stull.

At Chester (Pa.), the Suburban Gas Company operate water-gas plant and bye-product coke-oven plant. The latter is situated about  $1\frac{1}{4}$  miles from the former, so that the coke-oven gas has this extent of travel before it is mixed with the water gas. All the gas evolved from the coal charged into the ovens is used for distribution to the consumers; the gas required for heating the oven flues being derived from an independent producer installation. This method of operation, together with the general system of oven charging employed, is productive of widely varying results from the standpoint of quality of gas received. As an illustration of this, the illuminating power will range from 17 candles immediately after charging to 1 candle towards the end of the coking period; the heating values varying approximately between the limits of 650 and 550 B.Th.U. per cubic foot. This fact will in itself explain some of the variable results obtained with benzol enrichment. Another feature in the operation is the presence of water gas in different portions in the mixture to be enriched.

The gas from the coke-ovens, after its travel through a 10-inch main  $1\frac{1}{4}$  miles long, is metered ahead of the purifiers, and before being added to the water gas; the two gases being mixed in the boxes. The illuminating power of the water gas, when this is to be mixed with the coke-oven gas, is kept at approximately 20 candles. This value was determined upon, after experiment, as yielding the best economic benzol effects on the mixed gas. Some attempts to carry it below 18-candle power gave very poor results. The 20-candle value allows for 1 or 2 candles enrichment from the water gas, depending on the proportion of the mixture, which, in turn, determines the candle power of the gas to be delivered to the consumers. We have not had any considerable amount of experience with benzol enrichment on the straight water gas, except in the months of April and May, 1908, during which time we obtained an average of 21,900 candle-feet per gallon of benzol. The process was discontinued, however, on account of the poor carrying qualities of the water gas so treated.

After being mixed in the purifiers, the gas is enriched with benzol. The carburettor used is of a simple type; the oil being vaporized by steam. Candle-power readings are taken hourly on the gases before and after enrichment; and the finished power is read directly from the line at the outlet of the governors. This allows for a certain amount of condensation between the carburettor and this point; the major portion probably taking place in the holder inlet-pipe and the commercial holder itself. It is a very noticeable fact that enriching values vary considerably, due to this phase of the operation. During the winter months, a large amount of condensate gathers on top of the water in the holder tank, which vaporizes during the warmer weather, and practically automatically enriches the gas. This means that after enrichment there are present in the gas certain hydrocarbon vapours of such low tension that their condensation takes place when the gas is chilled in the holder; this condensate revaporizing when the temperature of the gas increases to the proper point for such action to take place.

At the time of writing, we are experiencing a condition of higher candle power on the end of a 9-mile high-pressure system than at the holder station. The gas being pumped is all coke-oven gas, where previously it was a mixed gas. This condition can be explained in the same way. A comparison of drip-oil tests will tend to corroborate this statement; some of the higher-tension oils having been condensed in pockets along the line during the winter months. It is quite likely that the coal gas contains a lower percentage of illuminating power due to benzol and more to fixed gases, and for this reason is better able to absorb a greater proportion of the oils in the line than was possible with water gas. The following table gives a survey of operations for six months.

Month.	Temp Air.*	Candle Power.			Candle- Feet.	Darby C.P.	Drop.
		W.G.	C.O.G.	Mixed.			
February	38	20.0	7.6	17.3	18,900	12.7	5.6
March	38	20.2	8.1	16.9	18,900	15.2	1.7 (a)
April	50	19.0	7.0	16.8	34,100	16.1	0.7 (b)
May	61	20.1	8.0	16.8	52,500	16.1	0.7
June	71	20.8	6.5	19.0	27,600	15.2	3.8 (c)
July	74	19.8	6.5	19.0	30,100	17.1	1.9

(a) Less water gas than in February; and better grade of oil. (b) Less water gas than in March; and increase in air temperature. (c) Excess of water gas over coke-oven gas.

Looking at the February and March figures, it will be noticed that the enriching values for these months are identical, as well as the atmospheric temperatures. The carrying capacity of the gas, however, was increased. This may have been due to two causes—a decrease in the percentage of water gas in the mixture, and the use of a higher-grade benzol (about 82 against 78 per cent.). With April, the enriching value per gallon went up to a high figure—viz., 34,100 candle-feet. With this there was an increase of 12° Fahr. in atmospheric temperature for the month. There was also a further decrease in the percentage of water gas in the mixture. The average benzol consumption per day was less than in either February or March, along with lower initial candle-power values—showing that some of the condensate collected in the holder was being revaporized and enriching the gas. The increased carrying capacity of the gas under high pressure is to be noted. For May, a still higher value was realized; this being done with a rise of 11° Fahr. in atmospheric temperature and a slight increase in the percentage of water gas in the mixture over the previous month. In June, the water gas in the mixture exceeded the coke-oven gas; the results showing a decrease in enriching value. The figures for July show an enriching value of 30,100 candle-feet per gallon, under conditions which closely approximated those of the previous month.

## SCOTTISH JUNIOR (WESTERN) GAS ASSOCIATION

### Visit to the Bedlay Colliery.

Last Saturday afternoon, the members of the Western District Division of the Scottish Junior Gas Association paid a visit to the coke-ovens at the Bedlay Colliery, near Glenboig. There was a gratifying attendance; the company numbering about sixty. They were received at the works by Mr. J. Robertson, the Manager of the coking department, and by him and two assistants were shown round. The works are entirely new, having been opened in April, 1908. Everything in and about them is consequently of the most modern description; and the knowledge of this fact was one of the reasons for the large attendance.

The coal which is got at Bedlay is of a high coking quality, being somewhat similar to that which is found at Auchengeich, near Kilsyth. It is largely sold for gas-making; and it is only the small stuff that is sent to the coking department. It is first washed, then hammered by machinery into pieces about the size of a pea, and sent on a belt conveyor to the charging-machine. As the coal trickles into the machine, it is rammed into a solid mass by heavy stamping machinery of an ingenious description. The mass of coal is pushed into the retort, where it remains for about 24 hours, after which it is pushed out on to a sloping platform. As it emerges from the retort, the coke is quenched by a spray of water from an overhead pipe. At the foot of the slope it falls into a conveyor, which takes it away to the screening plant. The retort-bench is on the Semet-Solvay system, and contains thirty retorts, each 30 feet long, 2 feet broad, and 7 feet high; their capacity being 7 tons of coal each. There is a high yield of coke. The charging and discharging machinery is electrically driven. The gas which comes off is sufficient for the firing of the retorts and the tar-stills; and there is then a surplus which can be used in firing steam-boilers. The gas is drawn off by a Waller exhaustor, placed after a very extensive range of vertical pipe condensers. After the exhaustor, the gas is washed and returned for fuel. The bye-products are worked up—the tar into benzol and pitch, and the liquor into sulphate of ammonia. Of the latter, there is a very high yield.

At the close of the inspection of the works, tea was served in a store-room. After tea, the President (Mr. D. Currie, of Stirling) asked the members to accord to Messrs. Baird and Co. their hearty thanks for the great privilege they had granted the Association in allowing them to visit their magnificent works. At the present time, when so much was being said about carbonizing coal in bulk, the visit to Bedlay to inspect the coke-ovens had certainly proved very interesting, as it had given the visitors an idea of what could be done in the way of dealing with coal in large quantities. The President also asked the members to express their thanks to Mr. Robertson, and to Messrs. Buchanan and Hanson, for the courteous manner in which they had shown them through the works.

On behalf of the Company, Mr. Robertson returned thanks for the vote, saying he was certain the General Manager (Mr. J. T. Foyie) would have done had he been present. He hoped the visit had proved interesting. There was a difference between carbonizing 7 tons of coal and only a few hundredweight; but the trend of the day seemed to be to adopt vertical retorts, and carbonize in large quantities.

\* See "JOURNAL," Vol. CIV., p. 907.



HYPOCHLORITES FOR WATER PURIFICATION.

A recent number of the "Proceedings" of the American Philosophical Society contained the following article, by Dr. W. Pitt Mason, on "Purification of Water Supplies by Hypochlorites."

There is no question but those of us who have taken ground as opposed to the "disinfection" of water by "bleach," hypochlorite of sodium, or other similar substances, must change our position. The experimental work in France and England, the improvement of the water of Bubbly-Brook at the Chicago Stock Yards, and, above all, the remarkable results secured by the Jersey City Water Supply Company, when operating upon the entire municipal supply of Jersey City, suffice to silence opposition to what may be termed the most recent purification method of to-day.

It is true that some years ago the Woolf process was proposed, whereby an electrolyzed salt solution was employed for addition to either sewage or water; and still farther back the Webster plan was advocated. But none of the hypochlorites was exploited in the systematic and exhaustive manner that has been recently accomplished, nor has the smallness of the dose that will accomplish efficient treatment ever been suspected. Let the following facts speak for themselves.

Lake water was treated with increasing doses of bleaching powder equivalent to the amount of available chlorine indicated. It was then allowed to stand three hours in the dark, shaken, and sowed for "total count" of bacteria.

Dose of Bleach.		Bacteria per Cubic Centimetre.
Grains per Gallon.	Parts per Million.	
0	0	102,900
3/100	0.51	410
1/20	0.85	320
1/10	1.70	175
1/8	2.12	100
1/4	4.25	95
1/2	8.50	45

Numerous similar sowings were made, and even lower counts of residual germs were found.

Upon examining waters charged with pure cultures of *Bacillus coli communis*, and others contaminated with fresh faecal material of human origin, no gas-forming bacteria of any kind were found alive in any instance after the use of even the smallest dose of "bleach" shown above.

Other experimenters have arrived at similar conclusions with still smaller doses of "available chlorine." The most satisfactory test of the process, however, is the practical one of treating the entire municipal supply daily furnished to Jersey City. The dose there used during the month of December, 1908, averaged approximately 0.03 grain of available chlorine per gallon. It has since been materially reduced. While using the above-named amount, the daily counts of bacteria for the month were—

	Raw Water.	Treated Water.
Maximum	1600	30.0
Minimum	240	..
Average	559	2.7

No part of this minute dose of hypochlorite reaches the consumer, and protection against pathogenic organisms appears to be assured.

It is not expected that the process will take the place of filtration, because it does not aid in improving the physical appearance of a water. But as an adjunct to a filter plant, there can be no question of its usefulness in times of emergency; and it can surely be depended upon to render a reasonably polluted water safe for domestic purposes, and do it at a moderate price.

It goes without saying that the hypochlorite of sodium, obtained by electrolyzing a solution of common salt, can be substituted for the bleaching powder whenever local conditions allow of its cheap manufacture. The effect upon bacterial life is the same.

We have received from the Editor (Mr. S. Edgecumbe Rogers) the "Local Government Annual and Official Directory" for the current year. The main portion of the book is devoted to the directory, which gives the names and addresses of the chief officials of all the corporations and local and other authorities throughout the kingdom, as well as a list of the Borough Councils and City Companies of London. In addition to the directory, there is a quantity of information relating to electric light undertakings in the London boroughs; the charges for gas and water are shown; and there is a useful abstract of the local government legislation in 1909.

The following is an extract from a paper read by Mr. R. Hammond before the Institution of Electrical Engineers: "In regard to the metallic filament lamp, I am thoroughly with those who believe that it is a magnificent thing for the industry. We have been saying for the past 20 or 25 years that we should entirely abolish gas if, by various methods of economy, we could produce electricity cheap enough. We have made a fight against gas through all these years; and at last we find ourselves in a position, with the metallic filament lamp, of being able to supply electricity in England at practically a cheaper price than that at which gas is supplied. We have talked about shutting up the gas-works in England for a great many years; and I would like to say to the gas managers that the invention of the metallic filament lamp makes their tenure a very short one."

LARGE STEEL PIPE-LINE FOR BROOKLYN.

A recent number of "Engineering Record" contained a long illustrated article on a 72-inch steel pipe-line which has been laid in augmentation of the Brooklyn (New York) water supply. The following are some particulars in regard to the work.

The borough of Brooklyn takes its water supply from wells, infiltration galleries, and ponds stretching over a distance of 23 miles along the south shore of Long Island, and extending eastward to the Suffolk County line, about 30 miles eastward. The water is drawn from the wells, galleries, and ponds by pumps in 24 isolated stations, and delivered into large trunk mains, which, with the exception to be noted, have gravity flow. The trunk mains have gradually been added to as the consumption of water has increased, until at the present time they include the following lines: A brick conduit seven miles long from Massapequa westward to the Millburn pumping-station; three 48-inch cast-iron pipes therefrom westward to the gate-house west of the Millburn reservoir; two 48-inch cast-iron mains, 12½ miles long, from the reservoir to the pump-well of the Ridgewood reservoir pumping-station; and, finally, a 36 inch cast-iron pipe from the Millburn reservoir to Smith's Pond, where it connects with a brick conduit running to the pump-well at Ridgewood. The brick conduit from Massapequa to the Millburn pumping-station increases in capacity from 41 million gallons per day at the eastern end to 59 million gallons at the western end; the increase being required by the tapping of additional supplies. The three 48-inch cast-iron pipes from the Millburn pumping-station to the Millburn reservoir are force mains for overcoming the summit at that point; this being the exception to gravity flow above noted. The brick conduit from Smith's Pond to the Ridgewood reservoir pumping-station increases in capacity from 41 to 76 million gallons in its westward course. Through this system, about 125 million gallons of water a day are delivered to the city in the summer months; and of this quantity all the water from stations east of Baldwin, where the Millburn pumping-station is located, is pumped three times before reaching the distribution system—first, in being taken from the source and delivered to the brick conduit; secondly, in being raised by the pumping-station over the hill at this point; and, thirdly, in being raised to the Ridgewood reservoir.

It became apparent some years ago that a further increase in the supply was necessary; and, accordingly, the Department of Water Supply, Gas, and Electricity, having charge of the Brooklyn water system, determined on an increase in the number and capacities of its sources and pumping-stations, and in the means of bringing the additional supply to the Ridgewood reservoir, which is the main distributing centre of the city distribution system. The new trunk main decided upon was a 72-inch steel pipe 24½ miles long, to be operated as a force main delivering direct to the distribution system, and discharging the excess supply by an overflow connection into the Ridgewood reservoir. Its capacity will be from 50 to 60 million gallons per day. The main stations operating this line are now under contract, and are located at Massapequa and Wantagh; and at these points, 20½ and 18½ miles respectively from Ridgewood, additional infiltration galleries will be built. Moreover, there are in progress three 4 million gallon pumping-stations located at Rosedale, Rockville Center, and Baldwin, where new driven-well plants have already been built; and these stations will deliver under head directly to the new force main when completed. When placed in operation, the new line will save materially in pumping, by forcing the water at once into the distribution system, and, eliminating the second and third lifts at Millburn and Ridgewood, will relieve the heavy burden on these stations, and will increase the total capacity of the system. It will not, however, be sufficient to dispense with the older mains, but will afford a generous excess capacity; thus permitting one of them at a time to be thrown out of service for repairs, and allowing the duty upon them to be lessened. In accordance with these plans, work was begun about three-and-a-half years ago upon the first section of 72-inch line, and was completed in August, 1907. Since then it has been used to supplement the gravity flow in the older conduits; its grade being such that it could be thus operated with only a slight lift.

It was the intention from the first to extend the 72-inch pipe to the Suffolk County line; but lack of funds prevented its continuation immediately after the completion of the first section. However, in November, 1908, the remaining portion, about 16 miles—or, more exactly, 83,500 feet—was placed under contract, and work upon it is now under way.

The line eastward from Valley Stream is laid on a private right-of-way, in some places 100 feet and in others 200 feet wide. Being a pressure pipe, it is not laid on a gravity grade; the maximum gradient being 1 per cent. The maximum curve has a radius of 200 feet. In order to pass round curves, the ends of the pipes are cut to a suitable bevel. The line consists of a circular steel-plate pipe with an inside diameter of 72 inches, single-riveted circular joints, and longitudinal joints made with "lock bar." It was designed for an internal working pressure of 125 lbs. per square inch, with a factor of safety of 5 lbs. The plate is 7-16ths inch thick, made of steel, with an ultimate tensile strength, as provided in the specifications, between 52,000 and 62,000 lbs. per square inch, and an elastic limit of 30,000 lbs. The specifications regarding the lock bar provided that the edges should be upset by a hydraulic press exerting a pressure of not less than 500 tons; and the efficiency of the joint was considered to be 95 per cent.



The circular seams are joined with 1-inch rivets on  $2\frac{1}{4}$ -inch centres round the entire circumference.

The pipe is made up in lengths of 30 feet, each weighing approximately 12,000 lbs.; and each length is coated, while at a temperature of  $350^{\circ}$  to  $400^{\circ}$  Fahr., with a mixture of coal-tar pitch and oil. Each pipe is made of two plates, 30 feet long, each having a width equal to half the circumference, so that there are only two longitudinal seams. Previous to coating, each section is tested at the shop to a hydraulic pressure of 200 lbs. per square inch.

The coating required in the specifications is the same as that used upon the section of 72-inch pipe already completed east of Valley Stream; and in order to determine its efficiency, this pipe was drained and the coating carefully inspected, with the result that it was found to be in excellent condition. This mixture contains not less than 99.3 per cent. of pure bitumen, consisting of not less than 70 per cent. of petroleum, soluble in petroleum ether, and not more than 30 per cent. of asphaltene, soluble in chloroform. The specifications require that this coating shall be not less than  $1\frac{3}{32}$  inch and not more than  $1\frac{1}{16}$  inch thick.

The pipe, in general, is laid in a trench having a maximum depth of about 11 feet. The valleys, of course, must be crossed on embankments. On these, and wherever the top of the pipe is near or above the natural surface, a minimum cover of 3 feet of earth is required over it; the top of this fill being horizontal and 6 feet wide, with side slopes of  $1\frac{1}{2}$  to 1 reaching the natural ground surface. The contract note requires that upon the completion of the backfill and the earth cover over the pipe, 4 inches of rich top soil of good loam shall be placed over all and seeded with grass.

The pipe is provided at intervals of about 3500 feet with 48-inch gate-valves, which accordingly require reducers to be placed on both sides of them in order to connect with the 72-inch line. These valves divide the pipe into sections that can be drained and isolated from the rest of the line. The adoption of 48-inch rather than 72-inch valves was, of course, prompted by the economy of the smaller size in first cost and in possible future repairs, while, in addition, their operation is easier. These valves, which are provided with 8-inch bye-passes, are connected with the 72-inch pipe by a succession of three specials—the first consisting of a cast-steel connecting-piece with a deep hub on the end away from the valve, then another cast-steel piece forming a spigot, and, lastly, a steel plate reducer riveted to the spigot, and connecting to the 72-inch line. The first of these cast-steel pieces has a 6-inch flange projecting from its body just inside the hub, in order to afford an anchorage within the concrete wall of the chamber. The bell of the cast-steel special is almost 10 inches deep, and the specifications require that it shall be run solid with at least 8 inches of lead. Both the interior of the hub and the exterior of the spigot fitting into it are grooved, in order to afford a grip for the lead. The spigot piece is 18 inches long. The reducer has longitudinal seams riveted instead of being made with a lock-bar. The gate chamber needs no further comment save that the four reinforced concrete cover slabs, measuring approximately 31 in. by 8 ft. by 10 in., and supported upon 8-inch I-beams, have the joints filled with a lean cement mixture, which can readily be removed when it is desired to take up a slab. Two manholes are placed in the top, allowing access to the chamber, and also providing for the insertion of the keys for opening and closing the main and the bye-pass valves.

Automatic cluster air-valves manufactured are placed at all of the principal summits; and at the other summits hand-operated 4-inch valves are used. The 8-inch cluster valves are enclosed in a chamber, and are mounted on the top of an ordinary 8-inch gate-valve; so that in case repairs are necessary to the automatic valve, it will not be necessary to shut down the entire section of pipe in which it occurs. Normally, of course, the 8-inch gate is open, and the accumulated air is dealt with by the automatic valve.

For draining the pipe, at least one blow-off is placed in each section. To facilitate inspection and construction, a manhole is placed every 1000 feet. They have oval openings measuring 14 in. by 16 in. in the clear, and are closed with a cover similar to those used on the manholes of steam-boilers. For convenience in passing hot rivets into the line and for the air-hose of the riveting-tools, a 2-inch hole is placed in each 30-feet length near one end, and on the completion of the work is closed with a screw-plug.

On account of the topography on the South shore of Long Island, the pipe necessarily crosses a great many small streams; and these have been carried under the line through reinforced concrete culverts. In a number of places interurban railroad lines and the Long Island Railroad were arranged to be carried over the main.

**Liverpool and Automatic Lamp Lighting.**—When the Liverpool City Council were discussing the estimates for the ensuing year, Mr. Muspratt said they had been told that £10,000 a year could be saved by the adoption of automatic lighting; and, if this was so, action should be taken at once to secure it. Mr. Walker remarked that it was quite true that when the automatic lighting was completed there would be a saving of £10,000 a year. The Council, however, only allowed them to instal 1000 of these lighters each year; and it would take, on this basis, twenty years to complete the improvement. Alderman Smith asked whether the Council would authorize the expenditure of such a large sum as would be needed to completely reorganize the system of lighting all at once. This would cost about £18,000. The Committee proposed to make the alteration by instalments, which was the only reasonable, prudent, and proper course.

## REGISTER OF PATENTS.

### Purification of Gas and Recovery of Bye-Products.

WILTON, G., of Mark Lane, E.C.

No. 23,043; Oct. 29, 1908.

The patentee remarks that in the manufacture of gas from the carbonization of coal the usual method adopted for the purification is first to cool the evolved gases by air-jacketed or water-jacketed pipes. The gas is then passed through a series of washers or scrubbers or both, for the removal of tar and ammonia; clear water being used in the washing or scrubbing plant to the extent of from 20 to 50 gallons per ton of coal carbonized. In general, ammoniacal liquor containing 1 to 2 per cent. of free and fixed ammonia is thus obtained. There is always a considerable quantity of water which condenses out with the cooling of the gas; the quantity obtained in the case of coal being equal to about 10 gallons per ton. This "virgin liquor" contains about 1 per cent. of free and fixed ammonia in the case of coal.

According to this invention, it is proposed to first treat this liquor (taken from any suitable part of the plant) with an alkali, for liberating the fixed ammonia; the alkali being preferably in excess. Then the liquor spray is otherwise introduced into the hydraulic main or the hot-gas main, where the gas still contains a substantial quantity of tar. The ammonia liberated from the fixed condition in the virgin liquor will preferably be conducted, together with the virgin liquor, into contact with the hot gases in the hydraulic main or hot-gas main. The greater part of the free and fixed ammonia is thus expelled from the liquor, and may advantageously be recovered from the gas by leading the gas into an acid solution (such as sulphuric or muriatic acid) in a washer or scrubber, whereby the ammonia is absorbed and a salt of ammonia is produced in the solution, which can be treated for the recovery of salts of ammonia. Or the ammonia may be absorbed from the gas in any other suitable way.

The hot virgin liquor after being brought into contact with the hot gas, as described, may be passed through a tar-separator and boiled with steam or direct fire for the removal of any remaining ammonia, which may be conveyed to the hot-gas main.

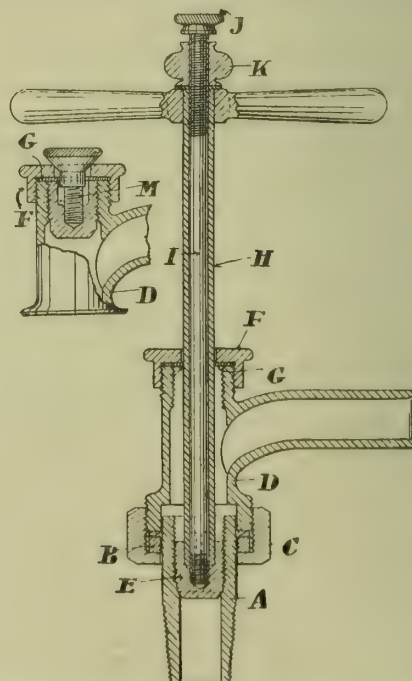
By the alkali treatment of the virgin liquor and the introduction of the treated liquor into the hydraulic main or hot-gas main as described, the whole, or the greater portion, of both the free and fixed ammonia contained in the virgin liquor is said to be recovered; the gases are reduced in temperature; and the deposition and mechanical mixture of the fixed ammonia with the tar in the hydraulic or hot-gas main is avoided.

### Branch Service-Pipes.

PASS, E., and PEART, E., of Denton, near Manchester.

No. 27,397; Dec. 17, 1908.

This invention relates to branch service-pipes connected to gas and water mains, and is an improvement on patent No. 676 of 1905.



Pass and Peart's Branch Service-Pipe Connector.

In the prior invention, a short tube A was employed, screwed at its lower end for attachment to the main, and formed with a fixed collar B, which acted as an abutment for an internally threaded nut C used to connect the short tube A with the branch pipe D. For convenience in securing the tube A to the main, it is now proposed to make the collar B separate, with an internal screw thread, and form a screw thread on the tube A, so that the tube alone may be screwed into the main first, and then the loose nut C can be placed thereon, and, lastly, the collar may be screwed in position to act as an abutment to the nut. The tube A is provided with a seat, on which is screwed a valve E.

When the branch pipe has been secured to the tube A and the supply is to be turned on, the valve E is screwed off its seat and screwed into the tube formed above the outlet to the branch pipe. Difficulties are said to arise in effecting this, owing to the screw threads in the tube A.



and the threads in the tube above the branch pipe D being interrupted by the fluid-way into the branch pipe. To overcome this, in addition to providing the valve E with means whereby it may be rotated by a key, it is formed with a screwed recess; and the tube on the branch pipe is provided with a screwed cap F, with packing leather disposed between it and the top of the tube to make a fluid-tight joint.

The key employed comprises a hollow spindle or sleeve H with a handle to rotate it; while within the sleeve is a spindle I projecting out of the external sleeve—the projecting ends being screw-threaded. The inner spindle is rotated by means of a knob J, or the like, to screw it into the hole in the valve E (as shown) and securely connect the valve to the inner spindle. When this has been effected and the rotating means on the end of the outer sleeve H have been brought into engagement with the recess in the valve, the internal spindle is secured by a milled nut K to the outer spindle or sleeve, which is then rotated to screw-out the valve plug E. When the valve plug leaves the screw threads (the valve being connected to the operating key by the inner spindle I), it can be safely lifted past the branch pipe outlet, where the screw threads are interrupted and easily screwed into the screw-threaded tube of the branch pipe D, above the outlet, until the upper part of the valve E beds against the leather below the cap F on the branch tube, as shown in the detail; the leather forming a fluid-tight joint.

To prevent the accidental displacement of the valve out of the branch tube by vibration, it is securely connected to the cap F by a screwed plug M passing through the cap and screwed into the top of the valve E; the plug having a conical head M<sup>1</sup> bedding on the cap.

**Incandescent Gas-Filaments.**

LAIGLE, R., of Paris.

No. 28,435; Dec. 30, 1908. Date claimed under International Convention, Jan. 10, 1908.

This invention relates to the manufacture of infusible and indestructible incandescent gas-filaments, of the kind described in patent No. 3785 of 1908—consisting in the use of at least one of the agglutinants, arabin or ammonium oleate, in the mixture employed for the manufacture of filaments of the kind referred to.

The filament is obtained from a plastic paste consisting of a mixture of the rare-earth oxides of thorium and cerium—a small proportion of oxide of beryllium acting as a binder; and of at least one of the agglutinants, arabin or ammonium oleate. The paste may also contain other substances—such as alumina, silica, and silicate of aluminium.

The filament is obtained by passing the plastic paste through a draw plate. For calcining the filament, it is subjected to a regular temperature, which is equal or slightly superior to the melting point of the oxide of beryllium.

The following composition of the paste is given by way of example :—

Oxide of thorium . . . . .	92.80
Oxide of cerium . . . . .	1.20
Alumina precipitated by ammonia . . . . .	3.00
Silica, or silicate of aluminium . . . . .	1.00
Oxide of beryllium . . . . .	2.00

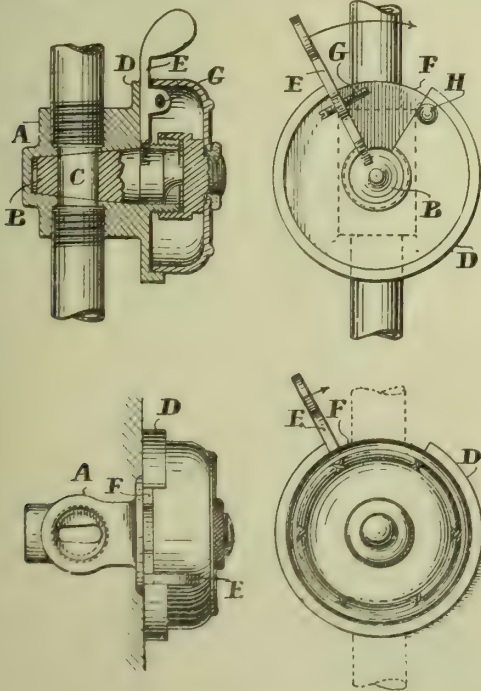
The agglutinant substances are incorporated in this composition.

**Gas-Tap.**

LYNDE, F. C., of Withington, near Manchester.

No. 53; Jan. 1, 1909.

This invention relates to a gas cock or tap primarily intended for controlling the supply of gas to a burner or burners at a distance, and which may, when desired, either completely close or cut off the gas port or supply, or may, when in its closed position, still permit the passage of enough gas to keep a pilot-jet alight.



Lynde's Gas-Tap.

The tap is illustrated in vertical cross section, its base part in elevation, in plan in place in a wall with the supply pipe removed, and in front elevation.

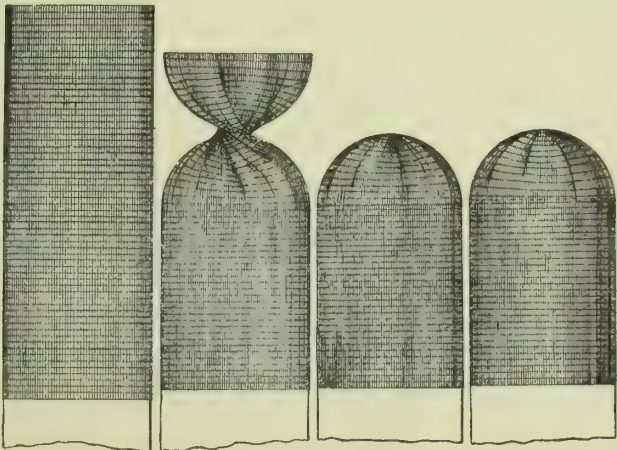
A is a tubular casing for the gas; and across it is placed the plug B formed with the transverse opening C in the usual manner. Combined with the casing is a circular base-plate D, through the centre of which the end of the tap plug projects. Radially secured to this end of the plug is an arm or finger E, by means of which the plug may be partly rotated to open or close or vary the area of the passage through the tap. The arm moves within an angular recess F in the face of the plate; the sides of the recess approximately radiating from the centre of the plate. The arm may carry a screw G adapted to come against a stud H in the closing movement of the arm in the direction of the arrow. By turning the screw in one direction or the other, the part of it which projects from the arm may be lengthened or shortened; and the closing movement of the arm may be regulated by the contact of the end of the screw with the stud, so as either to close the gas-passage altogether or to leave any desired amount of opening when the plug is in its most closed position for the supply of gas to a pilot-light.

**Incandescent Gas-Mantles.**

ROBIN, J. I., of Tooting.

No. 71; Jan. 1, 1909.

This invention relates to the manufacture of incandescent gas-mantles (upright and inverted), and more particularly to the closing of the fabric to form the tip or dome, instead of employing a thread of asbestos, which "does not become so incandescent as the fabric of the mantle," and so "detracts from the appearance and illuminating power." The invention consists in closing the mantle by twisting the fabric at the part where the apex or tip is to be formed; in spreading or folding-back the portion of the stocking beyond the twist; and in reversing the stocking after it has been so treated and without allowing the twisted portion to become untwisted.



Robin's Incandescent Mantles.

The illustrations show diagrammatically four steps adopted according to one mode of carrying out the invention in the manufacture of an inverted incandescent mantle. Although in this example the stocking is reversed after it has been twisted and spread back, the reversal may be omitted if desired; but in such case the top portion would probably have to be stitched, pasted, or otherwise secured to the main portion to prevent it falling away from it in use. It is found that this method of manufacturing a mantle may be "very rapidly carried out without requiring any appreciable skill on the part of the operators; so that a very great saving of labour is effected over the old methods."

This invention is also applicable to upright mantles. In such a case, however, it is preferred to twist the stocking upon a form provided with a neck—for instance, upon a form described in patent No. 14,798 of 1906—in order that the usual supporting crutch may pass through, and a loop may be provided for suspending the mantle from the crutch.

**Automatic Gas Lighter and Extinguisher.**

BONNIKSEN, B., and FLETCHER, H., of Leamington.

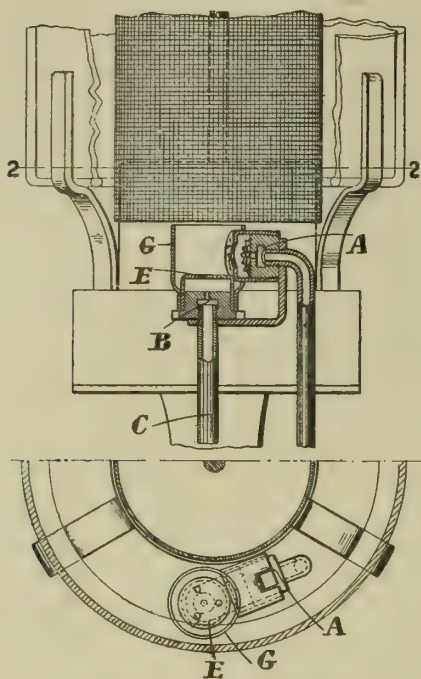
No. 645; Jan. 11, 1909.

This invention relates to an intermediate burner which "hands on" the flame from the pilot to the main burner and *vice versa*. The object is "to provide improved screening of the burners to obviate any failure of operation," the actual automatic mechanism employed resembling that described in patent No. 20,348 of 1908.

Preferably, the pilot burner A (p. 244) is supplied as was described in patents No. 4377 of 1906 and No. 12,619 of 1907. The intermediate burner B is supplied by a supplementary valve, which is only opened when the pressure is increased. The supplementary valve (described in the patent of 1908) communicates with a chamber from which a pipe C leads to the intermediate burner. The pilot burner is preferably supplied as usual; but the two pipes leading to the two burners are detachable—being preferably inserted in stuffing-boxes of the usual type, and containing leather or other suitable packing, which may be acted upon by a gland to grip the pipes securely and prevent leakage.

The pilot burner is normally alight when the main burner is extinguished; but when it is desired to light the main flame, which extends over the mantle D to about the level of the line 2, the pressure is increased—operating the mechanism, and closing the supply to the pilot burner while the supply to the main burner is opened. Before the pilot burner is actually extinguished, the increase of pressure has opened the supplementary valve supplying gas to the intermediate burner. The gas issuing from this is ignited by the pilot burner; and as it extends to (say) an inch above the line 2, it ignites the gas of the main burner. The next increase of pressure supplies the intermediate burner





Bonnicksen and Fletcher's Automatic Gas Lighter and Extinguisher.

as before, which is lit from the main flame. The main flame is extinguished, and the pilot B is supplied, which takes the light "handed on" to it from the main burner by means of the intermediate flame.

It is desirable that the flame issuing from the burner B be of low velocity—obtained by providing a cap E, which has a suitable number of holes in it, the area of which exceeds the area of the main hole. Further, in automatic mechanism of this type, it is found that "careful and special screening of the pilot and intermediate burners is essential to ensure good results with a small consumption of gas." For this purpose, the burner is provided with a shield G round the burner B, into which screen the burner A projects at right angles to the intermediate burner; the flame from the pilot burner striking the opposite side of the shield.

### Incandescent Gas-Mantles.

LEWES, V. B., of Greenwich.

No. 1629; Jan. 22, 1909.

The patentee claims as his invention a method of preventing the shrinkage and buckling of mantles impregnated with a high percentage of alumina and chromic oxide so as to adapt them for use on inverted burners.

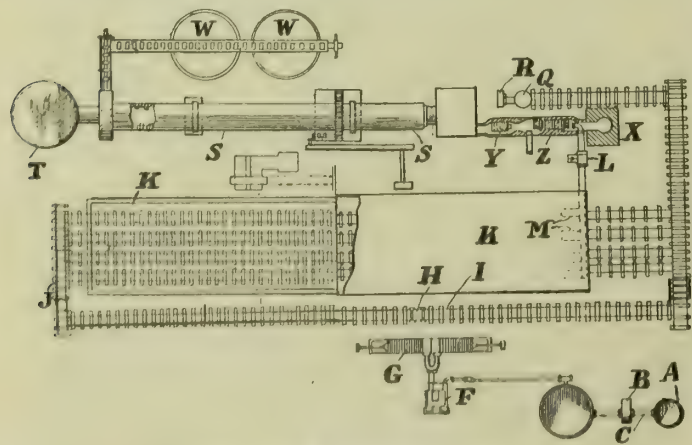
The "JOURNAL" for Nov. 30, p. 597, contained the full text (translated) of the specification filed with the French Patent Office, which is substantially the same as that issued by the English Office last week.

### Revivifying Spent Lime.

JONES, J. G., of Carthage, New York State, U.S.A.

No. 6411; March 17, 1909.

This process for revivifying spent lime consists, first, in separating the impurities from the lime in its carbonate state, after which the lime is relieved of a large percentage of its moisture, and, in a plastic state, placed in a drying chamber and subjected to air highly heated by waste carbonic acid gas issuing from a rotary kiln and given up from the waste carbonate of lime being calcined in the kiln.



Jones's Lime Revivifying Process.

A is a separator of impurities from the lime material—preferably by centrifugal action. B is for pumping the lime material, free from its impurities, from the separator into the agitator tank E. A pump F is in communication with the tank E for the purpose of drawing the lime material in a semi-liquid form to a filter-press G, in which the excess of water is filtered off under pressure; the lime being formed into cakes in the recesses between the filter-plates. These cakes are removed from the filter-press, placed upon a car H travelling upon the

track I, and conveyed to the track J, which runs at right angles to I, and thence to the kiln K. After the cakes of lime have been thoroughly dried, the cars move on other tracks L leading to the crusher Q, where, after crushing, they are raised by the elevator R into bins and thence to the rotary kiln S. Adjacent to one end of the kiln is a producer T, in which coal is reduced to gas, which is carried into the kiln, where it is burned. The kiln is provided with a brick lining; and certain of the bricks project beyond others for the purpose of agitating the pieces of lime cake as they slowly travel through the rotary kiln, fed by gravity. The gas heats up the fire-brick lining to a high degree, and the crushed lime cake, travelling slowly through the kiln, absorbs the heat from the burning gas and the heated brick lining until it reaches the burning zone, where it gives off its carbonic acid and becomes reduced to the oxide state. The lime is then discharged from the kiln through a hood, underneath which is a conveyor whereby the lime material is carried to an elevator, which conveys it to, and discharges it into, the tanks W.

The patentee says he has found from experimenting that an essential step in this process consists in the granulation of the cakes which have been dried, and passing the granules in a carbonate form through the kiln where the calcining takes place. He has also demonstrated that, where the lime to be dried or calcined is of a loose form when it passes into a kiln, it is not possible to successfully burn it, as it appears to be necessary that the lime when being calcined should be in a dense, solid form. "To secure the best results, the granules should be of such a size as might conveniently pass through a screen of a 1-inch mesh, although granules of slightly larger size can be successfully calcined."

The highly heated carbonic acid gas, which is produced by the calcining of the waste carbonate of lime material, is drawn through the kiln S, thence into a dust-separation chamber; the stack X being utilized to produce a draught whereby the gases are drawn into a water-heater Y, preferably of the standard fuel economizer type. The water contained in the pipes of the heater absorbs a portion of the heat in the carbonic acid, after which the gas is drawn through an air-heater Z, which is composed of a series of air-pipes, through which pure air is either forced or drawn by means of the fan L, and absorbs heat from the gases, and is then discharged into the interior of the drying chamber K through the branching ducts M. The heated gases thus being introduced into the drying chamber come in contact with the cakes in a wet state upon the car, and take up moisture from them.

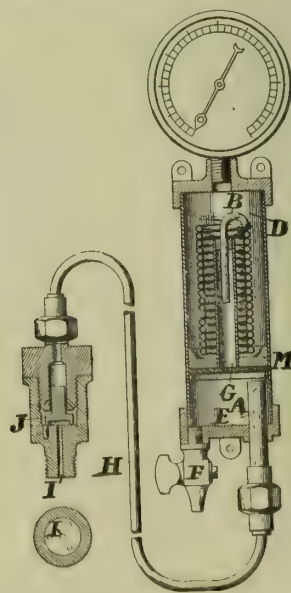
### Indicating Explosive Pressures in Gas-Engines.

LOOMIS, O. P., of Newport, Virginia, U.S.A.

No. 10,672; May 5, 1909.

The inventor provides a device by which the pressures at which gas-engines are operating can be conveniently ascertained—information enabling the engineer to tell at once whether proper pressures are being developed in the explosive space of the engine cylinder, and (in the case of multiple cylinders) enabling him to ascertain if all are alike in effort, if any are lacking, and to what extent.

In his prior patent (No. 13,850 of 1908), the inventor described a damping device for pressure gauges which could be used for indicating pressures in explosive engine cylinders; but the present invention has "certain features of improvement."



Loomis's Gas-Engine Pressure Indicator.

The pressure gauge shown is connected to a casing divided by a diaphragm M into two chambers A and D. The lower chamber (termed the sediment-collecting chamber) receives the pressure gases from the engine through a pipe H, having at its end an extension E projecting through the bottom of the chamber. The pipe is closed at top, and has near the top lateral openings which permit the pressure gases to escape into the lower chamber without being thrown outwardly against the layers of wire gauze which extend across the bottom of the diaphragm. There are two layers of copper gauze, the one next to the partition being rather coarse, and the one facing the chamber A being of finer mesh—both layers being held in place by a ring. By this arrangement, gases passing through the finer gauze against the surface of the diaphragm can afterwards pass along its surface to the opening in the pipe G—a large straining area being thus provided, which is not likely to become clogged.

The bottom of the chamber A is provided with an opening normally



closed by a stop-cock F. The soot, carbonized material, &c., carried from the engine cylinder by the gases collect in the chamber A, whence they can be blown out occasionally (along with the water which is always present) by opening the cock. The pressure gases pass from the chamber A upward through the pipe G, and thence into the pipe B, which is coiled so as to provide an extended frictional surface for the gases flowing through it. The combined throttling and cushioning effect produced by the pipe B and the expansion or air-chamber D prevent any violent fluctuations of the gauge needle, and make it practically dead-beat.

The operation of this portion of the device is the same as that disclosed in the prior patent referred to. The gases are admitted from the engine cylinder to the pipe H through a non-return valve J, which is mounted in a valve-casing, the lower part of which is provided with a bore I, opening into a chamber which is, in turn, closed by a plug into which is screwed a coupling which connects the valve-casing with the pipe H. The valve J is, as shown, seated on the bottom of the chamber in such a position as to normally close the bore I. An increase of pressure in the engine cylinder causes the valve to rise and allows the pressure to be transmitted to the tube H.

As the pressures of a gas-engine are pulsating, and at times even non-existent, it becomes necessary, in order to indicate the highest or maximum pressure, to retain the pressure until the highest is reached; and should this maximum decrease, the pressure within the gauge mechanism must be released until it agrees with whatever explosive pressure then exists in the engine cylinder. These results are accomplished by the valve which has just been described.

The small bore I, through which the pressure is transmitted from the explosive space of the engine cylinder through the pipe H, prevents too rapid a rush of gas at first.

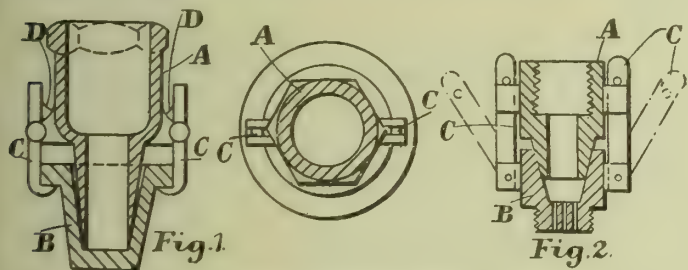
When the engine is started, the valve J lifts and allows the pressure to pass around its stem and enter the space above it, and thence be exerted through the pipe H through the damping mechanism on the gauge. After a few explosions, the pressure on the top of the valve (which keeps the pressure from returning during small intervals) will equal the explosive pressure, and the gauge pointer will cease rising and remain stationary. Should the pressure in the engine cylinder then rise, the valve J will lift and allow it to enter the pipe H until the pressures are again equalized. Should the pressure within the engine cylinder decrease, the pressure within the gauge mechanism is released, because of the fact that the tightness of the valve J is never perfect and slowly allows the pressure to leak back into the explosive space until the pressure in it and in the pipe H again balance. There is thus afforded a continuous dead-beat indication of the maximum pressures existing at any time in the explosive space of the engine cylinder.

### Inverted Incandescent Gas-Burners.

STUBBS, H., of Horwich, Lancs.

No. 1809; Jan. 26, 1909.

These inverted incandescent gas-burners are provided with means whereby the nozzle is readily attachable and detachable for the purpose of cleaning.



Stubbs's Inverted Burners.

Fig. 1 shows the supporting levers or arms pivoted to the upper portion of the nozzle. Fig. 2 is a section of a nozzle having the connecting arms pivoted to its lower half.

The nozzle is in two parts A, B, having male and female cone connections respectively. C are the attachment levers, shown in fig. 1 as fulcrumed to brackets upon the upper part of the nozzle, and having hooks or catches at their lower ends, which engage with a flange or lugs upon the lower half and serve to hold the two portions in position together. Springs D, interposed between the outer wall of the upper half and the upper ends of the levers, tend to keep the catches at the other ends of the levers in their required positions for holding the two parts of the nozzle together.

In fig. 2, the arms C are pivoted to brackets on the lower half B of the nozzle and catching on to lugs formed on the upper half A.

By this invention, the detachment of the incandescent burner "is rendered an easy operation;" and it also provides "an easy method of cleaning the globes and burner, as by freeing the catching levers the whole of the burner can be taken off and attended to."

The Directors of the Guildford Gaslight and Coke Company have accepted the tender of Messrs. Aldridge and Ranken for a Fiddes-Aldridge stoking machine, coal-handling and electric power plant for their new retort-house, from plans and specifications prepared by their Engineer, Mr. Penrith C. Cleasby.

The Bath Surveying Committee, having considered a report upon complaints as to smells alleged to proceed from the neighbourhood of the Bath destructor works, have agreed that the services of an expert be engaged to ascertain and report (1) as to whether the latest improvements for minimizing smells have been adopted in the case of the destructor, and (2) whether the newest and most effectual methods have been employed by the Bath Gas Company for rendering the fumes from their sulphate of ammonia works as innocuous and inoffensive as possible.

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### Dessau Vertical Retorts at Sunderland.

SIR,—Referring to the second half of the paragraph in your issue for last week (p. 153), giving the approximate results from our vertical retorts when worked with 12-hour charges (including one hour steaming), the illuminating power of the gas was, through a clerical error, stated as being "about 15½ candles," whereas this result should read "about 16½ candles."

As a matter of fact, the average of the actual results obtained during the past fourteen days is as follows:—

Gas made per ton (corrected)	12,465 cubic feet.
Illuminating power ("Metropolitan" No. 2 burner)	16·84 candles.
Calorific power (net)	559·2 B.Th.U.

Hendon Gas-Works, Sunderland, Jan. 22, 1910. CHAS. DRU DRURY.

### The Phenols in Gas Liquor.

SIR,—In the report of the presidential address to the Yorkshire Junior Gas Association in your last issue, I notice a reference to the paper on the above subject which was read before the Manchester Section of the Society of Chemical Industry in December, 1907. The reference is that I had estimated that "half the phenols evolved from the distillation of coal are found in the spent liquor." This statement, which is incorrect, is also given in the "Forty-Fourth Annual Report on Alkali Works," and in the new edition of Lunge's "Coal Tar and Ammonia," and, if not corrected, it might easily prove misleading.

What I did say was that about half the pure phenol (meaning thereby the chemical individual  $C_6H_5OH$ ) which was produced in the retorts, was lost in the gas liquor. This refers only to the phenol, and has no reference to the creosols and other phenolic bodies which are produced in the retorts.

Manchester, Jan. 21, 1910.

F. W. SKIRROW.

### Cost of Service-Pipes to Public Lamps.

SIR,—Under the provisions of the Gas-Works Clauses Act, 1871, the undertakers are bound to supply gas to any public lamps within the distance of 50 yards from any of the mains of the undertakers; but there is no provision as to who should bear the cost of the necessary service. I shall be glad to know what the general custom is in this respect, as clause 11, requiring the consumer to pay for the cost of any pipe beyond 30 feet, does not seem to apply.

SECRETARY.

Jan. 17, 1910.

### Charge Against a Gas-Works Clerk.

On Monday of last week, the charges against George Hepworth, until recently a clerk in the employ of the Pontefract Corporation, at their gas-works (to which reference has already been made in the "JOURNAL"), were investigated at Pontefract. Accused was charged on three counts—with falsifying his books, wilfully neglecting to enter certain receipts, and with embezzlement. He was represented by Mr. Green, and pleaded "Not guilty." Mr. Woodhead, who prosecuted for the Town Clerk, stated that apparently prisoner had entered in his books the correct amounts as paid in by the collectors, but subsequently altered the cash figures, and adjusted the records of consumption to balance. Mr. L. V. Whitaker, the Gas Manager, said accused's wages were 30s. per week. When told that the Auditors wished to see him at the municipal offices because there were two or three errors in the casting of his columns, he observed, "Oh, dash it!" and when witness subsequently returned to the office he had disappeared. Witness was cross-examined at some length, but refused to admit that the affairs of his department were in a muddled condition. The Bench committed Hepworth to the Borough Quarter Sessions for trial, allowing bail.

### Obtaining a Gas Supply under a False Name.

At the Birmingham Police Court, on Friday, George Howard Smith was summoned for having obtained a supply of gas from the Corporation under a name other than his own. Mr. Prideaux, who prosecuted, called evidence to show that, in December, Inspector Edwards, of the Gas Department, called at No. 21, Hallam Street, in the course of his rounds, and found the defendant in occupation of the house, which had previously been void. He adjusted the slot-meter, where there was a shortage of 2s. 5d., and received from defendant an order for a gas supply signed "Frederick Whitehouse." The defendant admitted having given a false name, but said a man named Whitehouse had promised to lodge at his house and to be responsible for the rent and gas. Mr. Prideaux informed the Bench that this was by no means an isolated case. Since September, 1908, it had been the defendant's practice to move from house to house, consuming gas through slot-meters, and when found in occupation giving a false name. He had lived at five addresses during the period named; and on eight occasions when the state of the meter was taken, shortages were found. On Jan. 14, having been traced by Detective-Sergeant Harris, the defendant confessed to having appropriated these sums by means of a false key. A fine of 40s. and costs was imposed, with the alternative of fourteen days' imprisonment.

**Besançon Gas-Works Flooded.**—Owing to the large quantity of rain which has lately fallen, France has been visited by floods which have done serious damage. At Besançon the gas-works are 3 feet under water, and several bridges are reported to have been destroyed. The whole department of the Yonne is said to be flooded; and in the valley of the Rhône there has been loss of life. The lighting service has been interrupted in a number of towns, and work has had to be suspended in many factories.



## MISCELLANEOUS NEWS.

### BIRMINGHAM CORPORATION GAS DEPARTMENT.

#### The Vacancy Caused by the Death of Mr. G. Hampton Barber.

In their report to be presented at the quarterly meeting of the City Council on the 1st prox., the Birmingham Gas Committee say: "Your Committee deeply regret to report that Mr. G. Hampton Barber, Secretary and Manager of the undertaking, died on Dec. 2 last, after a few days' illness. Mr. Barber, who was appointed in February, 1901, was a most capable and valuable officer, and devoted himself with much energy to the work of the department. He served your Committee with unswerving loyalty and enthusiasm, and displayed exceptional commercial ability in the performance of his duties. The Committee recommend that they be authorized to fill the vacancy, and to offer such salary as they may consider reasonable."

The report also contains the following comparative statements for the quarters ended June 30 and Sept. 30, 1908 and 1909.

Quarter ended June 30.	1908.	1909.	Increase.	Decrease.
Sale of gas—cubic feet	1,406,791,700	1,420,914,700	14,123,000 = 1 p.c. 315	—
New services. . . . .	1,648	1,963	—	—
Total number of prepayment meters fixed at June 30 . . . . .	57,522	64,189	6,667	—
Total number of cooking-stoves fixed with prepayment meters at June 30 . . . . .	42,921	50,679	7,758	—

Quarter ended Sept. 30.	1908.	1909.	Increase.	Decrease.
Sale of gas—cubic feet	1,290,196,500	1,351,437,400	61,240,900 = 4.7 p.c.	—
New services. . . . .	1,953	1,936	—	17
Total number of prepayment meters fixed at Sept. 30 . . . . .	58,979	65,674	6,695	—
Total number of cooking-stoves fixed with prepayment meters at Sept. 30 . . . . .	44,720	52,554	7,834	—

The reconstruction of No. 2 retort-house at the Adderley Street works has now been completed; and as a result of carbonizing in the new house, the cost of manufacture at the station has been considerably reduced. The Committee have authorized the laying of a new 36-inch main between the Salfley and the Nechells works, and the alteration of certain of the existing mains, for the purpose of better mixing the gas produced at the works named. The new arrangement will also facilitate and improve the distribution from both stations. The work has been commenced; but it cannot be completed until the spring.

### LITTLE HULTON DISTRICT COUNCIL'S GAS SCHEME.

#### Rejection by the Ratepayers—Question of a Poll under Consideration.

The Statutory Meeting last Wednesday evening of the ratepayers of Little Hulton was held to consider the scheme of the Urban District Council to apply for parliamentary powers to purchase the gas-mains in their area belonging to the Salford Corporation and the Farnworth and Kearsley Gas Company, and make the necessary arrangements for furnishing a supply of gas for public and private purposes.

Mr. W. HODGKISS, J.P., the Chairman of the District Council, in moving a resolution approving of the promotion of the Bill of which notice had been given, said it had only been possible to enter into the proposed undertaking by coming to an amicable agreement with the Salford Corporation, who were selling their mains at a lower price than Mr. Newbigging, the Council's adviser, had said they might have to pay for them. Subject to the passing of the Bill, the Council had agreed to buy from the Earl of Ellesmere gas in bulk at 9d. per 1000 cubic feet; and the price might be reduced under certain circumstances, but was never to be increased. If the gas was to be enriched, they would have to pay ½d. per candle power more. The present idea was to light the whole of the streets by means of incandescent mantles, which, with gas from the Brackley plant of Lord Ellesmere, would save them about £100 per annum.

The resolution having been seconded,

Mr. HODGKISS, in answer to questions, said the Council were pledged not to make known the amount to be paid to Salford; but he assured the ratepayers an excellent bargain had been made on their behalf.

A RATEPAYER said the price had been given as £7500; and he asked if that was correct.

Mr. HODGKISS agreed that this was the figure.

The RATEPAYER went on to say that the public should know that, in addition to the £7500, a sum of £2500 would be required to purchase the Farnworth undertaking, that £2000 was to be borrowed for new mains, another £1000 for working expenses, and perhaps £500 to get the scheme through—making a total of £13,500. If all this came out of the rates, he wanted to know what the increase would be.

Mr. ATKINSON, a member of the Council, stated that the bargain they had made would enable the Council to reduce the price of gas 3d. per 1000 cubic feet, and probably 5d. in the future. If Worsley and

Swinton, and probably Westhoughton, joined in the scheme, they would be in a still better position. They had also to remember that if the price of coal went up, as it was sure to do, their gas would remain at the same figure.

At this point, Mr. NEWBIGGING, at the request of the Chairman, addressed the meeting. He said the price to be paid to the Salford Corporation was very favourable to the Little Hulton community. Whatever shortcomings Salford had been guilty of in the past with regard to the gas supply, they had in this matter been most fair and reasonable. The ratepayers should not forget that they were taking over a going concern, and would have immediate revenue sufficient to cover their payment of interest and also the sinking fund.

On being put to the vote, the resolution was declared to be lost.

In view of this decision, the Council will, at their meeting next month, consider the question of taking a poll of the ratepayers on the question.

### GAS SUPPLY CONDITIONS IN BUENOS AYRES.

#### The New Contract with the Municipality.

Our readers are aware that, as from the 1st inst., the conditions of gas supply in Buenos Ayres are somewhat different from those previously existing, owing to the amalgamation of the Buenos Ayres (New), the River Plate, and the Primitiva Gas Companies. It may be of interest, before the matter passes into history, to indicate the chief features of the new contract entered into between the Municipality and the last-named Company, who are now solely responsible for keeping up the supply of gas.

The contract sets forth at the outset that the Company are authorized, for a period of twenty years, to produce, distribute, and sell gas within the municipal jurisdiction of the Federal capital, whether for lighting or for domestic or any other industrial purpose. The maximum price to be charged for gas employed for private lighting is 21c. paper currency per cubic metre, which is equal to 10s. 4d. per 1000 cubic feet; for public lighting, public establishments, institutions, &c., 15c. per cubic metre, or 7s. 4d. per 1000 cubic feet; and for cooking and other purposes, apart from lighting, 16c. per cubic metre, or 7s. 10d. per 1000 cubic feet. These prices are, however, subject to reductions in the case of large supplies. Provision is made for the reduction of the price by 0.5c. per cubic metre for every 7½ million cubic metres, or a fraction thereof, beyond a specified quantity, to come into force in the year following that in which the excess of sales may have taken place. When these reductions reach more than 25 per cent. of the maximum charges already mentioned, they are to cease, except as hereafter specified. The Company are to adopt any new invention or system for making gas which may allow of a saving to the extent of 20 per cent. in cost of production; and when this takes place, the maximum charges are to be reduced to the extent of half the economy effected. The Company are also to adopt any method which, in their opinion, or in that of the Municipality, will permit of the reduction of the quantity of carbon monoxide in the gas, or will in any other way improve its quality.

The Municipality are to have the right to examine the books and statistics of the Company, in order to ascertain whether or not the terms of the contract are being complied with. In the first quarter of each year, the Company are to present to the Municipality a complete balance-sheet, accompanied by details of their operations in the preceding twelve months; and also to furnish any information the Municipality may require. They are to put up station meters to register the quantity of gas made and supplied; and also provide the necessary apparatus for testing the illuminating and calorific power, purity, and pressure of the gas, and fit it up in their works and branch offices, as well as in the offices of the Public Lighting Department of the Municipality. They are to pay quarterly to the Municipality 10 per cent. of the gross receipts from the sale of gas within the municipal boundary, or any extensions of it. The gas sold for public lighting is exempted from this tax. An allowance of 12 per cent. is made for leakage in the portion of the gas production registered in the works and affected by the tax. The Company are also to pay the necessary rates for local services in respect of their property, including street sweeping, cleaning, and lighting; also for the municipal inspection of their machines, new buildings, and all other taxes which any other company or society would have to bear. They have likewise to pay the tax for testing their meters by the Municipality, and for testing the burners for use in public lighting, in accordance with the existing tariff.

The concession granted is subject to the regulations subjoined to the contract for guaranteeing the good quality and sufficient pressure of the gas supplied, as also the public safety, and likewise to the penalties specified therein and in any ordinances which may in the future be promulgated with the same objects in view. The existing ordinances with reference to the consumption and illuminating power of burners used for public lighting are to remain in force in case the Municipality should resolve to adopt any other types of burners; and the Company are to be obliged to supply these at cost price. They are also to remove or change the position of lamps and columns within such reasonable time as may be fixed by the Municipality, without any extra payment therefor.

When the Company require to interfere with a public roadway, they have to submit to the Municipality a drawing with details of the condition of the subsoil with respect to any mains, cables, &c., existing; and the officials of the Municipality who are charged with the inspection and care of the electrical installations and of the public lighting are to facilitate this by furnishing all the particulars they may have at their command. Permission to lay mains is not to be refused by the Municipality except for a just reason—such, for example, as when the work would, in the opinion of the officials, be dangerous to the public. The Company have, however, the right of appeal to the Council.

The Company must not refuse a supply of gas to any consumer who requires it, where they have mains laid. The supply of gas cannot be withheld except in the case of the monthly account remaining unpaid



after the expiration of the first fifteen days of the following month. The gas may be cut off when a consumer makes an illicit connection with the main or tampers with the meter with the view of defrauding the Company; and it is to remain off until he has paid his account, as settled by the officials of the Municipal Lighting Office.

Any difference arising on the contract is to be determined by arbitration, the conditions of which are set forth. The Municipality will insist upon exact compliance with the terms of the contract; and they have the power also to name a special representative for the purpose. Infraction of the stipulations contained in the contract is punishable by a fine of \$1000 paper currency for the first offence, and of \$2000 for a succeeding one. The fines are to be imposed as often as infractions occur; and as a guarantee for them, the Company are to keep in the National Bank, to the order of the Municipality, the sum of \$10,000.

Incorporated in the contract are the regulations already referred to. It is specified that the gas supplied by the Company is to be produced by the dry distillation of bituminous coal, and that it may contain an admixture of either pure or carburetted water gas to an extent limiting the carbon monoxide to 17 per cent. by volume, unless unavoidable circumstances necessitate an increase. It is to be perfectly free from sulphuretted hydrogen; and the maximum quantity of ammonia allowable is 17.48 grains per 100 cubic feet, and of sulphur compounds 30.59 grains in winter and 21.85 grains in summer. The minimum pressure is to be  $1\frac{1}{2}$  inches of water in the high portions of the city; and the presence of naphthalene in the service-pipes is not to justify failure to maintain the pressure named. The illuminating power of the gas is to be not less than 14.5 English candles, tested with the "Metropolitan" No. 2 argand burner, adjusted to a consumption of 5 cubic feet per hour; the unit of comparison to be a 2-candle Methven lamp. The calorific power is to be at least 539.2 B.Th.U. net per cubic foot, as tested by the Simmance-Abady calorimeter. The test for sulphuretted hydrogen is to be made as usual by means of acetate of lead paper; that for ammonia, by means of standard solutions of sulphuric acid; and that for pressure, by gauges in the Municipal Offices and elsewhere. Failure to comply with the regulations in respect of the before-mentioned matters will subject the Company to the following daily penalties. For the presence of sulphuretted hydrogen in the gas, \$200; for each 2.4 grains excess of ammonia per 100 cubic feet, \$20; for each 4.4 grains excess of sulphur compounds in a like quantity of gas, \$20; for each 1 per cent. in excess of carbon monoxide, \$100 for every case; for each 1-12th inch of pressure below  $1\frac{1}{2}$  inches, \$20; for each 5.5 B.Th.U. less than 539.2 B.Th.U. per cubic foot, \$30; for each failure to maintain the standard of illuminating power, \$20. The English equivalents of these fines may be readily ascertained by reckoning \$11.2 paper currency as £1 sterling.

### KIRKCALDY GAS TRANSFER QUESTION.

A Special Meeting of the Kirkcaldy Town Council was held on Monday evening of last week, in connection with the gas transfer under the provisions of the Burghs Gas Supply (Scotland) Act, which has been approved by the ratepayers.

The Town Clerk (Mr. W. L. Macindoe) reported the result of the vote which was taken on the 12th inst., and intimated that the resolution adopting the Act was registered in the Sheriff Court books on the 14th inst. Mr. J. Wright moved, Mr. J. Alison seconded, and it was unanimously agreed, that the Town Clerk should serve notice on the Kirkcaldy Gaslight Company, Limited: "I hereby give you notice that the Provost, Magistrates, and Councillors of the Burgh of Kirkcaldy have passed a resolution, which has been duly confirmed—'That the Burghs Gas Supply (Scotland) Act, 1876, be adopted and applied to the burgh,' which resolution was registered in the Sheriff Court books of the County of Fife on Jan. 14, 1910, and the provisions of the said Act are now in force. And I further give you notice, in pursuance of the provisions contained in the said Act, that the Town Council are willing to buy or to treat for the purchase of the undertaking of the Kirkcaldy Gaslight Company, Limited, and of all the rights, powers, and privileges, and all the lands, premises, works, and other property of the Company."

It was agreed to remit to the Gas Committee (with powers) to employ an expert to examine and report on the Company's works and property, and to instruct Mr. R. Cockburn Millar, C.A., of Edinburgh, to examine and report on the Company's books.

A vote of thanks was unanimously accorded to the Town Clerk, and to Mr. Barr, his Depute, for their careful and accurate work in connection with the important subject of the transfer.

**Cost of the Bermondsey Explosion.**—The General Purposes Committee of the Bermondsey Borough Council report the receipt of a letter from Messrs. Hicklin, Washington, and Pasmore, solicitors, acting on behalf of the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company, asking for a statement of the Council's claim against the authorities named in respect of the damage done by the explosion in Grange Road on Dec. 30, 1908. The Committee forwarded a claim for £4455 5s. 8d. This sum includes the net expenditure by the Borough Council, £100 in respect of the legal work done by the Town Clerk, and interest on the £5000 borrowed by the Council to repair the damage.

**Street Lighting in Westminster.**—The Works Committee of the Westminster City Council report having considered what steps should be taken, in view of the termination, on March 31 next, of the contracts with the Gaslight and Coke Company for low-pressure gas lighting. The matter is important; and in case the Council may not have concluded arrangements for a new contract or contracts commencing on the 1st of April, it is advisable to arrange for the existing contracts to be continued, if necessary from month to month, on the present terms. This is to be done, subject to the concurrence of the Company. In reply to a petition signed by 59 residents and traders in Victoria Street, calling attention to the inefficient lighting of that thoroughfare, the petitioners are to be informed that an experimental installation has been arranged.

### COST OF GAS AND ELECTRIC LIGHTING.

In the Engineering Supplement to "The Times" for the 12th inst., there was an article on "Concentric Wiring and Metal Filament Lamps," from an electrical correspondent, in the course of which it was stated that "metal filament lamps, if properly installed, provide a cheaper and healthier light than gas-mantles." The statement was promptly replied to by Mr. Hanbury Thomas, the Managing-Director of the Sheffield United Gas Company, in the following letter, which was inserted in last Wednesday's "Supplement."

This, to say the least of it, is a very erroneous assertion for any electrician to make, unless he added that the comparison was with gas at least 5s. per 1000 cubic feet—a price which is only charged in villages. The circular I send herewith shows the comparative cost of gas and electric lighting in Sheffield; and by it you will see that with the metal filament lamp electric light is four times as dear as gas with the incandescent mantle. Mr. F. H. R. Lavender, in a paper which he recently read before the Birmingham local section of the Institution of Electrical Engineers, gave a table showing the results of tests of six metal filament lamps with an initial candle power varying from 21.5 to 31.2, wherein he showed the maximum cost per 1000 candle-hours to be 8.8d. and the minimum 5.6d., with electric current at 4d. per unit, whereas the cost of 1000 candle-hours for an incandescent gas-burner is rather under 1d., which more than bears out the figures shown in the enclosed circular.

With regard to the hygienic aspect of the two forms of illumination, the researches of Dr. Rideal, Mr. Hehner, and others, have abundantly proved that gas has nothing to fear from comparison with electricity. Although some amount of carbonic acid is produced by the combustion of gas, the air of a room is not necessarily contaminated thereby, as the heat from the burning gas assists the natural ventilation, and promotes the egress of foul air and the ingress of fresh air. Moreover, the idea that carbonic acid is itself poisonous has long ago been exploded. It is the poisonous products of respiration that are associated with it, when evolved from human beings, which make the atmosphere of a crowded room impure. Whereas one can breathe with impunity an atmosphere containing 100 parts of carbonic acid per 10,000 parts of air, one of 10 parts per 10,000 due to the respiration of human beings would be highly dangerous.

It is a pity that electricians should make these very misleading statements; and I do not think that this pays in the long run, as in many cases, not only in Sheffield, but in other parts of the country where gas is dearer than here, the electric light is replaced by gas on the ground of expense.

The circular referred to by Mr. Thomas stated that with current at 4d. a unit the cost per hour of a 16-candle carbon lamp using 60 watts is  $\frac{1}{3}$  1.; of a 32-candle osram or other metallic filament lamp using 40 watts, 1-6th of a penny; and of a 50-candle osram or other lamp using 62 watts,  $\frac{1}{4}$  d.; whereas a 60-candle incandescent gas-burner using 4 cubic feet of gas at 1s. 4d. per 1000 costs 1-16th of a penny per hour, and a 60-candle inverted incandescent gas-burner using  $3\frac{1}{2}$  cubic feet at the same price, 1-18th of a penny.

### THE FATAL GAS EXPLOSION IN THE CITY.

At the City Coroner's Court last Wednesday, Dr. Waldo held an inquest on James Thomas Lloyd, a painter and decorator, who was found dead as the result of a gas explosion at the offices of Messrs. Jackson, Pixley, and Co., accountants, in Coleman Street on the 15th inst., as reported in the "JOURNAL" last week (p. 195). Helen Green, a cleaner at the premises, said that when she arrived there about five o'clock in the morning on the day in question there was a smell of gas. She went down to the basement without a light and opened the windows, and afterwards she opened every window on the six floors. Deceased arrived about eight o'clock, and she asked him if he smelt gas. He replied that he did, and said there must be an escape somewhere. As he was going downstairs for his paints, witness said: "I have not had a light this morning; don't you light up." Lloyd was not smoking, and had no light with him. There was a gas apparatus in the basement; but deceased had not made use of it. Five minutes later, witness was taking letters from the postman at the door when there was a loud explosion. The marble step on which she was standing parted, and she was thrown into the middle of the road. In reply to a Juror, witness said she was the last to leave the premises on the previous evening, and everything then was all right. The gas was not turned off at the meter, which was in the basement. Archibald Thomas Nash, an officer at the Redcross Street Fire Station, said a call was received at 8.23 a.m. on the 15th inst., and he with some men were on the scene in a minute-and-a-half. Entering the basement, they found the deceased at the foot of the stairs, having upon him heavy masonry which appeared to be part of the strong-room. There was a very powerful odour of coal gas. There was a ventilation aperture close to the strong-room floor, through which there was a gas-pipe. There must have been an escape of gas into the strong-room, and a slight explosion outside which connected with the larger quantity of gas inside the room, which had been full of gas, because the explosion blew out 14-inch walls. A light must have been introduced into the basement somehow. George Rains, a clerk, deposed that a gas-drier was put in the strong-room on account of dampness. It was lighted in the morning, and put out about four o'clock in the afternoon. Mr. S. J. Hood, an Assistant Inspector in the service of the Gaslight and Coke Company, stated that if the deceased used a light, and the explosive mixture was in the strong-room, the draught from the open windows would have caused the mixture to explode. The force of the explosion would have been away from the deceased, and he would not have been burnt. Witness did not think a light from the outside caused the explosion. A police-sergeant stated that no matches were found on the body. Dr. Kearney, the Police



Divisional Surgeon, described the injuries sustained by deceased, and said that death was due to shock. There were no marks of singeing; and he would have expected that if the deceased had caused the ignition such marks would have been observed. The Jury returned a verdict of "Accidental death, due to an explosion of coal gas, the cause of which was unknown."

## INCREASED STORAGE AT HECKMONDWIKE GAS-WORKS.

### Presentation to the Chairman of the Company.

A new gasholder of upwards of a million cubic feet capacity, recently erected on the works of the Heckmondwike and Liversedge Gas Company by Messrs. Clayton, Son, and Co., Limited, of Leeds, has just been brought into use. It is of three lifts, in a steel tank; and it was designed by, and erected under the superintendence of, Mr. F. D. Richmond, the Company's Engineer and Manager. The turning of the gas into the holder was performed by the Chairman, Mr. J. J. Stead, in the presence of the Directors, the Contractors, and the Manager. After a few brief remarks, the party adjourned to the Board-Room, where toasts to the success of the Company, the Chairman, the Contractors, and the Engineer were proposed and duly honoured.

A brief history of the Company was given by the Chairman, who stated that the Company was established in 1843 with a capital of £750. New works were built on the present site in 1850; and in 1862 the Company was incorporated. Further powers were obtained in 1875; and last year an Act was passed for sanctioning increased capital and extensions of the works. It was opposed by the Urban District Councils of Heckmondwike and Liversedge, who succeeded in getting inserted a suspensory clause, giving them the power to promote a Bill the following session. But when the resolution for compulsory purchase was submitted to a meeting of the ratepayers of the two townships, it was negatived by an overwhelming majority; and so the undertakers were left to carry on their work as a Company. The Chairman stated, as a coincidence, that the gasholder just inaugurated was the sixth in the history of the Company (three being now in use), that he was the sixth Chairman, and that he was in his sixth year of office.

A pleasant incident of the proceedings was the presentation to Mr. Stead of a beautiful solid silver cigar-case, with the following inscription and a design of the new holder engraved upon it: "Presented to John James Stead, Esq., Chairman of the Heckmondwike and Liversedge Gas Company, by Frank Dean Richmond, Engineer, Manager, and Secretary of the Company, on the occasion of his opening the valve to the new one million cubic feet gasholder. January 14, 1910."

## "DOMESTIC" WATER SUPPLY AND MOTOR-CARS.

### Bradford Corporation Bill

Some 300 or 400 ratepayers put in an appearance at the statutory public meeting held last Tuesday for the purpose of considering the proposed Bill of the Bradford Corporation. The Lord Mayor (Alderman W. Land) presided; and, in response to the request of those present, the clauses were put separately to the meeting.

Mr. A. E. MASSER said he appeared on behalf of the Bradford Automobile Club to object to the inclusion of a clause defining the meaning of the term "domestic purposes" in connection with the supply of water. The clause read: "A supply of water for use elsewhere than in or in connection with a dwelling-house shall not be deemed to be a supply of water for domestic purposes." He first called attention to a discrepancy between the references to this clause in two advertisements of the Bill, and argued that unless the alteration made in the clause had received the assent of two-thirds of the City Council the whole proceedings of that meeting were invalidated.

The LORD MAYOR replied that the clause which appeared in the copy of the Bill deposited in Parliament had received the assent of two-thirds of the City Council.

Mr. MASSER went on to say that the clause was an attempt to override by a Private Act of Parliament a legal decision as to the nature of a domestic water supply. The Bradford Automobile Club had challenged the Corporation to take out a summons in the Police Court in order to test the legality of making a special charge for water used for washing a motor-car; and this challenge had been declined, because the Corporation knew that they were bound hand and foot by the decision in *Harrogate Corporation v. Mackey*. The proposed charge of 1s. per horse power per year was the height of absurdity; and unless the Automobile Club received assurances of reasonable treatment, they would oppose the Bill through all its stages.

Mr. G. H. KENT described the charge as unfair, and warned the ratepayers that if the Corporation were successful in securing this definition of a domestic supply, they would use it against others besides the owners of motor-cars.

Alderman LUPTON remarked that he could assure the Automobile Club that the Water Committee would be equitable in the exercise of their powers.

Mr. MASSER said he was very pleased to hear this expression of opinion from a member of the Council. It was the absurd method of the proposed charge to which automobilists objected. The owner of a four-seated 10-H.P. car with a tremendous surface to be washed would only have to pay 10s., while for a 60-H.P. two-seater, he would have to pay 60s.

Mr. JAMES CRAWSHAW objected to the inclusion of the clause unless at the same time there was included a definite scale of charges for domestic and all other purposes.

Mr. S. DIXON asked if the clause would give the Corporation the right to charge for the swilling of a back yard.

The LORD MAYOR: It does not apply to that.

Mr. DIXON: Then if you can swill your back yard, why can't you swill your dog, or your horse, or your carriage?

The clause was carried.

## WATER SUPPLY IN A RURAL DISTRICT.

At a District Meeting of the Institution of Municipal Engineers, held at Gloucester on the 7th inst., a paper was presented by Mr. WILLIAM WHITEHOUSE, entitled "A Record of Twenty-Five Years' Experience in a Rural District." The object of the author was to set forth some of the conditions under which an engineer and surveyor has to work in a rural district, and the difficulties to be overcome in meeting the increased demand for water, drainage requirements, hospital accommodation, and new roads, during a period of twenty-five years.

The district with which he is associated is situated in the county of Gloucestershire, and consists of eleven agricultural parishes and the township of East Dean. The township of East Dean is in the Royal Forest of Dean, and is the portion in which most of his work lies. The area of the district is 28,646 acres, the population about 20,000, and the number of inhabited houses about 4500. Most of his work lies in the township of East Dean, as this part of the district has systems of water supply and drainage, and, in fact, one portion—Cinderford, and its environs—is quite urban in character, and has a population of about 8000. The East Dean portion of the district is in a very scattered condition; and this renders the control of sanitary matters expensive and difficult. Long stretches of mains have to be constructed, both for water and drainage purposes, to accommodate a small number of houses. The portion of the paper dealing with the water undertaking was in terms of which the following is an abstract.

It was necessary, in consequence of the Forest being a mining district, to obtain a supply from some part where it would not be likely that mining operations would interfere. Fortunately, this was not difficult. In fact, the discovery had already been made, and the supply was available. Messrs. Henry Crawshaw and Co., who were owners of both iron ore and coal gales, drove a heading at a place called Green-bottom, with the idea of draining the percolating surface water from the limestone crop, and so prevent it getting into their iron ore measures. This heading was started in the old red sandstone, and driven through to a bed of shale—which is about 40 yards thick, and lies between the sandstone and limestone—and then through the limestone to a shaft called the Beech Pit. This heading is about 400 yards long; and from what can be gathered from the information handed down by the workmen, considerable trouble was experienced in performing the work. When about 100 yards of the heading had been driven, or almost through the sandstone, the workmen had to cut through, for a considerable distance, a bed of conglomerate, or what is locally known as the pudding stone rock. This rock yielded water so rapidly that the driving had to be abandoned for a time. The work was, however, subsequently again taken in hand and completed. This supply, being outside the coal and iron ore measures, was absolutely reliable; and it is not surprising to find that the rural sanitary authority turned their attention to it when searching for a source of supply. Negotiations were entered into with the Crown, the right to the water secured, and the works started, I believe, about the year 1870.

The works consisted of a pumping-station and service reservoir, from which the water gravitated to the consumers. A small pump-well was constructed near the mouth of the heading, from which the engines raised the water to the service reservoir. The engines are high pressure, and of the horizontal type, nominally 20 H.P. each, and manufactured and fixed by the old firm of James Watts and Co., Soho, Birmingham. Each engine is capable of raising 8000 gallons per hour. It is hardly necessary to state that in these days of gas, oil, suction gas, electrical power, &c., plant of the description mentioned would hardly be considered. However, the engines are well made, have done excellent service, and are to-day in first-class condition. The engines have to raise the water to the service reservoir, which is about  $\frac{1}{2}$  mile distant, and a vertical height of 406 feet above the pumping-station. The load upon the engines is heavy; and at first considerable difficulty was experienced with the pump-valves. However, improvement has been made in them; and they are now working exceedingly well.

The service reservoir is round in shape, 61 feet diameter at bottom, and 62 feet at top. It was, until enlarged, 10 feet deep to the water-line, and therefore of 185,000 gallons capacity. Originally the reservoir was not covered. The rising main from the pumping-station is 6 inches in diameter; and the service mains from the reservoir vary from 5 to 3 inches. The district is a very hilly and undulating one; and great difficulty has always been experienced in supplying the high-level districts—due, no doubt, to the fact that the trunk mains have been throttled, friction, and the large draught made upon the mains in the low-lying parts of the district. The length of the mains originally constructed would be about 10 miles; and the pressure in the lowest parts of the district is about 175 lbs. When I first became acquainted with the works, some 27 years ago, the number of houses connected with the mains was about 200, and the population supplied 1000.

In the year 1884, it was found to be necessary to do something to meet the increasing demand for water; and at this time the difficulty was overcome by the construction of an impounding reservoir near the pumping-station, to store the water which flowed from the heading during the night, and at times during which pumping was not being performed. This impounding reservoir is 270 feet long by 15 feet wide, and 9 feet deep, with a capacity of 225,000 gallons. The impounding reservoir was connected with the pump-well; and the water from the heading continually flows into it, and through an overflow to the waste drain when full, though means of diverting the water through the pump-well were made, in case of emergency, or to enable repairs to be made to the reservoir. The impounding reservoir is constructed of 9-inch brickwork, with internal counterforts and concrete bottom; and it was covered with a galvanized iron roof. Considerable difficulty was experienced in making the reservoir water-tight; but it was eventually rendered so by cement concrete and blue brick underpinning, and outside counterforts. The chief cause of the trouble was, I believe, in consequence of a portion of the reservoir having been built over an old watercourse, and on sideland ground, which necessitated supporting the one side with a new bank, which gradually set.

The Rural District Council was formed in 1894; and I was appointed Surveyor in 1896. For several years, the yield of water at our heading had not been sufficient to maintain a constant supply during portions



of the year; and after my appointment, I immediately turned attention to this problem. As previously stated, our service reservoir was not covered; and in consequence of its being open to the sun and light, algae, or water weed, was very rapidly formed in hot weather, with the result that it was necessary to cleanse the reservoir about every twenty-one days, and I have known it to be necessary to do so in fourteen days. On one or two exceptional occasions, when scarcity or bad weather has prevented the work of cleansing being performed, I have seen large quantities of insects mixed with the water weed—in fact, a living mass. It must not be assumed from this that our water supply is an impure one—derived, as it is, from a source upwards of 120 feet below the surface. An analysis of the water made by Mr. Embrey, the County Analyst, showed it to be very pure, and well fitted for domestic use.

After receiving the Council's permission to prepare a scheme for covering the reservoir, I had first of all to consider the question of maintaining the supply to the consumers during the performance of the work. This was got over by tapping the rising main, fixing valves, and constructing a branch round the reservoir from the rising main to the service main, so that the water could be pumped into the service main direct. The fluctuations of the consumption were met with a 200-gallon storage tank, and the excess passed through an overflow-pipe into the waste drain. After a few days, we were able to gauge the rate of supply so nicely during the day that very little waste occurred. The supply of the district was maintained some months in this manner.

After a good deal of careful consideration, I made up my mind that the best, cheapest, and most durable, as well as the least expensive to maintain, was a ferro-concrete covering. Though I say ferro-concrete, it could hardly be considered the highly scientific method now so popular with engineers. It was simply an adaptation of the system of fire-proof floor construction. The reservoir being round, made it rather awkward to cover; but the plan adopted simplified the work very much. The main joists are 12 in. by 6 in. steel, the ends resting on the wall, and the bearing supported by pillars built with Staffordshire blue bricks set in cement. The lateral joists are 6 in. by 3 in. steel. Staging was fixed to the underside of the lateral joists; and the latter were afterwards cased in cement concrete of the following specification: Aggregate 4 parts washed clinker and 1 part washed sand. Matrix 1 part portland cement. This gave a very satisfactory result.

It was also decided to increase the size of the reservoir; and it was therefore made 5 feet deeper, and the 18-inch stone wall carried up 3 feet to form a parapet and to support the ends of the joists, and so stiffen and strengthen the floor. The reservoir was provided with inlet and outlet cast-iron ventilators. The deepening of the reservoir gave us 50 per cent. more storage room; and during the next twelve months, it also gave us considerable trouble.

Previous to taking this work in hand, I had consulted some old plans; and from them it appeared that the reservoir walls and floor were built on a good concrete foundation, which I calculated would easily bear the extra weight we placed upon it. However, three months after the work had been completed, there was considerable and continuous leakage. I took up part of the floor for examination, and found that the stone-slab paving was laid on clay puddle, and not on concrete as shown by the old plans. I lifted the greater part of the floor, and laid a foot of cement concrete underneath it, as well as doing as much underpinning as I could with safety. This caused considerable improvement; but still the leakage continued, and was more pronounced when the reservoir was full. I then came to the conclusion that the walls expanded with the weight of the water; and I had eight concrete counterforts constructed on the outside of the wall, each counterfort being 17 ft. by 6 ft. by 4 ft. 6 in., and built up from the bottom of the foundation. These means effectually cured the trouble; and there has been no evidence of leakage since.

The covering of the reservoir proved to be a complete cure of the water-weed trouble; and though we cleanse the reservoir once a year, there is never a vestige of algae, and, with the exception of a little sand which is pumped up from the intake, the water appears as clear and satisfactory at the end of twelve months as at the commencement. I estimate that we saved about 700,000 gallons of water yearly by covering the reservoir, as we had to send about 50,000 gallons through the waste-pipe every time the reservoir was cleansed. We also saved the cost and trouble of cleansing, as well as the annoyance and inconvenience to consumers by stopping the supply. But, of course, the greatest benefit of all was the improved quality of the water.

Although covering our service reservoir meant a great improvement in the quality as well as in the quantity of water, we were still unable to maintain a constant supply during periods of drought. I therefore tried the introduction of a superior class of fittings and machinery for tapping the mains under pressure, and employed an inspector, who gave his whole time to the repair of leaky taps. All these things reduced the consumption; but, as the number of consumers increased, the insufficiency of the supply became more apparent, and we had to shut off the water during the night for some parts of every year. Under these circumstances, the Council began to seriously consider the question of an additional supply, which became more urgent in consequence of the persistent applications for water which were being received from parts of the district situated at a level too high to be dominated by our service reservoir. In 1903, the Council directed me to have an inspection made of the heading to which I have previously referred; and I obtained the services of two Forest of Dean miners to undertake this work. On their report, the heading was repaired and cleared up; and this improved our supply by at least 25 per cent.

As time went on, the number of consumers rapidly increased; and in 1907 the Council determined to make an attempt to provide an additional supply. We had found, after repeated examinations of the heading, that most of the water boiled up from the bottom; and this, combined with other local knowledge, enabled us to come to the conclusion that more water could be found by sinking a shaft for this purpose. The dip of the strata also assured us that in sinking a shaft we should not interfere with our existing supply.

This shaft was commenced during the spring of 1907, and sunk within a few yards of the mouth of the heading. The well was sunk in the old red sandstone; and the specification stated that it was to be 40 yards deep, lined with 9-inch brickwork, and the diameter 6 feet

in the clear. In order to give the local miners a chance, tenders were invited for the sinking labour alone; the Council finding all machinery and driving power. Nine feet from the surface, rock was met with; and it remained rock right to the bottom. The boring was done by hand drills; and the explosive used for blasting is known as "Rippite," and was fired from the top of the shaft with an electric battery. The water was struck 45 feet from the surface, and gained in volume with every additional foot. We commenced the pumping with "Pulsometers," and got on fairly well until about 60 feet from the surface, when we began to experience considerable difficulty in keeping the well clear of water for the sinkers to proceed with their work. Pulsometers are excellent pumps, providing they have a constant supply of water to pump at, and if a good pressure of steam is maintained; but when anything goes wrong, and the pump gets hot, it is a most difficult job to start it again. In sinking operations, there are so many difficulties to contend with and guard against that the work is one continual worry. Sometimes the pump would be put out of action by the blasting, at other times the grit sucked into it would place the pump *hors de combat*; and before the steam could be turned off, the pump would get hot, and have to be cooled before another start could be made. At this period of the sinking operations, the water was coming into the shaft so fast that it would rise at such a rate as to render it necessary to draw up the men five minutes after the stoppage of the pumps. However, we struggled on until the shaft was 90 feet deep, and the yield of water after a wet season about 15,000 gallons an hour. In January, 1908, it was decided to suspend operations until the summer, as the quantity of water to be dealt with made the work costly to the Council and the contractor.

Sinking was again started in July, 1908. During the period of suspension, we had decided to go in for a different class of pump; and, after getting all the advice and information we could collect, purchased one of Evans's "Grif" pattern, specially made to suit our circumstances. Sinkers' pumping machinery and tackle is a speciality with Messrs. J. Evans and Co., of Wolverhampton; and I am bound to say that the service given by their pump was excellent, and the remaining 30 feet of the shaft—though the most difficult—was performed in about three months without any unexpected trouble.

The work was commenced in the spring of 1907; and, after being suspended during the winter months, was finished about the end of the summer of 1908. The experience gained in sinking this shaft I sum up as follows:

(1) That it is a mistake to make your shaft too small. If our shaft had been 8 feet instead of 6 feet in the clear, we should have performed the work much more rapidly and, I think, more cheaply. Pumping machinery to deal with a large quantity of water takes up so much space that the sinkers are hampered in a small shaft.

(2) That it is most inadvisable not to make your contract an inclusive one for both machinery and labour. When difficulties arise, the sinkers blame the machinery; and those in charge of the machinery blame the sinkers. This is not only unpleasant, but prejudicial to the conduct of the work.

(3) That it is advisable to provide and fix sufficient and positive pumping machinery as soon as pumping machinery is required, or, in other words, avoid all makeshifts or temporary expedients.

It may be interesting if I give the cost of this work.

	£	s.	d.
Sinking contract (labour only) . . . . .	353	0	0
Labour (stokers, fitters, carpenters erecting pit-head framing, engine and boiler-sheds, &c.) . . . . .	465	2	11
Machinery . . . . .	656	2	1
Fuel . . . . .	276	0	0
	£1750	5	0

Value of machinery and plant at conclusion of work, £602.

Before closing, I should like to give some statistics relating to the present size of our works, as compared with those previously given in the paper, and what may be considered as our present resources:

	1882.	1909.
Number of houses supplied . . . . .	200	1900
Population . . . . .	1000	9500
Average consumption at the present time, about 12 gallons per head per day—114,000 gallons per day.		

During times of drought, our minimum supply from the heading is about 80,000 gallons per day. The minimum yield from the new shaft is about 150,000 gallons per day, so that we have a margin of 116,000 gallons. A considerable part of the northern portion of our district is not supplied. When it is, the greater part of our surplus yield will be wanted.

**Hastings Corporation Bill.**—A meeting was held last Tuesday at the Hastings Public Hall for the purpose of considering the Corporation Bill, which seeks power to borrow £100,000 for an extensive water scheme, to grant superannuation to workmen, to establish medical baths, and to effect sanitary and other improvements. The Mayor (Alderman Mitchell) presided over a crowded attendance. From the commencement, strong opposition was encountered to the Bill. A proposal to adjourn the discussion was not accepted; those present clamouring for a division. On the motion being put, two voted for the adoption of the Bill; the remainder of the meeting being absolutely averse to it.

**Colwyn Bay Gas Managership.**—A proposal that a salary of £250 a year should be offered for a Gas Manager to take the place of Mr. J. W. C. Pennington (whose resignation will become effective in March), and that the person appointed should devote the whole of his time to the duties, led to some discussion in the Colwyn Bay Urban District Council. Mr. Heenan said it was absurd to have two men taking charge of the gas and electricity concerns; and it would be more businesslike if these comparatively small undertakings were managed by one competent man. He moved that the matter be referred back with a view to one Engineer being engaged to control the electricity-works and the gas-works. Mr. Davies seconded; but, after a long discussion, the amendment was defeated by ten votes to seven, and consequently the Council will proceed to the appointment of a Gas Engineer only.



## WATER SUPPLY OF NEW YORK CITY.

At the recent Meeting of the New England Water-Works Association, a paper on the above subject was read by Mr. William W. Brush. The following particulars are taken from some extracts from the paper given in "Engineering Record."

About 25 separate systems of water supply were used to serve the territory covered by the present city of New York; and practically all these systems have remained in use since the consolidation. The new supply from the Catskills is the first system that has been designed to supply water to all the boroughs comprising the greater city, and will practically cross-connect all the existing systems.

During the latter part of the Eighteenth and the early part of the Nineteenth centuries, several attempts were made to furnish a water supply from wells on Manhattan Island; but the quantity and quality were so unsatisfactory that the introduction of a water supply system for what is now the borough of Manhattan may be properly said to date from 1842, when water from the Croton River was first utilized, the population at that time being about 350,000. This was supplemented by an emergency supply from the Bronx and Byram rivers, which was introduced in 1884. The available supply from the Croton River was greatly increased by the construction of the new Croton aqueduct, which was put into service in 1890, and the extension of the Croton reservoir system, which is still in progress.

The Croton supply is taken from the river, about 30 miles north of the city, with a hilly, comparatively impervious, and rather sparsely settled watershed. The total tributary area is 360 square miles, of which about 19.3 square miles are water surface. The main or new Croton dam is about 6 miles from the point where the river joins the Hudson. This dam is of rubble masonry, faced with ashlar, having its foundation on rock; the lowest point of the foundation being 123 feet below the river bed at this point, the bed being 173 feet below the top of the dam. The crest of the spillway is at an elevation of 196 feet, and the water level can be raised by flash boards to 202 feet. The top of the dam is at 210 feet. The dam, including a spillway of 1000 feet, is 2163 feet long and contains about 850,000 cubic yards of masonry. Construction was commenced in 1892, and the works sufficiently completed to be used in 1905. The total cost, including land, was about \$15,000,000. The reservoir formed by this dam is 20 miles long, and has a storage capacity at the spillway level of 38,000 million gallons, of which about 20,000 million gallons are above the invert of the aqueduct, and therefore ordinarily available. The original Croton dam, about three miles above the new one, is submerged by this reservoir to a depth of 34 feet.

Fourteen auxiliary reservoirs have been formed by masonry dams and earthen dikes, constructed on the various tributary streams and branches of the Croton. The stored water is discharged as required into the natural watercourses, and allowed to flow to the main reservoir. The Croton Falls reservoir, now under construction, will give an additional storage reservoir on what is known as the West Branch of the Croton River; and a diverting dam and channel will convey water from the East Branch into this reservoir. Upon the completion of this reservoir, the total available storage will be about 105,000 million gallons—equivalent to 290 millions per square mile of watershed.

The yearly rainfall on the Croton watershed averages about 48 inches; and the estimated safe minimum yield, based on the stream flows as measured since 1868, and assuming the completion of the Croton Falls reservoir, is 336 million gallons daily, which is equivalent to 930,000 gallons per square mile of watershed.

There are two aqueducts available to convey the water to the city. The old Croton aqueduct is 7 ft. 6 in. wide by 8 feet high, with a cross-section of about 53 square feet. Its slope is 1.1 feet per mile, and its capacity about 80 million gallons daily. It is 34 miles long, of which 4 miles are in earth or rock tunnel, the remainder being "cut-and-cover" section. The new Croton aqueduct is 13.6 feet wide and 13.5 feet high, with an area of 154 square feet. The slope is 0.7 foot per mile; and it has a capacity of 300 million gallons daily. The total aqueduct capacity for the old and new Croton is therefore slightly less than 400 million gallons daily. The aqueduct is almost wholly in rock tunnel, being 31 miles in length, of which only a little more than a mile is cut-and-cover.

The aqueducts are now connected to the Jerome Park reservoir, about 3 miles south of the northern city line. It is divided into two basins, the westerly one having been sufficiently completed to be put into use in 1905. The easterly basin is unfinished, as it was anticipated that it would be used in connection with a future filtration plant for the Croton supply. The reservoir has a flow-line at 134 feet; the bottom elevation being about 107 feet. The west basin has an area of 94 acres, and a capacity of about 770 million gallons. The old Croton aqueduct continues from this reservoir in cut-and-cover to the Harlem River, where it crosses in pipes over the High Bridge.

The new Croton aqueduct drops rapidly just north of the reservoir into a circular brick-lined tunnel, 12.25 feet in diameter, with its invert about 7 feet above tide water. A branch aqueduct connects the main conduit with the reservoir, and water from the latter can flow into the tunnel through a downtake shaft connected to a central gate-house. At the Harlem River the tunnel drops to an elevation of about 300 feet; the diameter reducing to 10 feet. On the west side of the river the tunnel is brought up to 13.5 feet. The pressure on this tunnel varies from about 50 lbs. per square inch for the land section to nearly 200 lbs. for the river section. From the gate-house the water is carried, mainly in 48-inch cast-iron mains, to the distribution system and to service reservoirs in Central Park. These reservoirs consist of three basins, the two southerly ones known as the old, and the northerly one as the new, reservoir. The normal flow-line is at 118 feet; and the capacity of the three basins is about 1200 million gallons.

About 75 per cent., or 250 million gallons daily, of the Croton supply is distributed from the low-level reservoirs, which gives a resulting hydraulic gradient in down-town Manhattan, during the daytime, equivalent to an elevation of about 70 feet. As a large area of the Bronx and Manhattan boroughs lies above the elevation which can be supplied from the low-level reservoirs, high services have been created by pumping the Croton water.

In the borough of the Bronx, the supply from the Bronx and Byram Rivers is delivered by a single 48-inch pipe, 15.2 miles long, from Lake Kensico, formed by a dam across the Bronx River at Kensico (N.Y.), to the Williamsbridge reservoir, located to the east of the Jerome Park reservoir. The watershed tributary to this lake is 22 square miles, and there are four lakes above Lake Kensico available for storage, having 2240 million gallons capacity, which, with Lake Kensico, makes 3870 million gallons. The supply, which averages about 20 million gallons daily, is used for the intermediate service in The Bronx. The Williamsbridge reservoir contains 140 million gallons, with the water level at 193 feet.

The distribution system of Manhattan and The Bronx consists of 1200 miles of mains, varying from 4 to 60 inches diameter, on which have been set 18,500 gates and 18,400 hydrants. There are something like 150,000 services, of which about one-third are metered. The average daily consumption of the two boroughs is about 325 million gallons. The original Croton works cost \$12,000,000, and, with the additions since that time, including the Bronx and Byram works, have cost about \$100,000,000.

In connection with the water supply system, a separate high-pressure service has been installed to reduce the fire loss and conflagration hazard in the down-town section of Manhattan. This system at present covers an area of about 1450 acres, within which 50 miles of mains from 12 to 24 inches diameter have been laid, with 896 gates and 1274 hydrants. There are about 5 miles of 8 inch pipe laid for hydrant connections, with an 8-inch valve on each connection. The mains are supplied by two pumping-stations—one on the East River and the other on the Hudson. Each station is connected to use either the salt water from the river or the fresh water from the Croton system; it being expected to use salt water only as an emergency supply. Each station has five six-stage turbine pumps driven by electric motors, each pump being capable of delivering 3000 gallons per minute against a head of 300 lbs. per square inch at the station. Each hydrant is equipped with three 3-inch and one 4½-inch outlet, and approximately ten lines of hose can be run from each hydrant. The high-pressure system has cost somewhat less than \$4,000,000 for stations, including land, mains, and appurtenances; and extensions now in progress are estimated to cost about \$1,500,000.

Brooklyn was dependent upon individual private and public wells and cisterns prior to the introduction of water from the Ridgewood system in 1859. At that time, the population was about 250,000, and the total area of the city was less than half of the present borough. The original works extended about 12 miles along the south shore of Long Island; and in 1890 an additional supply was obtained by an extension eastward of about 10 miles—the watershed area being about 159 square miles. The conditions of this watershed are exactly the reverse of those on the Croton shed, where huge storage of water on the surface is the only economical method of obtaining a large percentage of the rainfall. On the Brooklyn watershed the storage of a large quantity of water on the surface is practically impossible. There is only one reservoir that holds more than 50 million gallons; this being known as the Hempstead storage reservoir, which contains about 880 million gallons with a flow-line at 30 feet; this being equivalent to a depth of about 19 feet at the dam.

The supply from the Brooklyn shed is derived mainly from small streams on which shallow ponds have been formed, and from driven wells and infiltration galleries drawing on the sub-surface waters. This form of development is due to the geological character of the watershed, which, on account of its sand and gravel formation, absorbs nearly all the rainfall, amounting to about 43.5 inches yearly. The rainfall which does not evaporate and is not used for vegetation passes slowly through the upper sands to the saturated bed, and then flows towards the sea at a rate usually less than a mile per year. It is estimated that each year about 14 inches of rainfall flow through the streams, and about 12 inches pass out to the bays and ocean through the sands and gravels. Beds of clay, of a thickness varying from a few inches to about 50 feet, and of irregular shape and area, divide the underground flow into several strata.

Taking advantage of the natural stream and reservoir of filtered water that underlie the south side of Long Island, the supply from the surface streams has been supplemented, and to a large extent supplanted, by the sub-surface development. The first consisted of a large open well; but this was not successful in adding materially to the supply. In 1882, groups of 2-inch wells, about ½ mile from the tide water, where the water level was at from 5 to 10 feet, were driven to a depth of about 40 feet and connected to a central suction-pipe about 700 feet in length, laid at approximately the ground-water level. From 100 to 150 of these wells, with strainers 5 to 7 feet in length, were driven from each station; and by lowering the water level from 10 to 15 feet a supply of from 2½ to 5 million gallons daily was obtained. The system was later modified by increasing the diameter of the wells to 4½ to 8 inches, lengthening the strainers to 10 to 20 feet, and reducing the number of wells.

The supply from the eastern end of the watershed, amounting to from 60 to 70 million gallons daily, is drawn from four streams, five driven well stations, and two galleries. The supply is carried by gravity through a brick conduit to an intermediate pumping-station, known as the Millburn station. Here the water is raised from a pressure of 5 feet to one equivalent to an elevation of about 60 feet, and forced into three 48-inch mains, two of which carry the water to the main or Ridgewood pumping-station, located in the north-east section of the borough. The third 48-inch main discharges into the upper end of a brick conduit which runs through the westerly part of the watershed, and carries the water by gravity to the Ridgewood station, thirteen small driven well stations, one pond pumping-station, four combined pond and driven well stations, and three ponds delivering their supply directly into this conduit. A 72-inch steel pipe is now being laid parallel to the existing conduits, so that the water can be forced directly into the distribution system from several of the pumping-stations on the watershed. At the Ridgewood station, about 120 million gallons daily are pumped from an elevation of about 7 feet into the low service, which is fed by the Ridgewood distributing reservoir, having its flow line at 170 feet, and about 12 million gallons daily into the Mount Prospect reservoir, which has its flow line at 198 feet. There are four driven well stations within the borough limits that



pump about 15 million gallons daily directly into the mains against the Ridgewood pressure.

The distribution system consists of about 870 miles of mains from 4 to 48 inches in diameter, with about 14,000 gates and 13,000 hydrants. There are about 145,000 taps, of which about 14,000 are metered. The total average daily consumption is about 145 million gallons for a population of 1,500,000, or 97 gallons per head. The total cost of the Brooklyn system has been slightly over \$30,000,000. Three driven well stations, owned by private companies and furnishing about 10 million gallons daily, supply a portion of the borough.

There are two high-pressure fire-service systems in Brooklyn. The main one was installed in 1905-7, and protects a business and manufacturing district along the East River, running from the Erie Basin to the Navy Yard, and extending back approximately one mile from the river front. This area comprises about 1400 acres. The supply is furnished by two stations; the main one being located on the river front, and the reserve station opposite Fort Greene Park. The total cost of the installation, which, in addition to the stations, includes about 21 miles of 12-inch to 20-inch mains, 1000 gates, and 730 hydrants, was about \$1,300,000. Extensions are to be made to the pipe system, at an estimated cost of \$750,000. The Coney Island high-pressure system was installed in 1904-5, and protects the amusement section of Coney Island. The pumping-station is located on Coney Island Creek, and can obtain its supply either from the Ridgewood system or from the salt-water creek. The equipment of this station consists of three Nash gas-engines, connected to Goulds triplex pumps; each unit having a capacity of 1500 gallons per minute against a pressure of 150 lbs. per square inch. The total cost of the installation, including about 1.2 miles of 12-inch to 16-inch mains, with 61 gates and 47 hydrants, was about \$100,000. Extensions to the system are now under way; the estimated cost being about \$150,000.

The safe supply from the systems utilized for all the boroughs, with the possible exception of the borough of Queens, is not sufficient to meet the requirements of the consumers during a period of drought similar to that which has been experienced for several years—the increase in supply obtained by the construction of new reservoirs on the Croton watershed, and the additional development of the underground supply of Long Island, hardly keeping pace with the increase in consumption; and further relief from such development is impracticable. As a result of an agitation for an additional supply, the Board of Water Supply was created by the Legislature in 1905 to construct the necessary works. The watersheds adopted for the new supply consist of Esopus, Rondout, Schoharie, and Catskill Creeks in the Catskill Mountains. The waters of the Schoharie Creek are to be delivered by tunnel into the valley of the Esopus; branch conduits being planned to convey the Rondout and Catskill waters to the main aqueduct. The Ashokan reservoir is now being developed in the Esopus Valley, and from it an aqueduct to deliver 500 million gallons daily is under construction. A large receiving and storage reservoir is to be constructed on the site of Lake Kensico, previously mentioned; and a distributing reservoir on the high

ground just north of Van Cortlandt Park. The Kensico reservoir is to have a capacity of about 40,000 million gallons, with a water surface 355 feet above tide. The dam is to be of masonry, 1830 feet long and nearly 300 feet from the crest to the deepest part of the foundation.

The terminus of the Catskill aqueduct will be in the Hill View reservoir, which will be used as an equalizing basin, and will hold approximately 900 million gallons. The flow line is to be 295 feet above tide, the depth to be 36 ft. 6 in., and the water surface about 3000 feet long by 1500 feet wide. A central wall will divide the reservoir into two basins. South of the reservoir, it is expected to construct a pressure tunnel under the borough of The Bronx, crossing the Harlem River just below High Bridge, running through the borough of Manhattan, and crossing into Brooklyn under the East River, just below the Navy Yard. This tunnel is to be of sufficient size to carry the supply delivered by the Catskill aqueduct; and borings are now being made to determine the character and elevation of rock that is to be penetrated. Connections at the various shaft sites to the pipe system are to be provided for the delivery of the Catskill water into any part of the boroughs of Manhattan and The Bronx. For Brooklyn and Queens, large pipes will be required, as the conditions are not favourable for the economical extension of the tunnel system. For Richmond, submerged pipe-lines will be laid across the Narrows, and a reservoir constructed to equalize the pressure and safeguard the supply for the borough.

The Water Board have carried on extensive preliminary surveys and investigations to determine the available supply from the undeveloped watersheds of Long Island; and they recommend that the south and easterly sections of Suffolk County be utilized for Brooklyn, Queens, and Richmond by drawing from the sub-surface flow. The Board of Estimate and Apportionment approved last year the utilization of this source of supply; and the State Water Commission were requested to authorize its development for New York City. Opposition was encountered from owners of large estates within the watershed; and the Commissioners have not yet approved the petition of the city.

**East Grinstead Gas and Water Company's Bill.**—The East Grinstead Urban District Council have decided to present a petition against the Bill which the local Gas and Water Company are promoting. At the meeting at which this determination was come to, the Chairman (Mr. J. Rice) said the Council were not antagonistic to the Company; but they had a clear duty in the matter. Some years ago, a Bill was passed through Parliament that was not altogether advantageous to the town. They knew from bitter experience that many clauses were not included in it that should have been; and now that the opportunity had come—not by the Council's making—of getting certain concessions from the Company, he thought the Council should take it. A meeting of the Council had been called so that they might put themselves in the best possible position to get the things they required inserted in the Bill. A Committee of six was appointed to go into details and frame requirements for submission to a future meeting of the Council.

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## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Wishaw Town Council on Monday, the Convener of the Gas Committee—Bailie Bell—reported that the average price of gas to prepayment meter consumers in thirty-five burghs in Scotland was 7d. per 1000 cubic feet more than the price to consumers by ordinary meters, as compared with 4d. per 1000 cubic feet in Wishaw. For the year to May, 1909, the gas consumed through ordinary meters was 41,752,000 cubic feet; and the cost of upkeep and time surveying for a year to November, 1909, was £22 10s. During the year to May, 1909, the gas consumed through prepayment meters amounted to 20,837,000 cubic feet, and the extra revenue upon this quantity, at 4d. per 1000 cubic feet, was £347. The cost of repairs, time surveying, &c., for a year to November, 1909, was £351; so that there had been a slight loss at 4d. Prepayment meters also cost about 10s. each more than ordinary ones. The Gas Manager had been instructed to prepare annually an estimate of the depreciation at the gas-works, to be submitted to the Scottish Office. The action of the Gas Committee was approved by the Council.

In connection with the movement for the purification of the air of Glasgow, the Gas Committee of the Corporation appointed a Sub-Committee to make arrangements for the delivery of a course of lectures to demonstrate the advantages to be derived from the use of gas for cooking and heating, as well as for lighting purposes. The Sub-Committee have made arrangements for the delivery of ten lectures in different parts of the city. In addition, Mr. A. Wilson, the Gas Engineer, will lecture, on Wednesday, Feb. 9, in the High School Hall in Elmbank Street, under the auspices of the Glasgow Health Culture Society, on which occasion Mr. M. W. Montgomery, the Convener of the Gas Committee, will preside. Lord Provost M'Innes Shaw has called a meeting of citizens to consider the subject, to be held in the City Chambers on Wednesday, the 16th prox.

In the political struggle which is in progress at present, it is not to be expected that much will transpire which ought to find its way into the pages of the "JOURNAL;" and the only incident of this nature which I observe is a reference to the price of the Granton Gas-Works site. Speaking at Garvald on Wednesday, Mr. B. Hall Blyth, of Edinburgh, who is the Unionist candidate for Haddingtonshire, referred to a speech recently made at that place by Treasurer Leishman, of Edinburgh. He said the Treasurer had referred to the land acquired at Granton by the Edinburgh Gas Commissioners from the Duke of Buccleuch, and had held the Duke up to ridicule for having demanded a high price for land which the Treasurer contended owed its development to the community and not to the Duke. He (Mr. Blyth) could speak with knowledge on this subject, having been employed by the Duke to value the land at Granton. The land was sold to the Corporation for £100 an acre. The Gas Commissioners hunted high and low for ground, and this was the best and cheapest they could get. Treasurer

Leishman had said that the Duke of Buccleuch had done nothing to develop the ground. The Duke's father spent £600,000 in making a harbour at Granton; and this, with the Duke's private railway and several other considerations, gave the ground such advantage that the Edinburgh Corporation were able to buy coal cheaper now than they were ever able to purchase it at the old site of the gas-works, and Edinburgh gas consumers were getting the benefit. To these remarks Treasurer Leishman replied in a letter to the Editor of the "Scotsman," published yesterday, in the course of which he pointed out that he did not hold the Duke of Buccleuch up to ridicule, as it was the system he attacked and not the individual. If a sum of £100 per acre had been the price, nobody could say much, as he believed this figure to represent a fair value for the land. Instead of this sum, however, he found, from official records, that the site of the Granton Gas-Works, consisting of 106½ acres, was sold for a total sum of £124,000; being at the rate of £1167 10s. 7d. per acre. The making of Granton Harbour was a commercial transaction, and had nothing whatever to do with the value of agricultural land. It was simply not true that the Gas Commissioners were buying coal cheaper now than they ever did before. Figures were given to show this; and it was argued that the site of the gas-works had no effect upon the price of coal, as the railway rates were the same to both the old and the new gas-works. Mr. Blyth was thus wrong as to the price of the site, and as to the effect of the site on the price of coal.

Three weeks ago, I mentioned that the Gas Committee of the Dundee Corporation had before them the question of the advisability of applying for a Provisional Order authorizing them to borrow £120,000, to cover estimated capital expenditure in connection with the gas undertaking till 1920. The subject was then remitted to a Committee to consider; the proposed amount being regarded as very large. The Committee seem to have taken the same view, because the recommendation which came before the Town Council on Thursday was that power be asked to borrow only £65,000. Mr. W. F. Burke considered that, as more money was required, they should ask for more, and so save the expense of a second Provisional Order. Treasurer Soutar explained that £65,000 was essential, but that it would meet requirements for the next five years. The Council agreed to the recommendation.

Sheriff-Substitute Glegg had before him in the Small Debt Court in Glasgow on Wednesday an action by Patrick Sweeney, dock labourer, in which he sued the Corporation for £20 as damages for personal injuries alleged to have been sustained by him through falling down an unlighted stair at No. 51, Wigton Street, Canal Bank, where he resides. It was stated for the pursuer that the stair had not been lighted for three weeks prior to the accident; and it was maintained that the Corporation were responsible for the state of matters. On behalf of the Corporation, it was argued that, the pursuer having used the stair with a full knowledge of its condition, he ought to be held responsible for the injury he sustained. The Sheriff upheld the defence, and dismissed the action, with expenses.

The burgh officials of all grades in Broughty Ferry held a most successful *conversazione* and dance in the Good Templar Hall last

## I am M.P. among RADIATORS.

LET me explain. "M.P." stands for "Most Popular" and "Most Progressive," and there are reasons for my ELECTION to this place of honour. Modest I may not be, but in simplicity I excel. Herein am I a RADICAL reformer. I am not LIBERAL in the matter of gas consumption, but most sparing. I am CONSERVATIVE, though, in uniform distribution of heat. Initial cost and upkeep are with me at their lowest, from which follows FREE TRADING to an extent of which I am justly proud.

A Steamless Radiator,

Representing:

THE DAVIS GAS STOVE CO.,  
LUTON.



Tuesday evening. The arrangements for the entertainments were mostly in the hands of Mr. G. Keillor, the Gas Manager, who was duly thanked for his services.

A unique exhibition is being held in Glasgow; the exhibits consisting of primitive apparatus for lighting and heating. It is situated in a building in Castle Street, fronting Cathedral Square, known as Provands' Lordship, which is claimed to be the oldest house in Glasgow. The exhibition is thus appropriately housed. It is an interesting collection. There are exhibits of flint and steel, by means of which lights were raised before the days of lucifer matches. Of lamps there are many, of numerous types, from ancient stone vessels and the oil-lamp known as the "cruisie," in iron and brass, in which rushes were used as wicks, to the modern incandescent gas-lamps, by means of which the venerable building is now lighted. There are lanterns of many sorts, including a specimen of the street-lamps used in Glasgow when oil was the illuminant, a specimen of the first type of street gas-lamp used in Glasgow, and hand lanterns used for lighting the street-lamps in Glasgow and Aberdeen. Rob Roy's lantern—a wooden case with glass in the four sides of it—and a collapsible burglar's lantern, are shown. Candlesticks and candelabra are in great variety; among them being a chandelier which was for long used in the lighting of the Parish Church of Rothesay. The heating appliances on view consist mostly of ancient fireplaces, hearths for burning peat, and coal and charcoal grates, in the latter of which there has been some attempt at the introduction of ornamentation. An hour passed in the exhibition is time well spent; the educative influence of the collection being great, illustrating, as it does, the slow but untiring efforts of mankind in the direction of furnishing himself and his surroundings with better means of procuring light and heat.

**Warminster New Water-Works.**—Last Wednesday, Mr. E. J. Bradfield, the Chairman of the Warminster Urban District Council, formally inaugurated a new installation of machinery in connection with the water supply of the town. Mr. C. H. Lawton (the Engineer of the works) presented Mr. Bradfield and Mr. J. E. Cornish (Chairman of the Water Committee) with silver keys as souvenirs of the day's proceedings. The plant consists of a 35 B.H.P. suction gas-engine and high-speed pump. Mr. Bradfield afterwards hospitably entertained the members and officials of the Council, and in the course of a few remarks said it was seventeen years ago that the old duplex steam-engine and turbines were installed at the works. These had answered the purpose well, and it was hoped to retain them for any case of emergency. With the new plant, they were now thoroughly up-to-date; and if the present yield of water kept up, they would be able to ensure for the town a constant supply. The total amount of the loans taken up was £11,295, and with £6712 repaid, they still had a sum of £4583 outstanding. He thought they could congratulate themselves and the town on the happy position they were now in. Mr. Cornish proposed a vote of thanks to Mr. Lawton and the Contractor (Mr. A. Titt), who had carried out their duties so well.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Jan. 22.

### Sulphate of Ammonia.

During the past week the market has continued very firm, although direct demand has hardly been so good. Dealers apparently still require further quantity to cover former sales; and this circumstance has been sufficient to fully maintain values, while in some instances a small advance has again been scored. The closing quotations are £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. to £11 15s. per ton f.o.b. Liverpool, and £11 16s. 3d. per ton f.o.b. Leith. There is no new feature to comment upon in the forward position, which remains neglected for the most part; but it is reported that prompt price has been paid f.o.b. Leith for February and March delivery.

### Nitrate of Soda.

No further reduction has been made in the price of this article, and the value is still given as 9s. 1½d. per cwt. for ordinary and 9s. 4½d. for refined quality, on spot.

LONDON, Jan. 24.

### Tar Products.

The market for tar products has been firm throughout the past week. Pitch is slightly better, and there is certainly more inquiry for this article. In creosote, the distillers are firmer in their ideas of price. In the 90's quality benzol, though makers are asking considerably higher prices, no large transactions are reported; and it is certain that the Germans are underquoting the English makers.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 30s. 3d. to 30s. 9d.; east coast, 29s. 3d. to 29s. 9d.; west coast, 29s. 3d. to 30s. 3d. f.a.s. Mersey ports, 29s. 3d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 4½d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. 0½d. to 1s. 1½d.; heavy naphtha, casks included, London, 11½d.; North, 10½d. to 11d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11½d. to 1s. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

### Sulphate of Ammonia.

This article remains steady, and there does not seem to have been quite so much buying. In London, the principal Gas Companies are quoting £11 15s. for forward delivery; but outside makes can be obtained at about £11 6s. 3d. In Hull, £11 12s. 6d. is asked, and in Liverpool, £11 15s. 0d. In Leith, the majority of makers seem to be sold out for prompt, and for forward are asking £11 15s. In Middlesbrough, business has been done at £11 15s.; but for July-December, slightly under this can be obtained.

## ONE Bland Mantle used regularly for 3 YEARS and STILL burning!!!

Read the following Unsolicited Letter:—

Dr Sir:

I have used your Burners that I had from you in my shop regular which I think is nearly 3 years and I have the same mantle on now that I started with and it still gives a good light. you can make use of this if you think people also my name and any one can see the Burners in my shop at Work

Dec 14<sup>th</sup> 1909

I remain yours Respectfully  
A W Teall

Ironmonger & Co  
The Leach Gloucester

Samples and Quotations of both UPRIGHT and INVERTED Mantles on application.

**THE BLAND LIGHT SYNDICATE, LTD.,**

63, Queen Victoria St., London, E.C.  
20, Fennel Street, Manchester.

Telephone: 5720 (2 lines) London Wall.

Telegraphic Address: "BLANLITE LONDON."



## COAL TRADE REPORTS.

### Northern Coal Trade.

There is now a partial settlement of the difficulty in the northern coal trade, and steam coals are fairly plentiful, though gas coals are still somewhat scarce. The Northumbrian collieries are turning out fair supplies, on the average; and best steams are from 10s. 9d. to 11s. 3d. per ton f.o.b. Second-class steams are 10s. 6d.; and steam smalls from 6s. 3d. to 6s. 9d. It is probable that as the output grows full the shipments may be more regular; but this is the quiet season, and prices are not very firm. In the gas coal trade, there is now some enlargement of the output, though important collieries are idle, and there are arrears of contract shipments to make up. Prices are still very irregular; but as far as quotation can be made, Durham gas coals are from about 11s. to 12s. per ton f.o.b., and sales of some 50,000 tons of best coals are reported for shipment over this year at about 11s. 6d. per ton f.o.b. Of course, the stoppage of many pits for three weeks has helped to make gas coals scarce at this season. Coke is firm for the same reason; and good gas coke is from 13s. 6d. to 14s. per ton f.o.b. in the Tyne.

### Scotch Coal Trade.

There is a well-maintained demand for all classes of coal, which is helped by the difficulty with the miners in the North of England. The prices now quoted are: Ell, 10s. 3d. to 11s. 6d. per ton f.o.b. Glasgow; splint, 11s. to 11s. 3d.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 263,049 tons—an increase of 19,179 tons upon the preceding week, and of 64,972 tons upon the corresponding week of 1909. For the year so far, the shipments have amounted to 416,039 tons—an increase of 76,960 tons over the corresponding period of last year.

**Public Lighting at Paignton.**—The question of the public lighting was under consideration at a meeting of the Paignton District Council yesterday week. The Surveyor, in a report on the subject, stated that the present gas lighting with flat-flame burners was very unsatisfactory; and he recommended that incandescent burners of the Kern type be substituted for them. A letter from the Manager of the Gas Company stated that they were prepared to consider an arrangement for improving the lighting, subject to an agreement for five years. They would substitute new lanterns of the best copper pattern, and incandescent burners for the old lanterns and burners, and maintain, clean, light, and extinguish them at an inclusive charge, varying according to the burners used. The Surveyor reported that the terms offered would effect an annual saving of £95 10s., and the lighting would be much improved. The Lighting Committee recommended the acceptance of the Company's offer, subject to the right of the Council to remove 10 per cent. of the lamps in any one year, and also to a discount of 2½ per cent. on the total amount of the quarterly accounts. The report was adopted.

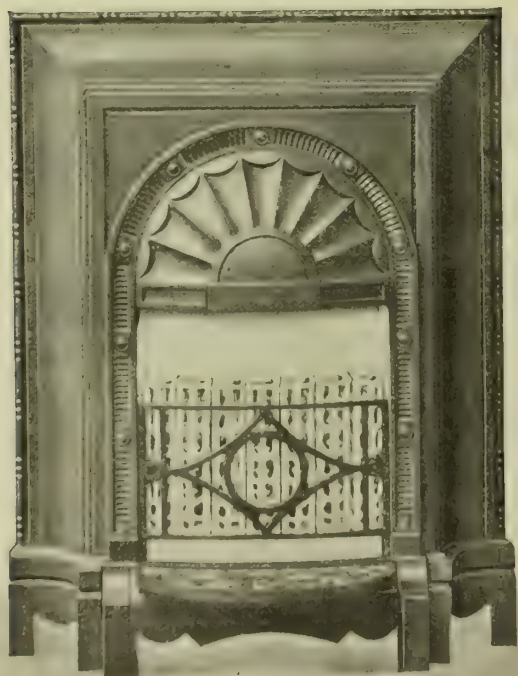
### Hard Labour for a Gas Company's Official.

At the East Ham Police Court last Tuesday, Alfred Carter was charged on remand with making false entries in books belonging to the Gaslight and Coke Company, and further with stealing various sums of money from the Company by procuring it to be paid to Albert Luckin and Henry Honeyball by false entries. As already reported, the allegation against the prisoner was that, in his position as timekeeper over the men working in the coke department, he had made false entries in books, with the result that the two men mentioned had received wages to which they were not entitled, and had shared the money with the prisoner. Mr. Levick (for the defence) now stated that if the Magistrate would deal with the case, the prisoner would plead "Guilty." Mr. Humphreys (for the prosecution) stated that the Directors had left the matter in his hands, and he desired to leave it to the Magistrate. The plea was accepted; and Mr. Levick pointed out that the prisoner was already a ruined man, and had lost a position which he had held for 18 years. The Magistrate said there were two bad features about the case. In the first place, the plan of peculation must have been very carefully prepared. In the second, the prisoner must have corrupted those in a humbler position than himself. The least he could do was to pass sentence of three months' hard labour.

**Gas Companies' Standard Burner Bills.**—These three Bills came before one of the Examiners of Standing Orders proofs last Thursday. Compliance was reported; and the Bills were passed for first reading in the new Parliament.

**Sanitary Condition of the Beckton Gas-Works.**—At the meeting of the Woolwich Borough Council last Thursday, Dr. S. Davies, the Medical Officer of Health, presented a report upon the sanitary condition of the Beckton Gas-Works. He said 3241 men were employed in the works, and about 2000 were engaged at one time. He had inspected the works with regard to their sanitary condition, and was pleased to report that, on the whole, he found this decidedly satisfactory. It was very gratifying to note that the Gaslight and Coke Company paid special attention to the personal well-being of their employees. A large amount of money had been spent in building rooms where the men could prepare and eat their meals, and also wash and bathe themselves. These rooms were well equipped with large lavatory basins, supplied with hot and cold water, and also with spray baths; and they were well and increasingly made use of. The Borough Council, at their dust destructor, and the Gas Company had set an example, in respect of making provision for the cleanliness of their employees, which it was much to be desired should be followed by other employers of labour in the borough, including the Government. Such provision might appear to be, to a certain extent, a luxury, or be regarded as yielding to the "sanitary fad;" but he believed that where it had been tried it had been found not only to increase the health of employees, but also to be advantageous to their wage-earning capacity, and thus would ultimately prove a money-saving expenditure.

# GENERAL ELECTION NOW IN PROGRESS.



When the Gas Fire

# (S)ELECTION

took place last October,

# MAIN'S GAS FIRES

obtained

FIRST PLACE BY A HUGE

# MAJORITY.

"GAINSBOROUGH" Fire. Price 24s. subject.

## R. & A. MAIN, Ltd.,

Gothic Works, EDMONTON, LONDON, N., & Gothic Works, FALKIRK, N.B.



### Dumping German Gas-Mantles in England.

The following letter on the above subject, signed "Director," appeared in the "Daily Telegraph" last Friday: "This unfortunate country has been marked down as a dumping-ground for cheap German incandescent mantles, the better qualities of which are used by British gas companies, and the lower-grade qualities are retailed in the poorer districts. The mantles are sold almost exclusively by German agents, who naturally contribute to our Exchequer, through their income-tax; but the bulk of the spoil goes to the German exporter, who contributes nothing. As a Director of a mantle-manufacturing Company in the East-end, I am in a position to judge what effect this competition has on labour alone. We employ some 100 to 150 steady, hard-working girls; but could we obtain a fair share of the business of the 50 million imported mantles, we could employ probably 300 girls. We make a mantle as good as, or even better than, the imported one; but the latter is dumped here at a price which is simply ruinous, and cannot yield the Germans a profit. It is simply their surplus production."

**Slight Explosion at Limavady Gas-Works.**—Last Thursday afternoon, while the Manager (Mr. Robert Gault) and some men were working in the station meter and governor house at the Limavady Gas-Works, there was a slight explosion. They were engaged in removing an obstruction in the main leading to the gasholder; and the Manager was undoing the connections, when, it is surmised, the hammer with which he was working caused a spark, resulting in an explosion. A stoker was blown into the yard, but was not much injured. The Manager was somewhat singed, and another man was also slightly burned. The slate roof was blown off the house; and the walls were shaken and damaged.

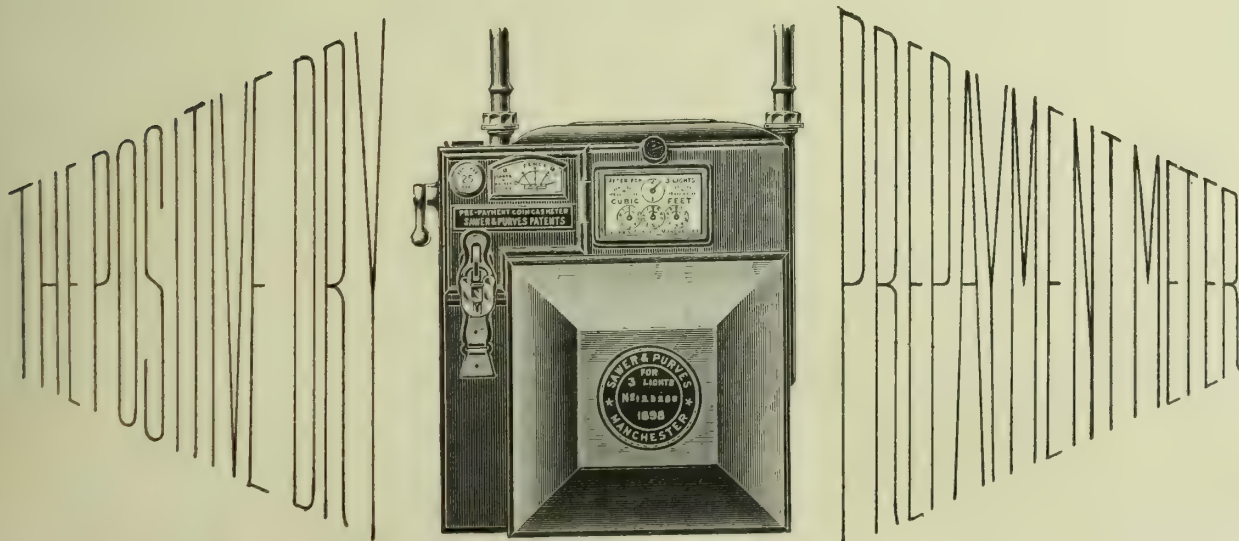
**Devonport Corporation and the Water Engineer.**—A proposal was submitted to the Devonport Town Council last Thursday for the increase of the salary of Mr. F. W. Lillicrap, the Water Engineer. The Water Committee recommended that Mr. Lillicrap's remuneration should be raised at once from £310 to £350 a year, and further increased to £450 by annual increments of £25. Alderman Blackall, the Chairman of the Committee, said Mr. Lillicrap had saved the Corporation £4500 in engineer's fees on works carried out since the Corporation took over the water supply. Mr. Ellis, the Chairman of the Finance Committee, moved that the recommendation be referred back to the Water Committee. He admitted that Mr. Lillicrap had done good service to the Corporation, but pointed out that the time was approaching when they would have to meet serious additional charges on account of the water undertaking, which would add considerably to the ratepayers' burdens. Mr. Lillicrap was appointed at a salary of £250, rising to £350, and had not reached this figure. If he had a claim for extra work, it should be met by a gratuity. The amendment of Mr. Ellis was carried by 41 votes to 9. After some discussion on the question of immediately advancing Mr. Lillicrap's remuneration to £350 per annum, it was decided that the whole subject should be further considered by the Water Committee.

**Tenders for the Lighting of Newton Abbot.**—Two tenders for the public lighting of Newton Abbot were laid before the Urban Council of the town yesterday week. One was from the Electric Lighting Company, who offered to undertake the work for £766 per annum; and the other from the Gas Company, who required £800. The Council's Accountant said they had been paying £950 per annum hitherto. It was decided to refer the matter to a Committee, for them to obtain a report as to two sample lamps put up.

**Power-Gas Corporation, Limited.**—The ninth ordinary general meeting of this Company was held at the Westminster Palace Hotel last Friday—Mr. Alfred Mond, M.P., in the chair. In moving the adoption of the report, noticed last week (p. 194), the Chairman said the result of the year's trading was a profit of £3779, which was £1500 more than in the preceding twelve months. The general engineering business had been better, and they had booked some good contracts, including one of £60,000 for the Calcutta Corporation, which was in course of execution. At the present time there were orders in hand sufficient to keep the works well employed for at least twelve months. The outlook for makers of producer gas and for gas-engine builders was brighter now than it had been at any other period. In Tuscany, a Mond peat plant, with sulphate of ammonia recovery, was now being used to supply an entire district with electricity produced from gas-engines. People were getting more accustomed to the use of these engines as a normal type of driving; and this, of course, would very much facilitate business. On the whole, he thought the Company's position next year should be better than it was now. Mr. E. Lloyd Pease seconded the motion; and it was carried.

**Colwyn Bay Urban District Council Finances.**—In his report to the Colwyn Bay Urban District Council, the Government Auditor (Mr. William Griffith) states that last year there was a deficiency in the district fund of £1092, in the gas supply fund account of £1921, and in the electricity supply fund account of £1662. There were bank overdrafts on these accounts as follows: District fund £2758, gas fund £4647, electricity fund £2537—which is equivalent to a 2s. 9d. rate. As to the gas and electricity accounts, during the three years ended March 31, 1908, the two concerns contributed £6868 in aid of the general district rate. In accordance with the provisions of the Acts, the total deficiencies in the revenue of the Council on account of the three funds (to be made good out of the next general district rate) amounts to £4677, which would be equivalent to a rate of 1s. 3d. The Auditor makes several suggestions with a view to the better keeping of the accounts. He says: "With regard to stock in store, I would point out that there are no registers of gas cookers and meters; and a postage account is not kept in the gas office. The repayment of all deposits should, in my opinion, be made through the Accountant. . . . I would suggest that an independent person should be appointed to take stock at the close of the year." Reference is made to friction which is alleged to exist between the Gas Accounts Department and the Accountant's Department, and is said to militate against efficiency. The Council have agreed to carry out the suggestions contained in the report.

# SAWER & PURVES,



## MANCHESTER & NOTTINGHAM.

Agent for Scotland: JNO. D. GIBSON, 2, Causeyside Street, PAISLEY.



**Price of Gas at Barnet.**—At the last meeting of the East Barnet Urban District Council, a letter was read from the Manager of the Barnet District Gas and Water Company, in reply to one which had been received by the Company containing a copy of a resolution passed by the Council with reference to the price of gas. He was instructed to inform the Council that the Directors were desirous of announcing a reduction at the earliest possible moment; but until they had the result of the last half-year's working before them, they were unable to come to a decision. He pointed out that the price of coals had been raised for this year, and that the Company had had notice of a reassessment of their property for rating purposes. They considered they were now greatly over-assessed, as for every 1000 cubic feet of gas sold they paid more than 3d. in rates and taxes, which was considerably in excess of other companies. They had recently been at great expense in reconstructing their works and enlarging their mains, so as to give all consumers an ample and satisfactory supply; and they had also opened show-rooms for gas appliances, and engaged competent men to give consumers expert advice. These additional expenses were nearly completed; and the Directors hoped that the improved results would be such as to warrant their reducing the price of gas at an early date. The letter was considered by the Council as very satisfactory; one member remarking that it showed that the Company were anxious to keep abreast of the times.

Messrs. Trier Bros., engineers and manufacturers, notify a change of office address from Great George Street, S.W., to Caxton House, Westminster.

The British High-Power Gas-Engine Company, Limited, which was registered a few weeks ago for the purpose of supplying high-power gas-engines, have adopted an engine of the double-acting four-cycle type.

The Sherborne Gas and Coke Company has been registered with a capital of £11,000, in 2200 shares of £5 each, to carry on the business of gas supply. The Company was registered as an unlimited concern in 1875; and it has now been re-registered.

The second annual dinner of the staff of the Bryan Donkin Company, Limited, was held on the 14th inst., at the Hotel Portland, Chesterfield. The chair was occupied by the Managing-Director (Mr. G. Clark), who was supported by his co-Directors, Messrs. H. J. Donkin, N. W. Burbidge, and A. G. Webb; and the company, which numbered between thirty and forty, included the staffs of the offices and works and the district representatives. Mr. W. A. Hopkins proposed "The Bryan Donkin Company," and referred to the prominent part they had taken in all the notable developments in the profession of engineering during the past century, especially in connection with the gas industry, with which the business of the Company was now mainly concerned. Mr. H. J. Donkin replied. Mr. N. W. Burbidge proposed "The Managing-Director," and read a letter from the Chairman of the Company (Mr. G. H. Shipley) expressing the satisfaction of the Board at Mr. Clark's work. The toast was acknowledged by Mr. Clark, who proposed "The Staff." The Works Manager (Mr. T. H. Haigh) replied. The final toast was "The Representatives;" and the proceedings closed with a vote of thanks to the Chairman.

## APPLICATIONS FOR LETTERS PATENT.

- 640-I.—GLOVER, R. B. G., "Gas-lamps." Jan. 10.  
 642.—STOTT, J. & V. H., and SCHOFIELD, L., "Water-heaters." Jan. 10.  
 653.—BOBY, W., "Water measuring and recording appliances." Jan. 10.  
 658.—PARKINSON, B. R., and WOODALL, H., "Jointing of sections or lengths of metal tubes and pipes." Jan. 10.  
 700.—BLUMENSTEIN, F., "Gas and air heater." Jan. 11.  
 715.—DEUTSCHE GASGLÜHLICHT AKT.-GES. (AUERGES.), "Inverted incandescent gas-lamp." Jan. 11.  
 735.—DONNELLY, S. H., "Ferrules for use with gas and water service pipes." Jan. 11.  
 739.—LAMBTON, J. W., and FLETCHER, E. J., "Combined vertical and inverted gas-burner." Jan. 11.  
 753.—ALDRIDGE, J. G. W., "Charges for gas-retorts." Jan. 11.  
 774.—PAUSINGER, F. VON, "Alarm apparatus for preventing explosions and poisoning by gas." Jan. 11.  
 787.—KEMP, C. W., "Gas-fittings." Jan. 12.  
 826.—BENNINGHOFF, C., and KLÖNNE, A., "Gas-fired retort or chamber furnaces." Jan. 12.  
 830.—ZIMMERLI, E. M., "Bunsen burner for illuminating purposes." Jan. 12.  
 851.—BURCH, A. R., "Gas-lanterns." Jan. 12.  
 864.—COLBRAN, J. B., "Globe-holders." Jan. 12.  
 873.—JACKSON, S., "Tool to compress joints of pipes." Jan. 12.  
 890.—ROTHERHAM, H., and JOHNSON, W., "Gas-burners." Jan. 13.  
 899.—ELY, B., and ROLLASON, A., "Treatment of waste chemical liquors containing sulphur compounds and cyanides." Jan. 13.  
 948.—GIORGI, A., "Gas-burners." Jan. 13.  
 991.—SCHÜLZKE, E., "Lighting and extinguishing gas-lanterns from a distance." Jan. 14.  
 1029.—ANDERSON, D., "Gas-lamps." Jan. 14.  
 1045.—SCHUSTER, N., "Removing heavy hydrocarbons from the hot gases from gas-retorts and the like." Jan. 15.  
 1069.—BERRY, J., and METERS LIMITED, "Controlling combined high and low pressure gas supplies." Jan. 15.  
 1090.—EARP-THOMAS, G. H., "Gas-filtering devices." Jan. 15.  
 1095.—KREBS, L., "Indicating an escape of gas." Jan. 15.  
 1096.—GIBBONS BROS., LTD., and MARLE, M. VAN, "Charging and discharging vertical gas-retorts and carbonizing ovens." Jan. 15.  
 1115.—SCHMIDT, P., "Gas-fired furnaces." Jan. 15.

An inquiry on behalf of the Local Government Board has been held at Nuneaton by Mr. P. M. Crosthwaite, with regard to an application by the Council for sanction to borrow £5000 for the purpose of water supply and laying down a new main. The Town Clerk (Mr. F. S. Clay) informed the Inspector that the money was absolutely necessary. It was essential to put down a new main. The old main was laid in 1884; and the population had since increased three-fold. The present population in the area was 33,515. The new main would consist of 17,000 yards of cast-iron and 1000 yards of steel pipes.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 224.

Issue	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	85-87	..	5 14 11	£	Stk.	Nov. 11	p.c.	Imperial Continental	175-177	..	4 10 5
1,474,000	Stk.	Jan. 13	5	Do. 4 p.c. Deb.	98-100	..	4 0 0	4,940,000	Stk.	Aug. 12	3 1/2	Do. 3 1/2 p.c. Deb. Red.	94-96	..	3 12 11
310,000	Stk.	Oct. 28	6 1/2	Bombay, Ltd.	54-56	..	5 6 1	1,235,000	Stk.	Aug. 26	10	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
200,000	5	"	6 1/2	Do. New, £4 paid	48-48	..	5 6 8	195,242	Stk.	"	7	Liverpool United A.	227-229	..	4 7 4
40,000	5	"	15	Bourne- 10 p.c.	28 1/2-29	..	5 3 5	561,000	"	"	7	Do. B.	16-169	..	4 2 10
50,000	10	Aug. 26	7	mouth Gas B 7 p.c.	162-163	..	4 3 7	718,100	"	"	7	Do. Deb. Stk.	103-105	..	3 16 2
311,810	10	"	6	and Water 6 p.c.	154-155	..	3 16 2	306,083	"	Dec. 29	4	Malta & Mediterranean.	44-5	..	6 0 0
75,000	10	"	7	Brentford Consolidated	253-256	..	4 17 8	75,000	5	Nov. 26	6	Met. of 15 p.c. Deb.	99-102	..	4 18 0
380,000	Stk.	Aug. 12	12 1/2	Do. New	190-192	..	4 19 0	560,000	100	Oct. 1	5	Melbourne 4 1/2 p.c. Deb.	100-102	..	4 8 3
300,000	"	"	9 1/2	Do. 5 p.c. Pref.	120-122	..	4 2 0	250,000	100	"	4 1/2	Monte Video, Ltd.	124-13	..	5 7 8
50,000	"	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	541,920	20	Nov. 11	3 1/2	Newcastle & Gt. tesh'd Con.	107-108	..	4 3 4
206,250	"	"	11	Brighton & Hove Orig.	217-220	..	5 0 0	1,775,892	Stk.	July 29	4 1/2	Do. 3 1/2 p.c. Deb.	91-93	..	3 15 3
220,000	Stk.	Sep. 10	8	Do. A Ord. Stk.	154-157	..	5 1 1	518,795	Stk.	Dec. 29	3 1/2	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
246,320	"	"	10	British	424-434	..	4 11 11	55,940	10	Aug. 26	7	Oriental, Ltd.	137-139	..	5 15 1
460,000	20	Oct. 14	10	Bromley, A 5 p.c.	118-120	..	5 0 0	300,000	Stk.	Nov. 26	8	Ottoman, Ltd.	68-68	..	6 5 6
109,000	Stk.	Aug. 26	6	Do. B 3 1/2 p.c.	88-90	..	5 0 0	60,000	5	Sep. 10	8	Portsea Island A.	137-139	..	4 19 0
165,700	"	"	4 1/2	Do. C 5 p.c.	106-108	..	5 1 10	31,800	53	Aug. 26	13	Do. B.	129-131	..	4 19 3
82,278	"	"	5 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	60,000	50	"	12	Do. C	122-124	..	4 16 9
55,000	"	Dec. 29	3 1/2	Buenos Ayres (New) Ltd.	144-144 1/2	+	4 14 11	100,000	50	"	10	Do. D and E.	102-104	..	4 16 2
500,000	10	Oct. 14	7	Do. 4 p.c. Deb.	98-100	..	4 0 0	114,800	50	"	10	Primitiva Ord.	78-78	..	4 14 11
250,000	Stk.	Dec. 29	4	Cape Town & Dis., Ltd.	3-4	..	—	398,490	5	Oct. 28	7	Do. 5 p.c. Pref.	58-58	..	4 13 0
100,000	10	"	—	Do. 4 1/2 p.c. Pref.	54-54	..	—	796,980	5	July 29	5	Do. 4 p.c. Deb.	99-100	+	4 0 0
100,000	10	"	—	Do. 6 p.c. 1st Mort.	48-49	..	6 2 6	488,900	100	Dec. 1	4	River Plate Ord.	17-17 1/2	..	4 11 5
50,000	50	Nov. 2	6	Do. 4 1/2 p.c. Deb. Stk.	80-82	..	5 9 9	1,000,000	10	Oct. 14	8	Do. 4 p.c. Deb.	98-100	..	4 0 0
100,000	Stk.	Dec. 29	4 1/2	Chester 5 p.c. Ord.	108 1/2-110 1/2	..	4 10 6	312,050	Stk.	Dec. 29	4	San Paulo, Ltd.	144-15	..	5 6 8
157,150	Stk.	Aug. 12	5	Commercial 4 p.c. Stk.	109-111	..	4 13 8	250,000	10	Sep. 29	8	Do. 6 p.c. Pref.	114-124	..	4 18 0
1,093,280	Stk.	Aug. 26	5 1/2	Do. 3 1/2 p.c. do.	103-105	..	4 15 3	62,500	50	Jan. 3	6	Do. 5 p.c. Deb.	50-51	..	4 18 0
560,000	"	"	5	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	125,000	50	"	5	Sheffield A	233-235	..	4 5 1
475,000	"	Dec. 29	3	Continental Union, Ltd.	95-97	..	5 3 1	135,000	Stk.	Sep. 10	10	Do. B	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Derby Con. Stk.	137-139	..	5 0 9	209,984	"	"	10	Do. C	233-235	..	4 5 1
200,000	"	"	7	Do. Deb. Stk.	121-123	..	4 1 4	523,500	10	Oct. 14	10	South African	124-124 1/2	..	7 10 1
492,270	Stk.	"	4	East Hull 5 p.c. Ord.	93-105	..	3 16 2	70,000	10	Aug. 12	5 1/2	South Met., 4 p.c. Ord.	120-122	..	4 7 4
55,000	"	Oct. 2	5	European, Ltd.	108-100	..	5 0 0	6,429,895	Stk.	Jan. 13	3	Do. 3 p.c. Deb.	81-83	..	3 12 3
145,995	"	July 14	12	Do. £7 10s. paid.	244-25	..	4 16 0	1,895,445	Stk.	Aug. 26	8	South Shields Con. Stk.	160-162	..	4 18 9
480,090	10	"	12	Gas 4 p.c. Ord.	104-105	+	4 10 9	209,823	Stk.	Aug. 12	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
351,060	10	"	3 1/2	light 3 1/2 p.c. max.	88-89	+	3 18 8	605,000	Stk.	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
15,141,545	Stk.	Aug. 12	4 1/2	and 4 p.c. Con. Pref.	103-105	..	3 16 2	60,000	"	Jan. 13	5	Southampton Ord.	120-122	..	4 2 0
2,600,000	"	"	3 1/2	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	117,058	Stk.	Nov. 11	5	Tottenham A 5 p.c.	110-112	..	4 9 3
3,799,735	"	Dec. 29	4	Hastings & St. L. 3 1/2 p.c.	94-96	..	5 4 2	502,310	Stk.	Aug. 12	6 1/2	and B 3 1/2 p.c.	111-113	..	4 15 3
4,193,975	"	Sep. 10	6 1/2	Do. 5 p.c.	118-120	..	5 8 4	120,000	"	Dec. 29	4	Edmonton 4 p.c. Deb.	98-100	..	4 0 0
258,740	Stk.	Sep. 10	6 1/2	Hongkong & China, Ltd.	174-18	..	6 2 3	149,470	"	Dec. 29	10	Tuscan, Ltd.	9-9 1/2	..	8 8 6
62,500	"	Sep. 29	11	Ilford A and C	144-146	..	4 9 0	182,380	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
70,000	10	"	6 1/2	Do. B	108-110	..	4 10 11	149,900	10	Aug. 14	5	Tynemouth, 5 p.c. max.	111-111 1/2	+	4 8 6
131,000	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	236,476	Stk.	Aug. 26	6 1/2	Wands' B 3 1/2 p.c.	119-141	..	4 14 0
65,780	"	"	"					255,036	"	"	3	worth 3 p.c. Deb. Stk.	73-75	+	4 0 0
65,500	"	"	"					79,416	"	Dec. 29	3				

Prices marked + are "Ex div."



The Centenary Gas Company, of London and Glasgow, have received instructions from the War Office to erect one of their patent turbine petrol gas generators within a portion of the barracks at Salisbury Plain; and they are also to supply and erect all the gas-pipes, burners, mantles, &c., that may be required in connection with the installation.

At the meeting of the West Ham Education Committee on Monday last week, it was reported that a letter had been received from the managers of St. Luke's School to the effect that the incandescent gas lighting provided in the boys' department had proved eminently satisfactory, and asking that the same system of lighting should be installed in the girls' and infants' departments. This request is to be acceded to.

### WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

#### Situations Vacant.

WORKS SUPERINTENDENT. Walsall Gas Department. Applications by Feb. 12.  
CANVASSING INSPECTOR. No. 5174.  
MANAGER (Gas Meter, &c., Trade). Hapgood's, 166 and 167, Strand, W.C.

#### Situations Wanted.

ENGINEER'S ASSISTANT. No. 5173.  
SULPHATE PLUMBING. Leadburner, 117, Galloway Road, Shepherd's Bush.

#### Plant, &c. (Second Hand), for Sale.

COMPLETE GAS WORKS PLANT (EXCEPT BUILDINGS). Particulars from the Eastbourne Gas Company.  
EXHAUSTER AND ENGINE, GAS-METERS, SCRAP IRON, AND BRASS, &c. Ashton-in-Makerfield Gas Department. Tenders by Jan. 31.  
PURIFIERS, SCRUBBERS, AND CONDENSERS. Edinburgh and Leith Gas Commissioners.

#### Patent Rights.

GAS STOVE UTENSILS. No. 5175.

#### Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. Feb. 15.  
NORTH MIDDLESEX GAS COMPANY. Feb. 15.  
SOUTHGATE GAS COMPANY. Feb. 15.

#### Meetings.

COMMERCIAL GAS COMPANY. Cannon Street Hotel, Feb. 24, Twelve o'clock.  
TOTTENHAM AND EDMONTON GAS COMPANY. Offices, Feb. 5, Three o'clock.

#### TENDERS FOR

##### Fire-Clay Goods.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

##### Carbon.

ASHTON-IN-MAKERFIELD GAS DEPARTMENT. Tenders by Jan. 31.

##### Cocks, Valves, Lamp Fittings, &c.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

##### General Stores—

(Oils, Paints, Lime, Brushes, Ironmongery, Steel Goods, Gaskin, &c., &c.)—  
HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

#### Iron Work for Retort Bench.

SHEFFIELD UNITED GAS COMPANY. Tenders by Feb. 8.

#### Meters.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

#### Oxide of Iron (New and Spent).

ASHTON-IN-MAKERFIELD GAS DEPARTMENT. Tenders by Jan. 31.  
HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

#### Pipes, &c.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.

#### Sulphuric Acid.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 8.  
HERNE BAY GAS COMPANY. Tenders by Feb. 1.

#### Tar.

HERNE BAY GAS COMPANY. Tenders by Feb. 1.

### NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1910, are reminded that this can only be done during the present month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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#### O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

#### SPENT OXIDE PURCHASED IN ANY DISTRICT.

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PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

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#### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

#### LUX'S GAS PURIFYING MASS.

See Advertisement on p. 259.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**SULPHURIC ACID for Sale, specially**  
suitable for making Sulphate of Ammonia.  
BROTHERTON AND CO., LTD., Chemical Manufacturers,  
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

#### KRAMERS AND AARTS WATER-GAS PLANT.

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**"GAZINE" (Registered in England and**  
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It is also used for the enrichment of Gas.  
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REPAIRS RECEIVE PROMPT ATTENTION.  
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ANY QUANTITY. ANY PORT. ANY STATION.

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#### BENZOL

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#### CARBURINE FOR GAS ENRICHING.

ALSO

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LONDON, E.C.  
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#### W. EDGAR, Blenheim Works,

Hammersmith.  
GAS APPARATUS MANUFACTURER  
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#### D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND  
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**S**PECIALLY prepared for the Manu-  
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SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD,  
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Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

**J. E. C. LORD, Ship Canal Tar Works,**  
Waste, Manchester, Pitch, Creosote, Benzols,  
Tolnol, Naphtha, Pyridine, all kinds of Cresylic Acid,  
Carbolic Acid, Sulphate of Ammonia, &c.

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND  
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PARATUS, including Retorts and Fittings, Condensers,  
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,  
Tanks, Valves, Connections, &c. Also a few COM-  
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FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,  
Thornhill, DEWSBURY.

#### AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers,  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
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**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
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WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
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40 YEARS' REPUTATION.  
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WORK in Connection with Sulphate Plants.  
We guarantee promptness, with efficiency for Re-  
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Consumers in any form are invited to correspond  
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**THE very best Patent Grids for Holding  
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See Illustrated Advertisement, Dec. 7, p. 705.

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**JOHN E. WILLIAMS AND CO.,**  
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**MEADE-KING, ROBINSON, & CO.**  
Represent the Strongest Independent Re-  
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Albert Chemical Works, BRADFORD,  
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
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Established 1887.  
Advertiser, who is Shipping Agent to several Gas  
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would be glad to undertake SHIPMENT OF GOODS  
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FOR REALLY RELIABLE  
ELEVATORS AND CONVEYORS  
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**SIMULTANEOUS Discharging-Charger.**  
The one Machine which Discharges and Charges  
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ALDRIDGE AND RANKEN,  
39, VICTORIA STREET, WESTMINSTER, S.W.  
Telegrams: "MOTORPATRY, LONDON." Telephone:  
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**AUTOMATIC Works for Automatic Gas**  
Machines to German Gas Meter Makers?  
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Journeyman Workman of over 30 Years' Expe-  
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**WANTED, a really capable Man to**  
MANAGE a Shop Manufacturing and Designing  
Gas-Meters, Station Meters, Station Governors, and  
Gas Apparatus of all kinds. Should also have a Know-  
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Essentials are a Knowledge of Gas Apparatus and  
General Engineering. Starting Salary up to £500, ac-  
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Apply HAPGOODS, LIMITED, 166 and 167, Strand,  
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**WANTED, a Works Superintendent for**  
Corporation Gas-Works.  
The Gas Committee of the Corporation require for  
the Pleck Gas-Works the Services of a WORKS  
SUPERINTENDENT.

Salary, £104 per Annum, rising by £10 per Annum to  
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A Form of Application and Statement of Duties may  
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Applicants must be Experienced in the Duties and  
hold a similar Appointment in Gas-Works.

Concussing will disqualify.  
Applications accompanied by copies of not more than  
Three recent Testimonials and marked outside "Gas-  
Works Superintendent," are to be sent to me not later  
than Saturday, the 12th of February next.

JOHN R. COOPER,  
Town Clerk.

Walsall, Jan. 21, 1910.

**WANTED, an Experienced and Well-**  
Educated CANVASSING INSPECTOR, having  
a Complete Knowledge of all Gas Appliances and able  
to Interview Customers, Prepare Estimates, and Take  
Charge of Gas-Fitters.  
Apply by letter, stating Age, Experience, and Salary  
required, with copies of not more than Three recent  
Testimonials, to No. 5174, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete  
to Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can  
be seen temporarily erected. Re-erected Cheap for  
immediate Sale.  
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

### SECOND-HAND GAS PLANT FOR SALE.

HAILSHAM, SUSSEX.

**THE Eastbourne Gas Company, having**  
acquired the Hailsham Gas Undertaking, invite  
TENDERS for TAKING DOWN and PURCHASING  
the Whole of the PLANT at the Hailsham Works  
(excepting buildings). Two small HOLDERS, Two  
BENCHES of RETORTS, Nearly New Braddock's  
6-inch GOVERNOR, STATION-METER ENGINE and  
EXHAUSTER (Waller), STEAM BOILER, PHOTO-  
METER, WORKS MAINS and SUNDRY SCRAP.  
Further Particulars of Mr. JOHN HAMMOND, Gas-  
Works, EASTBOURNE.

**EDINBURGH AND LEITH CORPORATIONS'**  
GAS COMMISSIONERS.

### FIRST-CLASS SECOND-HAND PLANT.

**THE Commissioners have for Sale the**  
following PLANT, together with all Accessories,  
&c., for which they are prepared to receive OFFERS.  
Two Sets of WATER-LUTE PURIFIERS, 24 feet  
by 19 feet.  
One Set of WATER-LUTE PURIFIERS, 27 ft.  
6 in. by 24 ft.  
Two TOWER SCRUBBERS, each 60 feet High by  
18 feet Diameter.  
One Battery of WROUGHT-IRON ANNULAR  
CONDENSERS, 31 ft. 6 in. high. Inner Tube,  
22 inches Diameter.  
Detailed Specifications and Drawings can be supplied  
to Persons contemplating the Purchase of this Plant,  
and references given to other Works where similar Plant  
has been transferred.  
For further Particulars and full Information, Apply  
to the undersigned.

W. R. HERRING,  
General Manager.

Calton Hill, Edinburgh,  
Jan. 21, 1910.

### URBAN DISTRICT COUNCIL OF ASHTON-IN-MAKERFIELD.

#### TENDERS.

**THE** above Council invite Tenders for  
the Purchase of the following—viz.:  
About 50 to 60 Tons of SPENT OXIDE OF IRON,  
containing from 45 to 50 per cent. of Sulphur.  
About 5 to 6 Tons of RETORT CARBON.  
About 4 to 5 Tons of Heavy and Light SCRAP  
IRON, and 2 cwt. Light SCRAP BRASS.  
One Round STATION METER, 8-inch Valves,  
Connections all complete, by Gas Meter Com-  
pany.  
One Dempster Reciprocating GAS-EXHAUSTER  
and STEAM ENGINE, with 8-inch Valves and  
Connections Complete.  
130 Old disused Dry and Wet GAS METERS (Sizes  
2, 3, 5, and 10 lights).  
All Goods may be inspected at the Council Gas-  
Works, Princess Road, and further Information may  
be obtained, on Application, from the Gas Manager.  
Sealed Tenders, endorsed with the name of the Goods  
tendered for, to be delivered at the Clerk's Office,  
Council Offices, Ashton-in-Makerfield, not later than  
the 31st of January, 1910.

By order,

ALBERT SYKES,  
Clerk to the Council.

Council Offices, Ashton-in-Makerfield,  
January, 1910.

### COUNTY BOROUGH OF HALIFAX.

**THE Gas-Works Committee of the**  
Halifax Corporation invite TENDERS for the  
Supply of (1) CAST-IRON PIPES. (2) OILS, PAINTS,  
&c. (3) CLEANING WASTE. (4) BRUSHES. (5)  
IRREGULAR PIPES and CASTINGS. (6) BRASS  
LAMP FITTINGS. (7) BRASS MAIN COCKS and  
UNIONS. (8) OXIDE OF IRON. (9) LIME. (10)  
SULPHURIC ACID. (11) IRONMONGERY. (12)  
STEEL GOODS. (13) FIRE-CLAY GOODS. (14) IRON  
VALVES and CONNECTIONS. (15) WET and  
DRY METERS. (16) TARRIED GASKIN. And for  
the PURCHASE of SPENT OXIDE OF IRON, during  
the Twelve Months ending the 31st of March, 1911.

Forms of Tender and further Information may be  
obtained on Application to Mr. J. Wilkinson, F.O.S.,  
Engineer, Gas-Works, Halifax.

Tenders, properly endorsed, must be sent to the  
undersigned on or before Tuesday, the 8th of February,  
1910.

The persons whose Tenders are accepted for the  
Supply of the above-mentioned Articles will be required  
to observe the Fair-Contracts Clauses adopted by the  
Corporation.

HERBERT ASHLING,  
Town Clerk.



**HERNE BAY GAS AND COKE COMPANY,  
LIMITED.****SULPHURIC ACID.**

**THE Directors are prepared to receive TENDERS**, on or before Tuesday, Feb. 1, 1910, for the Supply of about 40 Tons of SULPHURIC ACID, to be delivered during the Year 1910.

Particulars of Contract and Form of Tender may be obtained from the undersigned.

The Directors do not bind themselves to accept the lowest or any Tender.

C. V. BENNETT,  
Manager.

Beach Street, Herne Bay.

**HERNE BAY GAS AND COKE COMPANY,  
LIMITED.****TAR.**

**THE Directors invite Tenders for the Surplus TAR** produced at their Works during the Twelve Months ending the 31st of January, 1911.

Particulars of Contract and Form of Tender may be obtained from the undersigned.

Tenders to be sent in on or before Tuesday, Feb. 1, 1910.

The Directors do not bind themselves to accept the highest or any Tender.

C. V. BENNETT,  
Manager.

Beach Street, Herne Bay.

**TO ENGINEERS AND IRONFOUNDERS.**

**THE Directors of the Sheffield United Gaslight Company invite TENDERS** for the Supply of STEEL and IRON WORK for Twelve Settings of TEN RETORTS at their Neepsend Works.

**TENDER No. 1.**

For the Supply and Delivery only of CAST-IRON BUCKSTAY SHOES, ASH PANS, and FURNACE FITTINGS.

**TENDER No. 2.**

For the Supply and Erection of Steel and Iron Work, consisting of ROLLED STEEL JOISTS, CAST IRON FLOOR PLATES, &c., forming Flooring and Bracing.

**TENDER No. 3.**

For the Supply and Erection of Steel and Iron Work in HYDRAULIC MAINS, ASCENSION PIPES, GAS and TAR MAINS, &c.

Drawings may be seen and Specification, with Form of Tender and Quantities obtained (on and after Jan. 24) upon Application to the Engineer, Mr. J. W. Morrison, at the Company's Offices, Commercial Street.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed, must be delivered by post to Mr. Hanbury Thomas, Managing-Director, not later than the First Post on Tuesday, the 8th day of February.

WM. HAMBY,  
Secretary.

Commercial Street,  
Sheffield, Jan. 15, 1910.

**SALES BY AUCTION OF GAS AND WATER  
STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

**NORTH MIDDLESEX GAS COMPANY.**

NEW ISSUE OF £7500 FIVE PER CENT.  
PREFERENCE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

**SOUTHGATE AND DISTRICT GAS COMPANY.**

NEW ISSUE OF £5000 FIVE PER CENT.  
PREFERENCE STOCK,

AND  
£2500 SEVEN PER CENT. MAXIMUM DIVIDEND  
ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

**ALDRSHOT GAS, WATER, AND DISTRICT  
LIGHTING COMPANY.**

NEW ISSUE OF £4000 FIVE PER CENT. "C"  
CONSOLIDATED STOCK.

AND  
£4000 FOUR PER CENT. CONSOLIDATED  
PREFERENCE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

**COMMERCIAL GAS COMPANY.**

**NOTICE is Hereby Given**, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 24th of February, 1910, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December, 1909; to declare a Dividend; to elect Directors and an Auditor in the place of those retiring.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 28th inst. to the 24th of February next, both days inclusive, and the Dividends will be paid on the 1st of March next to the holders of Stock registered at the date of the closing.

By order of the Board,  
H. D. ELLIS,  
Secretary.

Offices: Stepney,  
Jan. 20, 1910.

**TOTTENHAM AND EDMONTON GASLIGHT  
AND COKE COMPANY.**

**NOTICE is Hereby Given**, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 639, High Road, Tottenham, on Saturday, the 5th day of February, 1910, at Three o'clock in the Afternoon precisely, to receive the Directors' Report and Statement of Accounts for the Half Year ended the 31st December, 1909; to declare Dividends; and to Transact the General Business of the Company.

The TRANSFER BOOKS for the CONSOLIDATED "A" and "B" STOCKS WILL BE CLOSED from Saturday, Jan. 29, to Saturday, Feb. 5, both days inclusive.

By order of the Board,  
E. TOPLEY,  
Secretary.

Chief Offices of the Company,  
639, High Road, Tottenham.  
Jan. 20, 1910.

Just Published. Demy 8vo. 168 pages. 109 Illustrations.  
8s. 6d. net.

**MODERN COKING PRACTICE,**

Including the Analysis of Materials and Products.

A Handbook for those engaged in Coke Manufacture and the Recovery of Bye-Products.

By T. H. BYROM, F.I.C., F.C.S., Mem. Soc. Chem. Indus., Chief Chemist to the Wigan Coal and Iron Company, and J. E. CHRISTOPHER, Memb. Soc. Chem. Indus., Lecturer on Coke Manufacture at the Wigan Technical College.

LONDON: CROSBY LOCKWOOD & SON,  
7, Stationers' Hall Court, E.C., & 121A, Victoria St., S.W.

**CASES FOR BINDING  
QUARTERLY  
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**NEWBATTLE CANNEL.**

Highest Results in Gas, & Excellent Coke.

**QUOTATIONS ON APPLICATION TO****THE LOTHIAN COAL COMPANY,  
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NEWBATTLE COLLIERIES,  
NEWTONGRANGE, MIDLOTHIAN.

**LUX'S  
Gas Purifying Material**

is now used in many Gas-  
Works throughout Scotland  
with gratifying success.

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Descriptive Pamphlet on Application.

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**PROCEEDINGS**

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**GAS MANAGERS****FOR 1909.**

Most of the previous Volumes are still on Sale.

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WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

**THOMAS DUXBURY & CO.,**

16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

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**NEW EARTH BORERS.**

15 Patents. Highest Awards.  
Work easily and quickly. Reliable.

For Earth-Working, Boring, Soil-Testing, Planting, Sinking Fences, Posts, and various other uses.

Borers from 60 to 400 mm. (2½ in. to 16 in.) diameter.

Great Saving of Labour. Low Prices.

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**E. JASMIN,**

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**MIRFIELD GAS COAL.  
UNEQUALLED.**

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

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RAVENSTHORPE, NEAR DEWSBURY.**

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**\* BRASS AND STEEL  
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Also IRON and STEEL WIRE of all descriptions.

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Wenlock Iron Wharf, 21 & 22, Wharf Road,  
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Manufacture and keep in Stock at their Works  
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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.



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**HEATHCOTE GAS COAL**  
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**GRASSMOOR COLLIERIES,  
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Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality  
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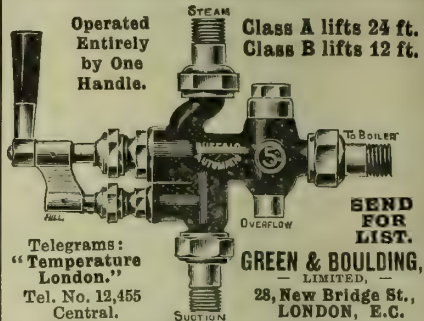
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RETORTS CAREFULLY PACKED  
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**Special Pressure and  
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For EXHAUSTER HOUSES.  
For OFFICES AND DISTRICTS.

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COAL AND COKE STORAGE PLANTS.

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STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

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## Important Improvements.



### BURNERS.

1. 20=Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

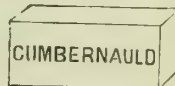
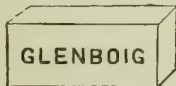
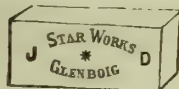
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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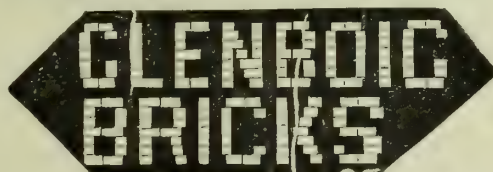


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The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,  
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

#### CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free .. .. .	5.03 ..	3.49 ..
Silica, combined .. .. .	43.20 ..	49.77 ..
Alumina .. .. .	36.55 ..	42.10 ..
Ferric oxide .. .. .	1.80 ..	2.08 ..
Titanic oxide .. .. .	1.30 ..	1.50 ..
Lime .. .. .	trace ..	trace ..
Magnesia .. .. .	trace ..	trace ..
Alkaline oxides .. .. .	trace ..	trace ..
Sulphates as trioxides .. .. .	0.92 ..	1.06 ..
Loss on Ignition .. .. .	13.20 ..	— ..
	100.00	100.00

#### PHYSICAL RESULTS.

Density .. .. .	2.65
Volume weight .. .. .	1.90
Porosity .. .. .	15.4 %
Linear shrinkage at 100° C. .. .. .	3.70 %
"    "    Total .. .. .	4.76 %
Volume shrinkage at 100° C. .. .. .	8.46 %
"    "    Total .. .. .	10.7 %
Plasticity .. .. .	12.6 %
Fire Stability .. .. .	23.3 %
	20.0 %
	1850° C. equiv. to 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

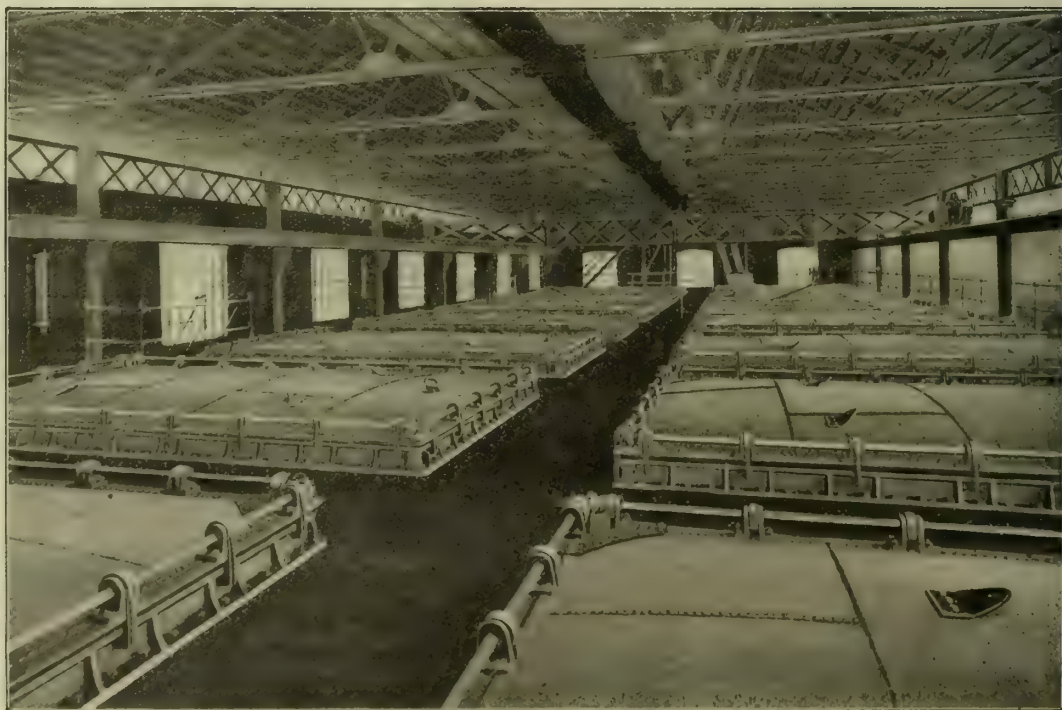
JOHN T. NORMAN.



OVER 500 MILBOURNE PATENT VALVES IN USE.



Milbourne Patent  
**PURIFIERS**  
 and VALVES.



OVER 10,000 MILBOURNE PATENT FASTENERS IN USE.

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Inclined and  
Horizontal Retort  
Benches.

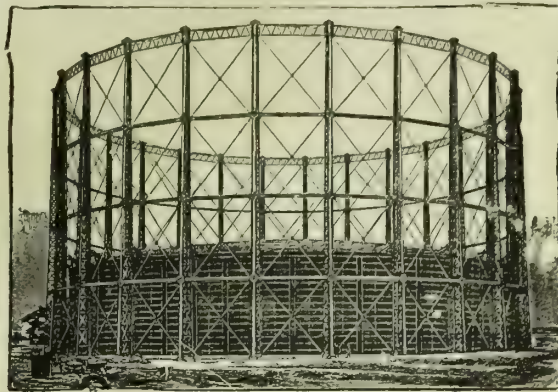
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Syndicate, Ltd., London,

FOR ALL THE  
BRICKWORK

IN THE  
DESSAU  
VERTICAL RETORT  
INSTALLATIONS.

COAL CONVEYING  
PLANTS  
COMPLETE WITH  
ELEVATORS,  
CONVEYORS,  
BREAKERS, &c.

**THOMAS PIGGOTT & CO., LTD.,**  
BIRMINGHAM.



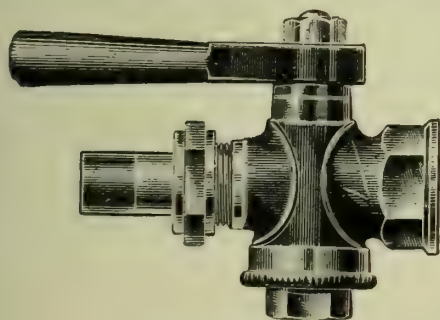
Triple Lift Gasholder, 212 ft. 6 in. diameter by 45 feet Lifts,  
erected at Garston, Liverpool.

Manufacturers  
and  
Erectors of {  
GASHOLDERS.  
GAS PLANTS.  
STEEL PIPES.  
STEEL TANKS.  
CONSTRUCTIONAL STEEL  
WORK.

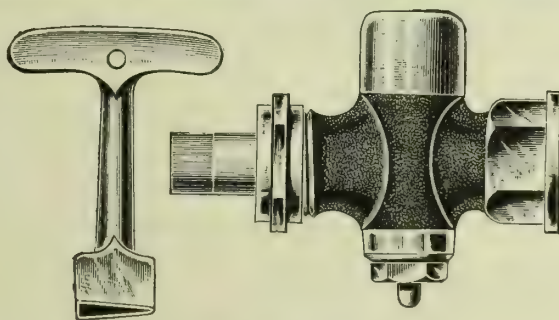
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WATER-GAS PLANTS.  
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D1 PATTERN.



C1 PATTERN.  
With Protecting Cap and Loose Key.

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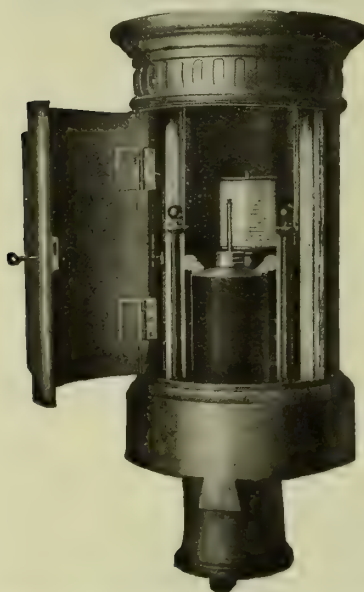
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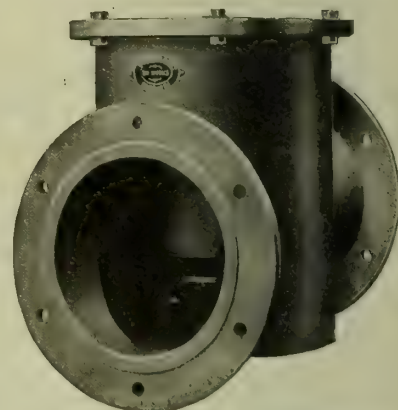
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**DISTRICT GOVERNOR**  
**FOR**  
**Ordinary or High Pressure.**

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 From a Photo. of 24 in. Size.  
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Welsbach

LIGHT

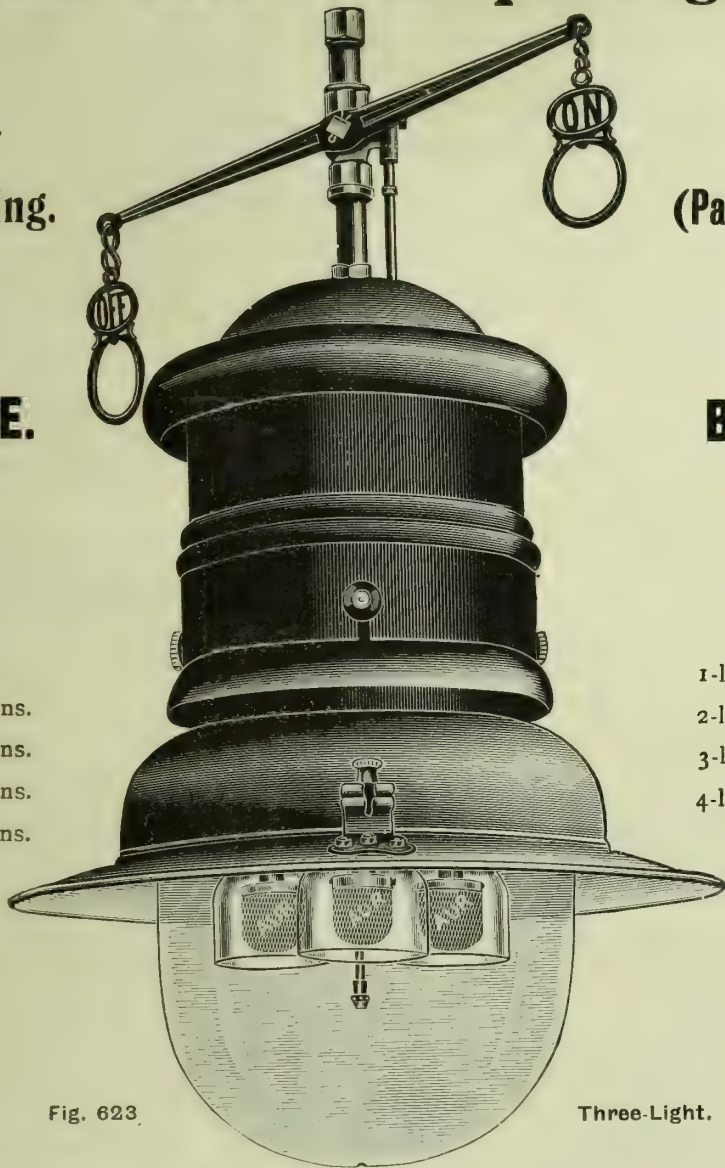
Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	1 ft. 8 ins.
2-light	2 ft. 4 ins.
3-light	2 ft. 4 ins.
4-light	2 ft. 7 ins.

Width over all.

1-light	1 ft. 1 in.
2-light	1 ft. 5 ins.
3-light	1 ft. 5 ins.
4-light	1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Telephone 2410 NORTH.



## MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE MCGREGOR GRAY, Assoc.M Inst.C.E., before the Association of Water Engineers.

**A.** The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as the rigidity of the Joints involved considerable difficulty in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

**B.** In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for pouring the Lead in at a suitable temperature to prevent it melting the Solid Lead Fillet, and running through into the Pipe.

**C.** In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

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## EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

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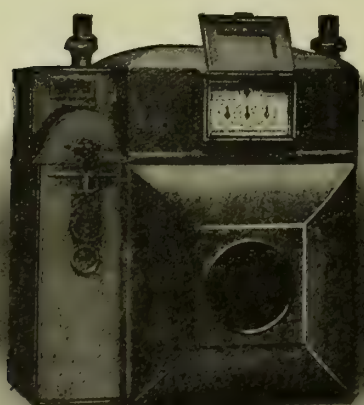
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— 2000 Workmen. —  
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FURNACES**  
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Production and Results  
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Tinplate Cases.**

Thousands of our  
Meters in use by the  
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giving

**COMPLETE  
SATISFACTION.**

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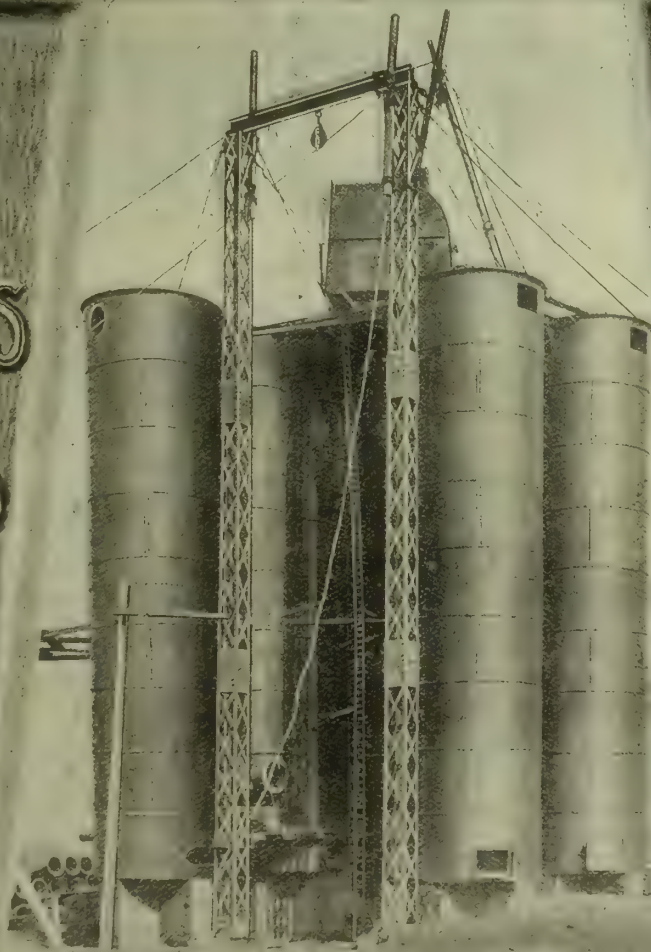
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HALIFAX**



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ENGINEERS  
AND  
CONTRACT  
ERS.**


W.P.



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PATENTS.**

IN



**VERTICAL  
RETORTS**

*Description and  
Particulars of Tests  
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on request.*

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REDUCED TO

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Descriptive Pamphlet on Application.

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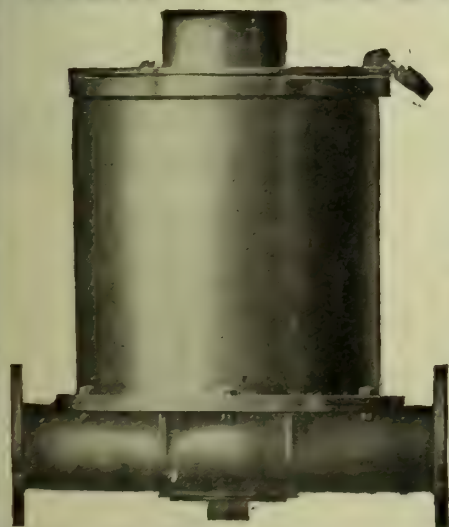
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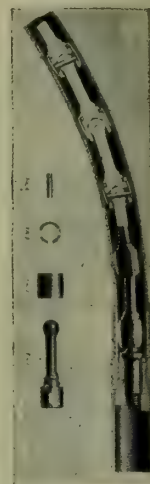


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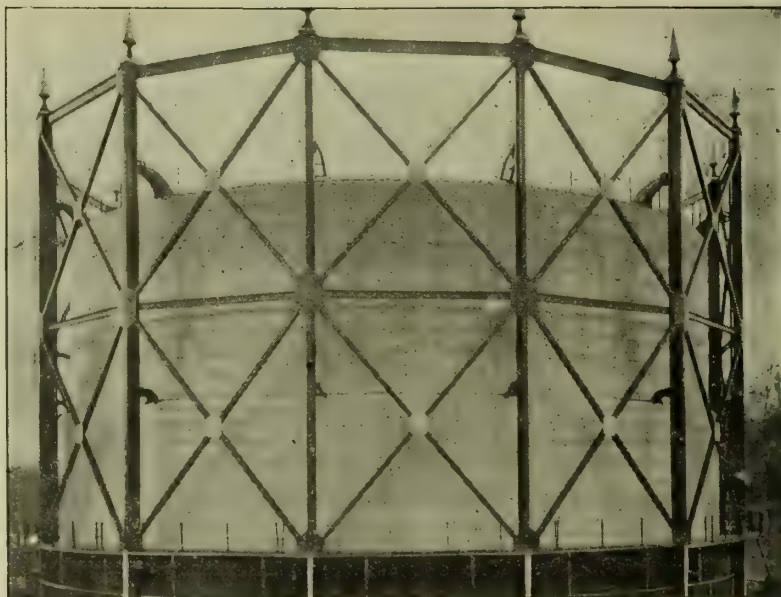
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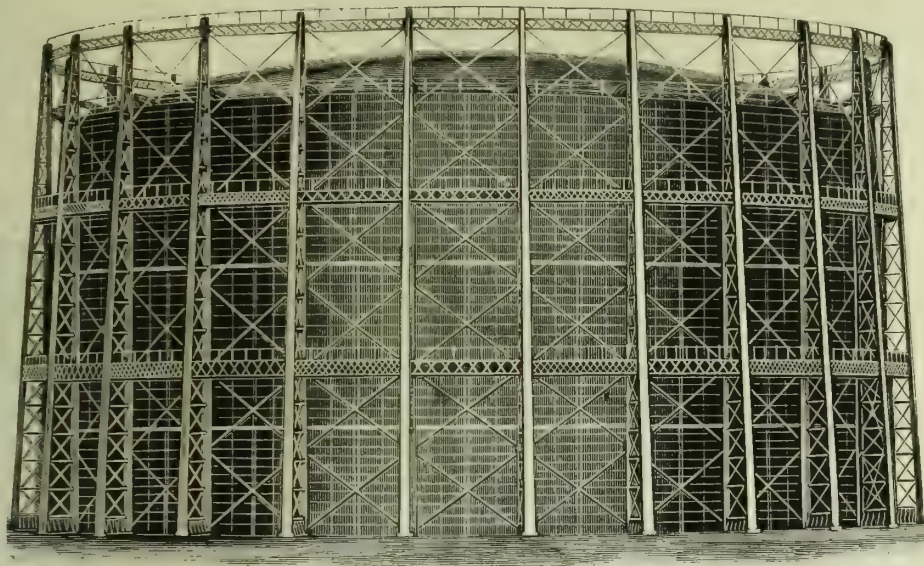
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ENSURES ABSOLUTE SECURITY AGAINST THEFT.**

Particulars on Application.



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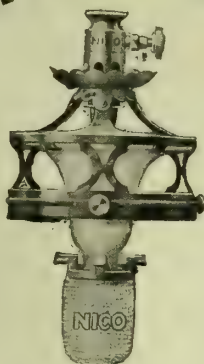


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Fig. 703. "SINGLE RAM" STEAM-PUMP.

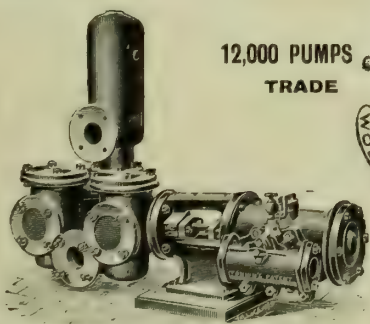


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

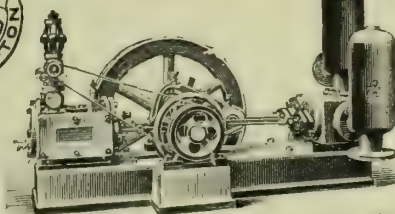


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

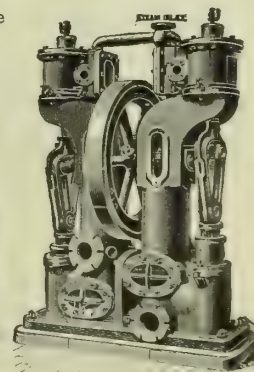


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.



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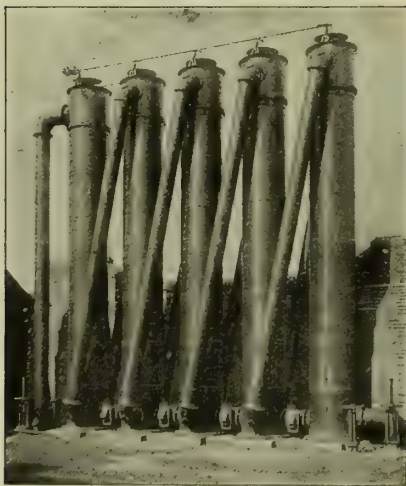
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*Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.*

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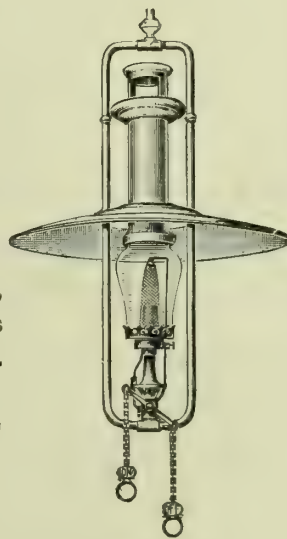
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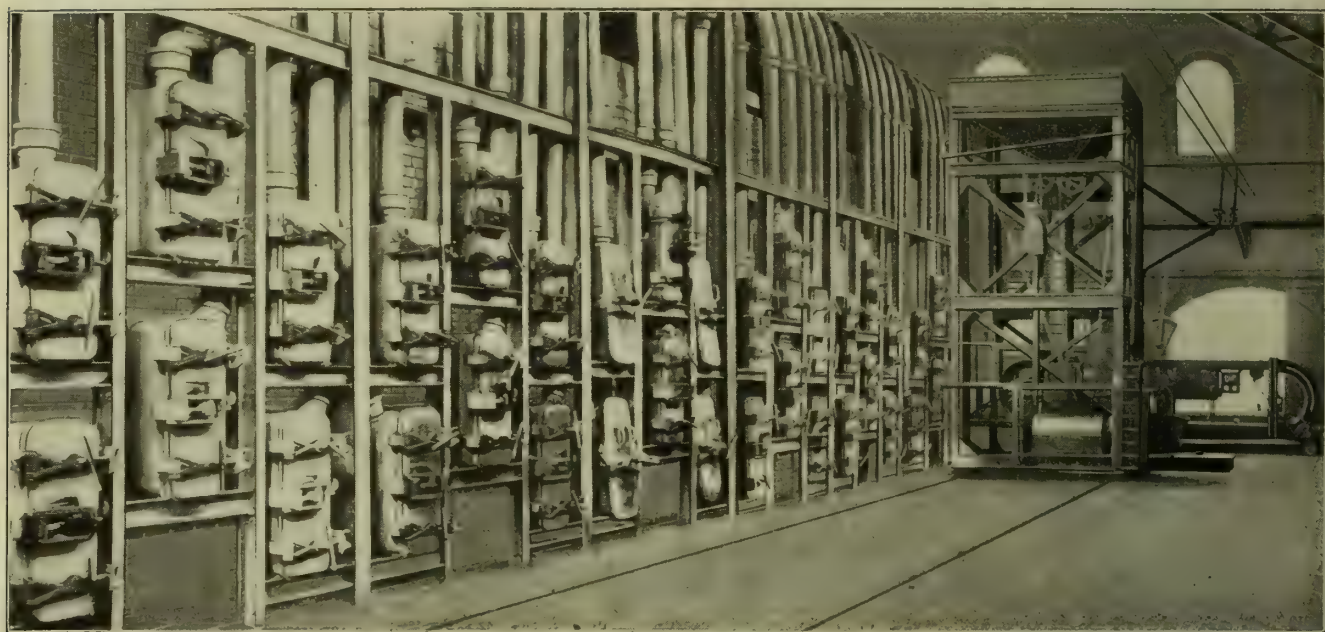
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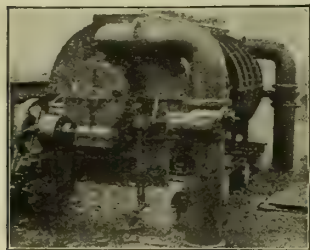
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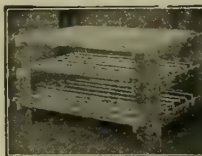


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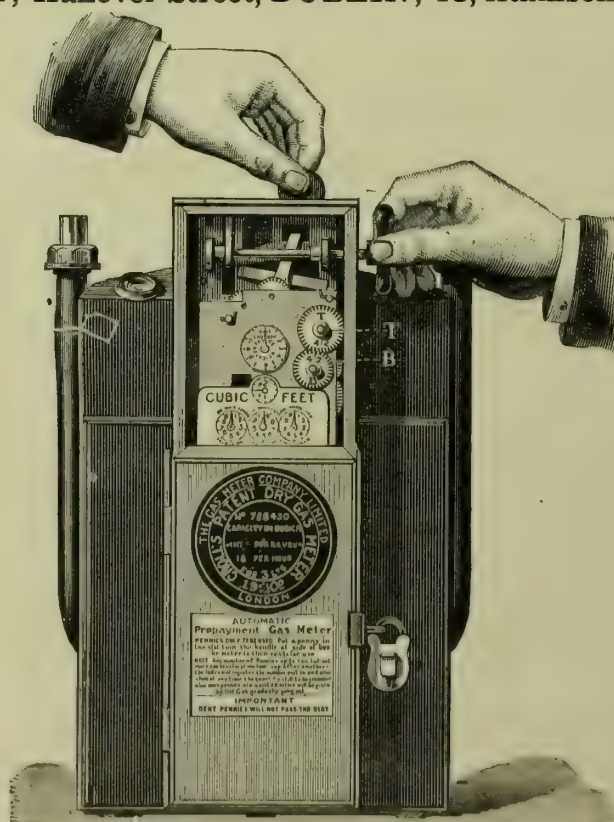
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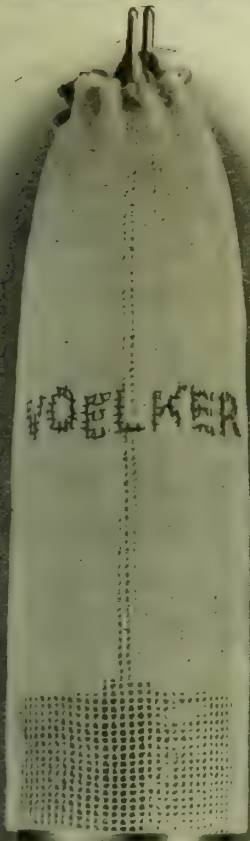
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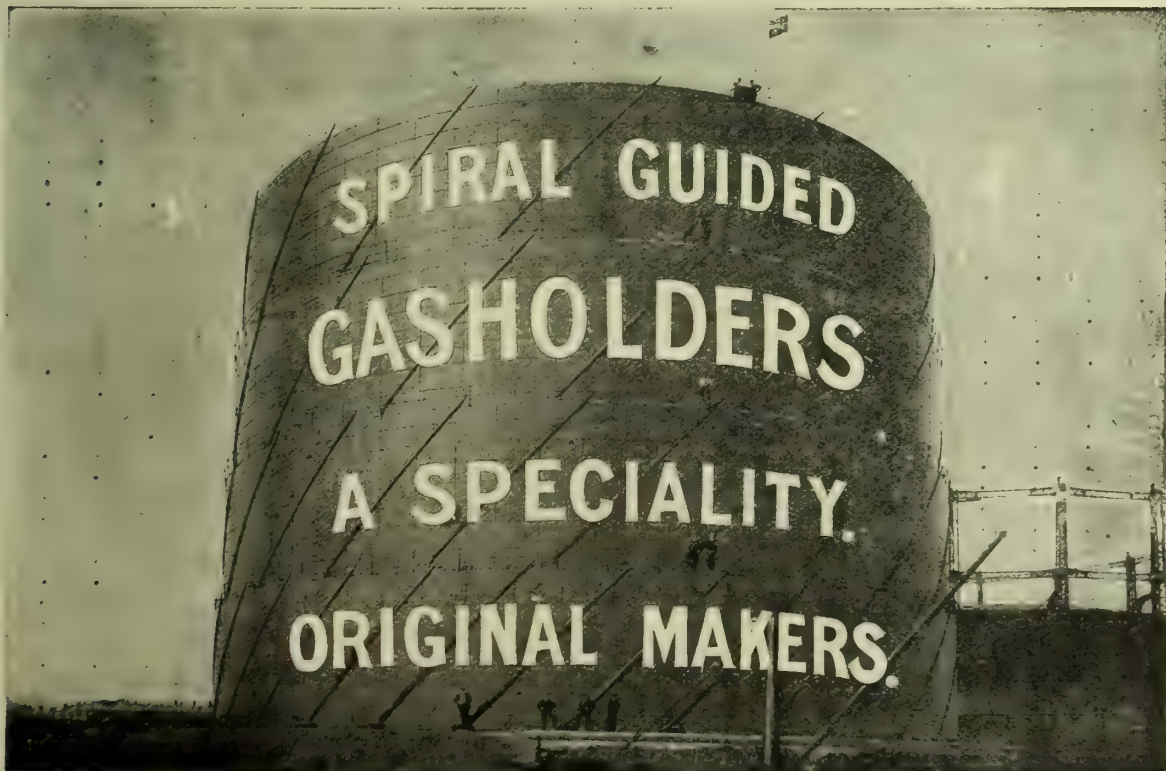
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Berlin-Rixdorf	650,000	Göteborg, Sweden	300,000	Rotterdam, Holland	850,000
Berlin-Rixdorf (2nd)	700,000	Göteborg (2nd)	600,000	Rotterdam (2nd)	1,500,000
Berlin-Tegel	3,500,000	Graudenz, Prussia	200,000	Rotterdam (3rd)	750,000
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Bridgwater	200,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridlington	150,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington (2nd)	200,000	Kiel, Sleswig	1,000,000	Southgate	400,000
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Bruges, Belgium	200,000	Lea Bridge	350,000	Staines	600,000
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Brussels-Anderlecht (2nd)	350,000	Lea Bridge (3rd)	400,000	Stockholm	1,500,000
Brussels-Forest	1,000,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
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Brussels-St. Josse (2nd)	600,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
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Brussels-Ville (3rd)	1,500,000	Liège, Belgium	1,000,000	Swansea (3rd)	450,000
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Copenhagen (2nd)	2,500,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
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Coventry	600,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
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Croydon (4th)	550,000	Nelson	400,000	Vienna (2nd)	2,500,000
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Dublin (2nd)	2,000,000	North Middlesex (3rd)	75,000	West Bromwich	550,000
Dublin (3rd)	650,000	Norwich	1,000,000	West Ham	1,500,000
Dundee	1,500,000	Norwich (2nd)	300,000	West Ham (2nd)	800,000
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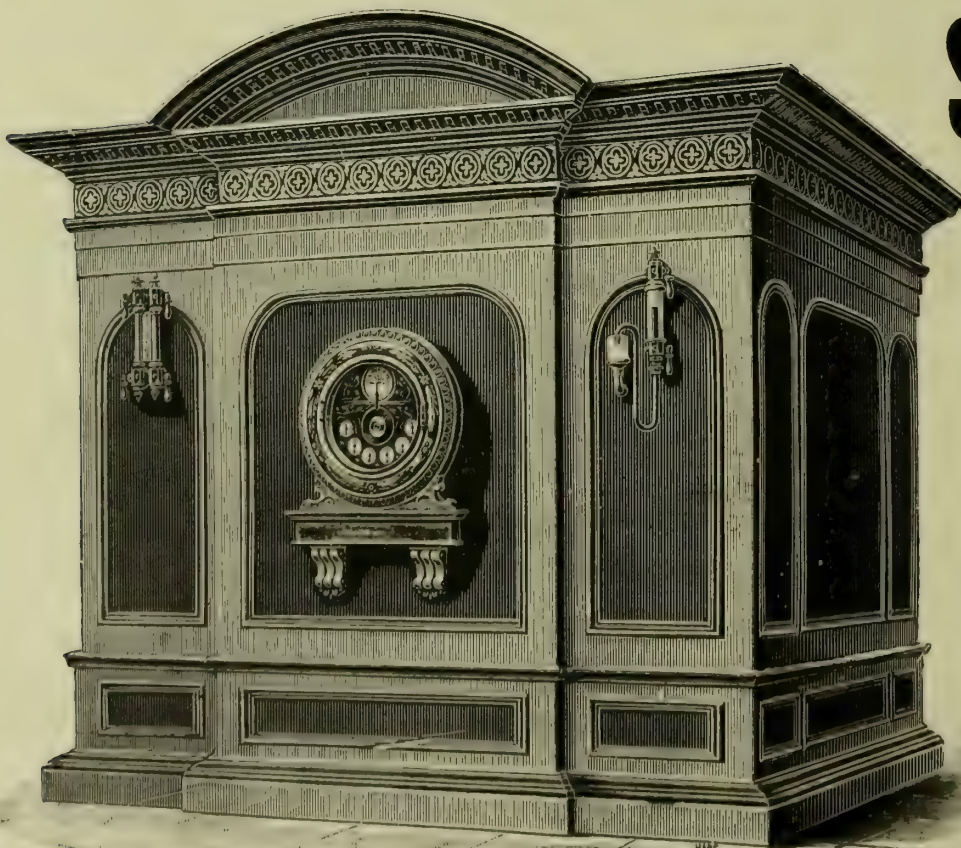
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2438.—TUESDAY, FEBRUARY 1, 1910.

## EDITORIAL NOTES—GAS, &c.

### The Final Accounts under the Old Conditions.

THE half-yearly accounts of the Gaslight and Coke Company which we publish to-day will be the last that will be issued under the old order of things. In several respects, conditions will change. The West Ham district will in future come into account, a gas supply under a prescribed standard of 14 candles will be the rule, and the price of gas for ordinary consumption north of the Thames will be at the lowest figure—2s. 8d.—ever reached by the Company. Comparison of results under the new circumstances and the old will therefore be somewhat difficult—indeed impossible; but all associated with the Company have the satisfaction of knowing that they are leaving the old conditions behind with accounts that have never been excelled in any material aspect in the history of the concern. The Governor of the Company (Mr. Corbet Woodall) will no doubt show this with greater transparency from his inner knowledge of the affairs than we are able to do from the bare figures before us. But they alone, in their portrayal of the final results of the half-year's trading, are somewhat extraordinary in relation both to finance and manufacture. It is no good now bemoaning the past; but one cannot help feeling, with before him the consistent tale of improvement in the issues of working and trading as (though the gas consumption has not up to the past half year been striking in its movements) latterly unfolded half year by half year, that there was deplorable waste in earlier times. The concern has, under proper direction, shown an egregious recuperative power, the latent existence of which in such degree as disclosed was not in quite recent years suspected, we imagine, even by those most intimately acquainted with its affairs.

When it is remembered that, in the second half of 1908, the consumption of gas was practically stationary in comparison with the corresponding period of 1907, and that in the first half of last year the increase was only  $\frac{3}{4}$  per cent. compared with the quantity sold during the relative months of 1908, the increase last half year in the sales of  $4\frac{3}{4}$  per cent., compared with the quantity sold in the second half of 1908, will be as surprising as it is encouraging. The *raison d'être* for the West Ham amalgamation was that the premier Company required a new outlet for business in an industrial district; and they have it from Jan. 1 this year. But the increase of consumption in the old area in the past half year indicates that conditions have there arisen that have relieved the Company from the dreary monotony of merely marking-time in relation to the gas business. What are those conditions? The Governor will perhaps explain at the meeting on Friday. The half year, regarded climatically, has not in itself been in any sense one that has been abnormally conducive to extended consumption. All that can be seen on the surface is that there has been a tendency to trade revival, there has been cheaper gas in the district, and business in the connecting-up of gas-fires has been proceeding by leaps and bounds. The activity in this respect is best shown by numerical comparison. The gas-stoves sold and let on hire in the half year numbered 35,153, as against 21,723 in the second half of 1908, and 15,387 in the first half of last year. Now there cannot be in three half years an addition of 72,263 gas-stoves to those previously existing without having some effect on the gas—particularly the day—consumption. In view of the magnitude of the Company's operations, and of this ever-extending stove connection, it would be a matter of much interest if the Governor could, in his address to the proprietors, give some account now as to the proportion of gas sent out in the daytime, in contrast with a number of years since. The connections of gas-fires as a notable feature in the expansion of the scope of the Company's business do not stand alone.

The consumers enrolled in the half year number 18,497—an increase of 2856 compared with the connections of the corresponding half of 1908. From which information it is clear the department responsible for the gas business has been in a state of perpetual activity; and we can say here, as will doubtless be said at the meeting on Friday—"Well done!" Before proceeding to manufacturing and financial matters, the volume of increase in gas consumption should be mentioned. On a total sale of 11,292,506,000 cubic feet, it was no less than 515,273,000 cubic feet.

In considering the financial results of the half year, there are four points that have to be borne in mind, and which points accentuate the excellence of the figures presented. They are that the price of gas was in the past half year 1d. less than in the corresponding period of 1908, that the revenue account on this occasion bears charges (£13,000) for co-partnership and (£12,000) on account of stamp and conveyance duties under the Act of last year, and that, in addition to setting aside £10,000 towards the redemption fund, a contribution (which did not appear in the second half of 1908) of £10,000 has been made to the insurance fund. Despite these charges, there is a balance of £400,402, against £354,687 twelve months ago, or an increase of £45,715. Adding the balance to the amount brought forward, there is a total sum available for distribution of £810,296, which is larger by £43,311 than twelve months since. The dividend is at the rate of £4 13s. 4d., requiring a sum of £353,302, comparing respectively with £4 10s. 8d. and £343,661. Consequently the balance to carry forward is £456,993, which is better by £33,670—lower price, co-partnership, stamp and conveyance duties, insurance fund, and increased dividend notwithstanding.

The manufacturing department has had a marked effect in improving the fortunes of the concern during recent times; and again the Chief Engineer (Mr. Thomas Goulden) and the technical staff under him have to be congratulated upon their achievements. For the reduction in the price of coal, they cannot take credit; but they can for the improvement in working that gives a larger product from the raw material placed at their disposal, and so yields economy in outlay for the latter as well as for labour. All through the manufacturing charges, though the business was greater, there are reductions, with the exception of the item of repairs and maintenance. The expenditure on coal in the half year, £489,615, is down by £72,340; the outlay on oil, £67,656, is a reduction of £16,224; passing over the few hundreds decrease in coke and breeze and in salaries, the entry for wages, £87,283, is down by £3665, and that for purification, £11,311, by £1372. The item of repairs and maintenance of works is £188,462; being higher by £13,413. The sum of the manufacturing charges, £892,075, is less by £81,091. Incidentally, it is satisfactory to note that the Northern coal troubles have not interfered with satisfactory deliveries to the Company's stations. While on coal, too, it is of interest to observe that residuals yielded £26,394 less than in the second half of 1908—that is to say, £367,516, against £393,910. Nevertheless, the total net cost of coal in the past six months was lower than in the corresponding period of 1908—£122,099, against £168,045. An important contribution to this result is found in the following figures: Although the total quantity of gas manufactured was 12,109,500,000 cubic feet, or an increase of 636,031,000 cubic feet, the amount of coal carbonized, 805,265 tons, was less by 7942 tons than in the corresponding period; the quantity of oil employed, 7,232,568 gallons, was less by 76,368 gallons; and the amount of spirit used, 19,191 gallons, was less by 17,024 gallons. There were reductions all through; and this half year, when working to the prescribed standard of 14 candles will rule, there will no doubt be further substantial differences recorded in the requirement for raw material in relation to gas output. In other respects there is not much else that calls for notice on the



expenditure side of the revenue account. The total of the distribution items, £248,934, works out to about £7000 more; and among the miscellaneous items there are the charges for co-partnership and stamp and conveyance duties already referred to. The outcome in the matter of expenditure is that the total of £1,424,940 is lower by £42,579 than in the corresponding period.

The revenue also shows expansion—the £2,039,524 being a greater total by £12,470; so that, if we add this to the £42,579 reduction in expenditure, we have the amount (£55,049) by which the balance on the revenue account, £614,583, is superior to that of twelve months ago. Glancing down the revenue figures, the reduction in the price of gas has not hindered the Company from, through expansion of business, putting £31,779 on to the receipts from private gas consumption, the total of which was £1,450,395. The price of gas for public lighting has also been reduced; and this, and the raids instigated by municipal ownership of electricity supplies, have caused a recession of £6319 in the receipts from public sources—the total being £68,319. Rental of ordinary meters shows a slight reduction; but rental of gas-stoves, an increase of £3010, and of gas-fittings £10,597. As already mentioned, the income from residuals is down by £26,394. Coke, which realized £228,880, has been the main disturbing factor; having shed some £29,984. Tar and tar products also receded by £3515. But, on the other hand, breeze mounted up by £3907, and ammoniacal liquor and sulphate of ammonia by £3197. To gas manufacture and sales the credit has to be given for an account which fitly closes the final chapter under the old conditions as largely revised in the matter of administration. The new chapter will continue the story of the Company under a largely amended charter.

### Increasing Production and Sales in South London.

THERE has not been an occasion, for some time past, on which we have had more pleasure in reviewing the accounts of the South Metropolitan Gas Company than on the present one. The 2s. price which the Company, by strenuous effort, maintained for a considerable period was not always favourable to a fat account, nor to the full dividends to which the proprietors were entitled, though the very lowness of the price (apart from the funds at the back of the Company) had in itself a reserve of strength that was not always appraised at its proper value by the purely investing public. Then, since the price was raised to 2s. 3d. (it is now 2s. 2d.), the Company have, in a measure, in common with other commercial enterprises in their area, been unfortunate in that the trade of the district, speaking generally, has not been in flourishing condition; and there has been besides a perceptible change in the private residential population both by migration and in character. This, in turn, has had its effect on the retail trading element in the composition of the Company's custom. But from general observations in the territory, and from the report and accounts which it will be the pleasure of the Chairman of the Company (Mr. Charles Carpenter) to present to the proprietors on the 9th inst., mutation in these respects appears to have touched bottom; and there are hopeful signs that improvement has already set in.

The varying conditions that have ruled in immediate past years, however, despite the efforts of the distribution staff, have kept the consumption line at a more constant level than a progressively administered Company such as this, with an extensive area and business, cares to see; but the present accounts show that unflagging, spirited work is telling on the conditions for business as they exist. There has been an increase of 4·12 per cent. in the consumption of gas, compared with the corresponding period of 1908. This is highly satisfactory and encouraging, in view of the fact that, in the half year with which comparison is made, there was an actual decrease of 1·7 per cent.; while in the first half of last year, the consumption was practically on an equality with that for the first half of 1908. In volume, the actual increase in the quantity of gas sold last half year is 247,502,000 cubic feet—the total sale having reached 6,253,703,000 cubic feet. We are not disposed to attribute much of the gratifying improvement to the reduction in price from 2s. 3d. to 2s. 2d., as, in respect of price, the consumers in the area fully recognize that they are treated well by the Company. But at the 2s. 2d. price, the dividend to which the proprietors are entitled under the sliding-scale—at the rate of £5 9s. 4d. per cent. per annum—has been earned;

and the profits allow of the balance forward being increased by £12,901.

On the same plane in the matter of attractiveness is the tale unfolded by the figures relating to the manufacturing department as to further increase in economies effected through enhanced working result. For the first time, the name of Mr. W. Doig Gibb appears as Chief Engineer on the face of the accounts; and it must be gratifying to him to know that, in respect of his particular department, the accounts have never before presented such a brilliant record as on this occasion. But Mr. Gibb will be the first to acknowledge (he entered upon his new responsibilities in October last) that the credit for the great upward turn in productive excellence is exclusively due to the technical staff (including the Chairman) on the scene before his arrival. The figures are interesting and instructive as to the financial effect of heavier charges and longer duration carbonization. The cost of coal in the half year was £332,081, or £51,038 less than in the corresponding period of 1908. The quantity of coal carbonized was 563,205 tons, or a diminution of 17,570 tons. Yet the amount of gas made was 6,624,378,000 cubic feet, or an increase of 257,330,000 cubic feet; the production being at the rate of 11,762 cubic feet per ton. But this is not the whole tale. In the corresponding period of 1908, the make per ton averaged 10,963 cubic feet, so that the yield last half year was in excess of this by 799 cubic feet per ton; and this 799 cubic feet, multiplied by the tonnage of coal carbonized in the half year, represents 450,000,795 cubic feet. Assuming the make per ton had only been the same as in the second half of 1908—viz., 10,963 cubic feet—to produce the 450,000,795 cubic feet of gas would have required 42,000 tons of coal. A further effect is seen in the carbonizing wages, which item (with an expenditure of £47,902) is down by £7449, representing a reduction of 0·35d. per 1000 cubic feet of gas made. But the fact that there has been this reduction in carbonizing wages does not mean that as wage-payers the Company are on the downgrade; for, as a matter of fact, the total sum paid in wages in the half year was £269,431, which was an increase of £7377 in contrast with the corresponding half of 1908. Therefore, in other directions than carbonizing (adding together the saving in carbonizing wages and the increase in the total wage payment), the Company's business gave an additional wage-earning power of £14,826. Other items under the head of gas manufacture do not call for special notice, except that there has been charged on repairs and maintenance of works in the half year £116,430—an increase of £25,252. But this notwithstanding, the total manufacturing expenses of £520,847 are down by £30,277.

Among other revenue expenditure, it is noticed that the charge for co-partnership is £16,000, or £3000 more, which, we opine, is due to the reduction in price of gas. The distribution charges amount to £144,671, or £9686 more, which is owing to the better and more extended service required by the consumer and for the Company's protection; and, in this respect, the Chairman and Directors of the Company shun anything in the nature of a parsimonious policy, preferring not to rely entirely on lowness of price. We see that the charges for materials and labour under the head of public lamps are not on this occasion compensated so closely as in the corresponding half by the payments of the local authorities. Then the difference between the two was only £765; now it is £4212. We take this to be attributable to the very proper policy the Company are pursuing in gradually bringing the public lighting quite up to date, where they are allowed to do so, by the application of inverted burners. In their public lighting policy is found the secret of their retention of the street lighting; and to-day in their area there are 23,743 incandescent public gas-lamps and only 11 flat-flame ones. The total expenditure on revenue account is £777,695, or a reduction of £12,446.

On the other side of the account, it is seen that the increased sale of gas has not yet recouped the 1d. reduction in price; for, whereas in the December half of 1908, the income from private consumption was £649,340, it was in the past half year, despite the 4·12 per cent. increase, £7609 less. The reduced price and the saving effected by inverted burners also caused a decline of £542 in the public lighting income; the amount received having been £16,565. The figures show the consumers and the public authorities that the concessions, though small per 1000 cubic feet, are, in their aggregate effect, very material ones. On the other hand, the meter and stove rental (£68,806) increased in the half year by £1797. The Company continue to make some



valuable annexations in their business field. The total number of meters fixed is 346,859—an increase, compared with the corresponding half of 1908, of 8500. The number of ordinary stoves is now 78,044—an addition of 863. Slot meter stoves have, by an increased connection of 7413, risen to a total of 195,393; and gas-fires, by an addition of 2686, to 26,516. Regarding residuals, coke has been a disappointing commodity; receipts, £140,096, having receded by £27,655. This is due to the fact that the market taking the surplus has not been favourable; but an endeavour is being made to counteract this by encouraging the more extended use of the fuel in the Metropolis. Receipts for breeze, tar, and sulphate also exhibit declines, but totalling to less than £2500. There are, however, hopes that the income from tar and tar products will improve, in view of the better prices pitch is commanding. The reduction of income from sulphate of ammonia was only £397; and the smallness of the amount is noteworthy in view of the lower quantity of coal carbonized. The total income from residuals was £230,416, which is a reduction of £30,062; and this, as seen, is almost entirely due to coke. Gas-fittings (the item did not appear in the accounts for the December half of 1908) figure among the receipts for £39,518. The issue of the trading is that the total income from all sources is £998,673, or an improvement of £2889, adding which to the lessened expenditure, £12,446, gives £15,335 as the increase in the amount (£220,978) transferred to net revenue account. Complete satisfaction with the state of things presented by the half-year's statement will be the dominant note at the meeting of the proprietors to-morrow week.

### Standard Burner Bill and Prospective Opposition.

THE Standard Gas-Burner Bills, which are being promoted (under the auspices of the Gas Companies' Protection Association) jointly by 47 Gas Companies, and which refer to 49 gas-supply areas, are growing day by day in importance in relation to the future interests of the gas industry. Though opposition menaces, there must be, at this stage, no thought of withdrawal of the measures. To take such a step would be tantamount to the confession of a weak case, and would be disastrous in respect of future legislative action, whether taken (as hitherto) by individual gas undertakings or in concerted manner as on this occasion. The promoting Companies have a case of extraordinary strength on their side. Parliamentary enactment and precedent are with them right away from the incipient stages of statutory testing for illuminating power; and the conditions of gas supply to-day are entirely in their favour for the granting of what is desired. The Companies must stand shoulder to shoulder in this matter; and there must be a stiffening of backs against any opposition that may be brought to bear on the measures. And, moreover, there should be no concession whatsoever on the part of any single Company having lot in the promotion; for it is clear that concession of any nature by one or more companies might seriously affect when before Committee the interests of the other units in the promotion. That there would be opposition to the Bills was almost a certainty from the time that such a promotion was mooted; but there is nothing more now than then to cause affright. The clear-cut case for the Bills and the single proposal have not altered one iota. That the interested local authorities, through their representatives, held a conference at the Westminster Palace Hotel last Thursday—a conference convened by the Town Clerk of Liverpool—to consider what, if any, aggressive joint action should be taken, is, if anything, favourable to the Bill. Much better is it to have a cut-and-dried case to meet, with only one force supporting it, than for a united body of promoters to have to engage in a sort of guerilla warfare with sundry local authorities. The position in connection with this joint application to Parliament is infinitely superior to that obtaining when the first Sulphur Compounds Bill was promoted; and that Bill came off with flying colours. There is no knowledge—the conference having been *in camera*—as to what, if any, decision or recommendation was come to on the occasion by the delegates of the local authorities concerned; but whatever (if anything) is proposed to be done by them, they must recognize that they are setting themselves the difficult and vain task either of attempting to present a destructive case against constructive and repeated enactment, or of seeking to force the introduction of matter that is altogether irrelevant to the Bill.

The scene of engagement with any opponents will be the

House of Lords, inasmuch as Lord Onslow and Mr. Ernest Moon, K.C. (Speaker's Counsel), last Thursday met the Parliamentary Agents for various Bills (in this particular instance, Messrs. R. W. Cooper and Sons), and, among their decisions, allocated the Standard Burner Bill to the House of Lords for first consideration. The Committee to whom it will be referred will not overlook the recommendations of the Board of Trade Committee from which issued the adoption of the Carpenter "Metropolitan" No. 2 burner. Nor will they lose sight of the fact that session after session since 1905 Parliament has been consistent for uniform gas testing, and has prescribed the No. 2 burner in the case of no less than 62 companies, and—the local authorities now considering the matter should note this—sixteen local authorities who are suppliers of gas. In addition, several undertakings have been authorized to use the burner by the Board of Trade acting under specific powers conferred by Act or Provisional Order. Upon such a mass of precedent as this Parliament will not now turn. Nor will the Committee fail to heed such considerations as are advanced in a special article printed in the present issue under the title of "The Case for the Standard Burner Bill," in which incontrovertible argument is brought forward, by an independent expert, both in respect of the compliance by Parliament with the simple and reasonable request of the promoters of the Bills, and of rejection of possible irrelevant demands on the part of any opposition. In plain language, and with a comprehensive grip of historical fact and position generally, our contributor shows that any hostility to the Bill can only be based on a misunderstanding of the position, technical and statutory.

From the precedent of London, statutory prescription in regard to the testing of town gas has always proceeded; and what is being proposed now, and what has been enacted by Parliament in regard to this matter from 1905 onwards, is only of a piece with the basic principle of gas testing, as formulated in the City of London Gas Act of 1868, that the burner used "shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." The spirit of that principle was continued in the London Gas Act of 1905, and in no way whatever are the Companies who are promoting the Joint Bill transgressing that principle by what they are now seeking. As a matter of fact, had the "Metropolitan" No. 2 burner been developed long since, it would have been obligatory on the part of the Metropolitan Gas Referees to have prescribed it for testing gas in London in substitution for the "London" No. 1 burner, as being a burner that complied with the condition enacted in 1868, and which condition proved the legislative recognition forty years and more ago that it was not within the province of Parliament to determine there and then any finality in relation to the burner to be used for testing. As a matter of fact—as the writer of the article in other columns, with discernment, points out—the fact that the "Metropolitan" No. 2 burner was not invented before has been to the loss of the gas industry through the continuance of a test-burner that was not suitable to the changed conditions of gas supply and use. The present promoters are asking for nothing but that their rights in the matter of testing may be restored to them, as they have been restored by Parliament to the London Companies and to about a tenth of the parliamentary controlled gas undertakings of the United Kingdom, apart from concerns that have had the use of the new burner granted them under the discretionary powers conferred on the Board of Trade by Private Acts and Orders.

With regard to the hints that have circulation as to demands being made by the opposition for the introduction of matter foreign to the single purpose of the Bill, our contributor's article is as destructive of any case that can be put forward in an endeavour to show the justice of such demand as it is of the opposition to the application of a test-burner that scientifically carries out, under current conditions, the spirit and the intentions of the legislative founders of gas-testing in this country. We hope the efforts that have been made by us to show to the local authorities of the towns concerned the weakness of the position they are assuming in this matter will have the effect, if not of entire withdrawal from opposition, of doing something to convince them that they are merely going forward as the champions of a forlorn hope. With such a clear presentment of the position before them, there will be no excuse now for them being, in any manner whatever, deceived in respect of the matter now under their consideration.



## Stand-by Clauses in Gas Bills.

WE are glad to see there is quite a revival of the stand-by clause or (as in the most up-to-date form it is proper to say) clauses in the Gas Bills that are to be promoted in the first session of the new Parliament. It was a hard fight, prosecuted in several sessions, that led to the insertion in the Heywood and Mountain Ash Acts of last year of protection, carrying the right to levy an annual charge covering the expenses involved in making provision for meeting maximum demands for gas to premises where the supply was merely treated as a stand-by to a private installation of producer or suction gas. In the case of the Heywood Act last session, a second clause appeared, making recompensing provision in like manner where a supply of gas was merely used for the convenience of having a stand-by to an electricity installation. The possession of such powers does not mean compulsory use. They are permissive and protective (as is quite proper), and entirely exercisable at the discretion of those gas suppliers who are fortunate enough to have the power to fall back upon them in case of need. For the sake of their own credit and reputation, no conductors of a gas-supply undertaking would harshly employ such powers; but it is right they should be in the position to collect a fixed annual sum on the expenditure to which they are subject in providing premises with a stand-by supply. And no manufacturer with such convenience could fairly object to the payment of a modest sum as insurance against the breakdown of his private plant, and the interruption of his manufacturing output. Electricity suppliers have had the power to make such an annual charge for several years—and years anterior to those during which gas suppliers were asking the parliamentary authorities to similarly empower them, but, without reason and inconsistently in view of electrical enactment, as regularly declined. But last session a spirit of sweet reasonableness in the matter came over the parliamentary authorities; and, as before remarked, precedents were set in the Heywood and Mountain Ash Acts. In the coming session, the Bristol, Exmouth, and Great Grimsby Gas Companies are asking for stand-by clauses for application where private gas-producing plants are installed. In the Warrington Corporation and Rhondda District Council Bills, similar powers in respect of both gas and electricity are being asked. The Warrington clauses follow literally the Heywood ones of last session, as reproduced from the Act in our issue for Oct. 12. The Rhondda District Council clause is a simple one, covering both gas and electricity, in terms disentitling any person to demand from the Council a supply, or the continuance of a supply, of gas for premises having a supply of gas or electricity from an installation other than that of the Council, unless there is previous agreement to pay the Council such minimum annual sum as will give them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for the premises; the sum payable, in default of agreement, being determined by arbitration as provided by the Arbitration Act, 1889.

## "The Times" Cost Controversy.

IT is a singular thing that "The Times" should continue to allow one of the contributors to its "Engineering Supplement" to assume such a severely antagonistic attitude towards the gas industry, and to be for ever extolling the hypothetical superior virtues of electric lighting to the detriment of gas lighting. Only recently he made some peculiar and unsupported assertions that are not borne out by the practical experience of the gas industry regarding the relative costs of gas and electric lighting and cognate matters. Against the comparisons and the form they took, Mr. Hanbury Thomas, of Sheffield, protested (see *ante*, p. 247); and this has brought from the "Contributor" a very effeminate sort of reply, composed of the ordinary stock postulations of the electricity industry, with support from that insuppressible Mr. H. H. Holmes, erstwhile Electricity Sales Manager of West Ham, and now (following the translation of his superior, Mr. A. H. Seabrook) the occupant of a like office at Marylebone. These letters are noticed in our "Miscellaneous News," together with a supplement from Mr. Holmes's jealously guarded little store of accounts that show savings (eschewing all other considerations) since the supersession of gas by electricity in certain dwellings. We do not say that by quoting these accounts—unnamed and without address—Mr. Holmes deliberately publishes

falsehoods; but we do say that Mr. Holmes is perfectly well aware that those accounts have their antitheses in gas accounts that exhibit considerable savings over displaced electric lighting.

Mr. Holmes knows—perhaps the "Contributor" to "The Times" does not know so well—that it is possible to obtain a higher illuminating power with gas, preferably by the use of inverted gas-burners, than it is with metallic filament lamps at less cost; but electrical sophists always give the go-by to the well-established fact that conditions that can be obtained at one time with the incandescent gas-burner can be quite easily maintained. The redoubtable but unconvincing Mr. Holmes has never been able to deny that it is possible at a given price to obtain a far greater illuminating power by incandescent gas-burners than by metallic filaments, nor has he been able to deny that it is not impossible readily to maintain that illuminating power. He is fully conscious of the fact that, if he did so deny, he would be deliberately putting himself in a cleft stick; and Mr. Holmes, bold as he is at advertisement, is too cute to act so foolishly. The figures he quotes in "The Times" are some of the old West Ham stock, with electricity at 3d. per unit. He merely gives the bare figures, without any information as to hours of lighting, types of burners used, and illuminating power afforded. A large-hearted credence remains with him as a glorious characteristic and valuable asset in his work as a Sales Manager. The consumers say that they get as much light under the new order of things as under the old. Mr. Holmes is satisfied. If true, then the consumers referred to ought to be ashamed of themselves for their neglect of a small duty that would have repaid them in abundance.

But, in face of these accounts, what has Mr. Holmes to say to the statement of Mr. Herbert N. Clark, of West Ham, in his paper before the Southern District Gas Association last November, that "in many cases the Gas Company have reclaimed and converted back to gas consumers 'of electricity.'" One large installation of high-pressure lighting was also described in that paper, upon which the remark was made: "A better light has been obtained at 'considerably less than half the cost than when the electric light was used.'" Is there any absurdity in these claims? No; the absurdity rests with the electricians in ignoring what is possible and what is actually attained with gas, and in presenting statements supported by a foundation composed of the fiction of their imaginations and of consumers' accounts that are not representative of the general experience. We should strongly advise "The Times" "Contributor" to pay a little more attention to modern gas-lighting developments before he again writes at large on the subject of light diffusion and concentration by the opposing lamps. And it would not be amiss if he did not cling too tenaciously to the trite arguments that were originated in electrical commercial circles.

## Right to Open Streets in New York.

In another part of the "JOURNAL" will be found some extracts from a judgment given by the Appellate Division of the Supreme Court in New York in an action between the authorities of the City and the New York Mutual Gas Company in regard to the right of the Company to open streets for laying their mains. The Company obtained in 1866 their power to manufacture and supply gas, and it was granted with the provision that no street or highway was to be opened without the consent of the municipal authority. This, however, might be dispensed with if the majority of the parties interested in the property adjacent to the part of the street proposed to be opened gave their consent in writing to the work being done. In 1868, the Board of Aldermen approved a resolution giving the Company permission to supply gas in the city for a period of thirty years subject to certain conditions which had been imposed upon two neighbouring Gas Companies. At the expiration of the above-named period, the Company continued their operations without obtaining municipal authority; and this, it was alleged, they had no right to do. The plaintiffs not only asked for an injunction to restrain the defendants from continuing to open the streets, but also for an order for the removal of the mains "with all convenient speed." The Company submitted a complete answer to the allegations of the plaintiffs, who, however, demurred to it on the ground of insufficiency. The Lower Court overruled the demurrer; and the plaintiffs



appealed, without success—the five Judges in the Appeal Court being all in favour of the Company. They went back to a General Act passed in 1848 to sanction the formation of gas companies—a measure akin to our Gas-Works Clauses Act of the preceding year—and decided that it gave the Company a perpetual franchise, subject only to permission being obtained to open the streets. This having been granted and acted upon, the Court decided that “the power to continue was a necessary incident of the franchise granted by the State, and not subject to interference or revocation by the local authority.” Though the case is mainly of interest to the parties specially concerned, it is not the less worthy of attention as an example of attempted interference by a local authority with the owners of a large undertaking carrying on their operations under legislative sanction, being very properly frustrated. The State is higher than the Municipality.

### Successful and Unsuccessful.

So far as known at the time of our last issue, the Members of the new Parliament and the unsuccessful candidates for seats who are identified with the gas industry were named in an article appearing on p. 222. There are a few additional names to be noted this week—all but one those of men who have been successful in their candidature. Sir Fortescue Flannery, one of the Directors of the South Suburban Gas Company, wrested from the Liberals for the Unionists, by a majority of 869 votes, the Maldon Division of Essex. The Right Hon. J. E. Ellis, a Director of the Scarborough Gas Company, held for the Liberal Party, by the substantial majority of 2844, the Rushcliffe Division of Nottinghamshire. Alderman N. W. Helme, the Chairman of the Lancaster Corporation Gas Committee, has, by an increased majority, been returned for the third time for Lancashire North. Mr. W. H. Cowan, contesting Aberdeenshire East in the Liberal interest, walked home with at his back the solid majority of 2638. By a reduced majority, Sir W. J. Crossley, one of the founders of Messrs. Crossley Bros., retained the Altrincham Division of Cheshire for the Liberals. By only 66 votes, Alderman W. F. Cotton, the Chairman of the Alliance and Dublin Consumers' Gas Company, was defeated, in running as a Nationalist for Dublin South in opposition to a Unionist. The Unionist majority in 1906 was 1343; so that Alderman Cotton has the consolation of knowing that, though unsuccessful in capturing the seat, he gave his opponent a severe shaking.

### District Council Finances.

Though, as is only natural, the finances of the Urban District Councils are on a smaller scale than those of the Borough Councils, it will nevertheless be gathered, from a perusal of the figures which appear on another page of to-day's issue, that in the aggregate their monetary transactions are of very considerable magnitude. The Blue-Books which deal with the two sets of authorities are, as far as is practicable, modelled on the same lines; but in the case of the District Councils there is an omission of one table which has on the last few occasions proved of much interest in connection with the statistics compiled with regard to the finances of the Borough Councils—that is, the table showing the transfers that have been made in aid of rates out of profits from, and the transfers from the rates to make up deficiencies in revenue on account of, the “reproductive” undertakings. At March, 1907, there were 326 boroughs (exclusive of the Metropolis), while the number of urban district councils was 811; but whereas the rateable value of the former was £73,265,136, that of the latter was only £31,804,974. There is even greater difference perceivable when the total amount of loans outstanding is taken into consideration; for in the case of the borough councils the figure is over £244,000,000, while in that of the urban district councils it is no more than £35,622,307. Of course, many items comprised in these loans are the same in both instances; and of the sum owing by the urban district councils 24·1 per cent. is for purposes of sewerage and sewage disposal, 15·5 per cent. for water-works, 9·7 per cent. for gas-works, 10·4 per cent. for education, 8·2 per cent. for street improvements, 6·6 per cent. for electric lighting, 5·7 per cent. for tramways and light railways. Altogether the loans outstanding in respect of undertakings which yield revenue and for works of private improvement (and which amount is recoverable) represent, in the case of the district councils, just 40·5 per cent. of the total debt. Of the receipts of these councils for the year 1906-7, the amount raised by means of public rates

accounts for 54·5 per cent.; while the receipts from revenue producing undertakings and private improvements represent rather more than 23·8 per cent. of the total income. It would not be fair, in comparing the figures relating to local governing authorities as now available with those published some years ago, to neglect to take into account the important influence which is now exercised on the finances by the item of “education.” In 1906-7, the district councils had loans outstanding of £3,552,280 in respect of elementary education; whereas in 1902-3 no amount at all appeared under this heading. In the intervening period, the total increase of loans has been some £7,500,000, which leaves, in round figures, an addition of only £4,000,000 to be accounted for in other directions than education. Nearly £1,000,000 of this has been in respect of electric lighting; while tramways and light railways are responsible for some £1,250,000. Gas-works, on the other hand, have only increased outstanding loans in the same period by about £200,000, and water-works by some £400,000. The average amount in the pound of the rates received by the district councils (other than for purposes of elementary education) has varied but little recently—the figure for some years past having been in the neighbourhood of 3s. 3d. in the pound; but, it must be borne in mind that, in addition to this, elementary education is responsible for rates amounting to about another 1s. 3½d. in the pound.

### Personal.

Mr. J. A. WITTEN, the Engineer and Manager of the Gorleston and Southtown Gas Company, recently underwent a serious operation; but his friends will be pleased to learn that he has now so far recovered as to be able to go to Bournemouth to recruit his health.

Mr. JOHN PIRIE, who has for many years been associated with the “JOURNAL” as its Edinburgh Correspondent, and who is personally known to most of our readers north of the Tweed, has recently been installed President of the Edinburgh Working Men's Club and Institute.

### Obituary.

The “Journal für Gasbeleuchtung” reports that the death occurred recently of Herr F. DEBACH, who, after being associated in various capacities with the Stuttgart gas undertaking from 1863, was appointed its Manager in 1893. He resigned that position in 1906 owing to failing health and strength. He was born in 1846.

Mr. JOHN LEARMONT died last Tuesday at the residence of his son at Rockbank House, Milngavie. Mr. Learmont was one of the oldest gas managers in Scotland—in his 89th year. He was trained as an agriculturist on his father's farm in Wigtownshire; but his life-work was the making of gas. He was connected with the industry for sixty years, first at Eaglesham and afterwards at Milngavie. At the inception of the West of Scotland Association of Gas Managers, he was appointed Secretary, and in this capacity was well known to his colleagues in the West of Scotland. He had not for many years before his death taken part in public business in connection with gas supply.

### Presentation to Mr. G. F. L. Foulger.

In the lecture-room at the offices of the Gaslight and Coke Company, Mare Street, Hackney, on Monday last week, Mr. G. F. L. Foulger was the recipient of a testimonial from the employees in the distribution, chief inspector's, and stove and meter departments. It took the form of a massive Georgian pattern silver tea and coffee service, spoons, and sugar-tongs, in a polished oak case, with an illuminated address, inscribed as follows:—

The Officers and Workmen of the Distribution, Chief Inspector's, and Stove and Meter Departments of the Gaslight and Coke Company, in expressing their deep regret at the cause of Mr. G. F. L. Foulger's retirement from the position of Distributing Engineer to the Company, ask his acceptance of a silver tea and coffee service, as a slight token of their esteem and gratitude for the kindness and solicitude for their welfare shown by him throughout his distinguished career. January, 1910.

The presentation was made by Mr. Foulger's successor, Mr. H. S. Reeson, who was supported by the Company's Chief Inspector, Mr. F. W. Goodenough. Mr. Foulger thanked the subscribers sincerely for their gift, which he said would always remind him of the happy time he had spent in the service of the Company, especially in connection with the distribution department. He assured the subscribers that he should always appreciate it, apart from its intrinsic value, as an indication of the goodwill extended to him by all his staff. On the same occasion, Mr. Foulger was asked to accept, on behalf of Mrs. Foulger, a gold flexible bracelet in a case; and he expressed his thanks to the subscribers. All present were extremely gratified to find Mr. Foulger looking very well.



## THE CASE FOR THE STANDARD BURNER BILL.

[COMMUNICATED ARTICLE.]

THE three Bills in identical terms which are being jointly promoted by 47 Gas Companies, representing 49 undertakings, in the United Kingdom, with the object of providing for the adoption of the "Metropolitan" argand burner No. 2 for the statutory testings of the illuminating power of the gas supplied by the Companies, have been threatened with opposition by certain local authorities whose districts are included in the area of supply of one or other of the promoting Companies. This opposition appears to have arisen mainly from misunderstanding of the object of the Bills, and of the effect of their provisions. The following communication has been prepared with a view to the removal of such misunderstanding where it exists; and as the author is independent of any of the promoting Companies or other gas undertakings and of any local authority, his comments may very properly be regarded as emanating from an impartial expert.

The three Bills will, for convenience, be spoken of in the sequel as the joint "Bill," because they were originally one; and the division into three was made at the request of the authorities of the House, owing to the large number of Companies concerned. The provisions of the Bill were stated fully in the "JOURNAL" for Dec. 21 last (page 823). Briefly they are that, from Jan. 1 next, the "Metropolitan" argand burner No. 2 shall be used in statutory testings of the illuminating power of the gas supplied, in place of whatever standard burner is now prescribed in the Special Act or Order of each of the promoting Companies. The Bill states the conditions to be observed in the testings with this burner—they are substantially identical with those now observed in London under the prescription of the Metropolitan Gas Referees. Power is reserved to the Board of Trade to approve the use of another burner in place of the "Metropolitan" argand burner No. 2, in order that, if an improvement on the latter is subsequently available, it may be adopted without the necessity of a further appeal to Parliament. As will be seen later, this provision in effect means that, if the Metropolitan Gas Referees, who are appointed by the Board of Trade, find it their duty, under the London Gas Acts, to prescribe at some later date another standard burner for the testing of gas in London, that burner will automatically become available for testing the gas supplied by the promoting Companies.

The question of the proper burner for use in statutory testings of the illuminating power of gas will be better followed if the history of the inception and development of such testings is known. Briefly, a standard of illuminating power and provision for testing were first enacted in Great Britain in the Metropolis Gas Act, 1860, which Act applied only to certain Companies then supplying gas in the Metropolis. The standard thereby fixed for common gas was 12 candles; and the burner to be used in testing was an argand having 15 holes and a 7-inch chimney, consuming 5 cubic feet of gas an hour. These provisions remained applicable until the City of London Gas Act, 1868, came into force in regard to Companies then supplying gas in the City of London. This Act required the Gas Referees to prescribe the burner for testing the illuminating power of the gas; and "it shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." It may be reasonably assumed that it was tacitly admitted at the date of passing of this Act that the 15-hole argand with 7-inch chimney prescribed in the Act of 1860 was not the most suitable burner for obtaining from the gas the greatest amount of light. It was known that the Gas Referees would have no difficulty in prescribing a burner affording a higher illuminating duty from gas consumed in it at the rate of 5 cubic feet per hour. By way of compensation, therefore, the 1868 Act forthwith required the gas supplied to be of an illuminating power of 14 candles when tested by the aforesaid most suitable burner for obtaining from the gas the greatest amount of light. The burner prescribed by the Gas Referees on March 31, 1869, in pursuance of this requirement of the 1868 Act, was Sugg's "London" argand No. 1, which the Referees reported gave 16 per cent. more light from the same gas than the earlier 15-hole testing-burner. Sugg's "London" argand No. 1 was accepted then, and for many years later, as the most suitable burner for obtaining from the gas the greatest amount of light. But if a more suitable burner for the purpose, such as the "Metropolitan" argand burner No. 2, had then been known, the Gas Referees would have been bound to prescribe it for testing the gas which, by the 1868 Act, was required to be of an illuminating power of 14 candles. Owing to the "Metropolitan" argand burner, No. 2 not having been devised until a recent date, the Companies supplying gas in the City of London from Sept. 30, 1868, onwards, and other Metropolitan Companies from a later date, were compelled, by the prescription of the Gas Referees, to supply gas of a higher illuminating power than was really necessary to fulfil the requirement as to quality embodied in the 1868 Act. Thus, due to the failure of the early Gas Referees to find a more suitable burner than Sugg's "London" argand No. 1 for obtaining from the gas the greatest amount of light, the London Gas Companies, in the first instance, and indirectly, as will be shown later, the majority of the Provincial Gas Companies also, were unable to secure the full benefit of the early legislative provisions in regard

to the quality of the gas supplied. The intentions of the legislators were frustrated by the action of the early Gas Referees, who, with the best possible aims, thereby did the gas industry lasting injury.

The object of the present joint Bill is to restore to a number of Gas Companies the rights in regard to the testing of the quality of gas which the early gas legislation conferred on the London Gas Companies, but which later legislation, inspired by the action of the early Gas Referees, took away from them. The "London" argand burner No. 1 was believed in March, 1869, when it was first prescribed for testing the quality of gas which was required to have an illuminating power of 14 candles, to be the most suitable burner for obtaining from the gas the greatest amount of light. In 1870, certain Metropolitan Companies were required to supply gas of 16-candle power, and others gas of 14-candle power. Sugg's "London" argand No. 1 burner was prescribed for testing both qualities of gas; the only difference being that a wider chimney had to be used for the richer gas. This prescription was made by the Gas Referees according to the clause of the 1868 Act, and two identical clauses in Acts of 1869 relating to other Metropolitan Gas Companies; so that it may be admitted that in 1870 Sugg's "London" argand No. 1 burner was believed to be the most suitable burner for obtaining the greatest amount of light from both 14-candle power and 16-candle power gas. In 1871, the Gas-Works Clauses Act Amendment Act was passed. The testing provisions of this Act apply to the majority of gas undertakings outside the Metropolis proper. In regard to testing for illuminating power, they require that the gas shall be consumed at the rate of 5 cubic feet per hour in a burner such as shall be prescribed in the Special Act or Order of the gas undertaking. In the vast majority of the Acts and Orders of provincial gas undertakings passed or granted after the passing of the Gas-Works Clauses Act Amendment Act until a quite recent date, the prescribed burner for gas required to be of an illuminating power of 14, 15, or 16 candles was Sugg's "London" argand No. 1. It was currently believed that this burner, owing to its prescription in the Metropolis for both 14 and 16 candle power gas under the provisions of the Acts of 1868 and 1869 was, in fact, the burner "most suitable for obtaining from the gas the greatest amount of light." Had a burner more suitable for the purpose been devised at that date, the Gas Referees would have been compelled, in fulfilment of their duty, to prescribe it for London in place of Sugg's "London" argand No. 1; and the more suitable burner would then have been prescribed in the Acts and Orders of provincial gas undertakings after the passing of the Gas-Works Clauses Act Amendment Act, 1871, just as, in fact, London precedent has been followed in the vast majority of these Acts and Orders in which Sugg's "London" argand No. 1 is the prescribed burner. The spirit of the legislation embodied in these Acts and Orders in regard to the testing of illuminating power was clearly that the gas undertakings had the right to have their gas tested by the burner which was most suitable for obtaining from the gas the greatest amount of light.

Improvement on Sugg's "London" argand No. 1 burner in this direction was not thought to be possible in the seventies; and hence it came about that in 1875 the burner which had hitherto been prescribed by the Gas Referees, under the 1868 and 1869 Acts, was specifically named in the Commercial Gas Act, 1875, as the burner for testing the illuminating power of the gas of the Commercial Gas Company. This unfortunate precedent was followed in other London Gas Acts in 1876, and the clauses of the 1868 and 1869 Acts requiring the Gas Referees to prescribe for testing the burner which was most suitable for obtaining from the gas the greatest amount of light, were repealed. Undoubtedly, however, it was universally accepted, at the time, that Sugg's "London" argand No. 1 burner complied, and would continue to comply, with that condition. When it became known in 1905 that other burners afforded a greater amount of light from the gas than Sugg's "London" argand No. 1, Parliament in the London Gas Act of that year, again placed on the Gas Referees the obligation to prescribe the burner for testing the illuminating power of the gas supplied by the Metropolitan Gas Companies, subject to the condition that: "The burner so prescribed shall be of such a pattern (not being an incandescent or similar burner) as shall be practicable for use by the consumer; and the burner and the chimney (if any) shall be the most suitable for obtaining, and in making the test shall be so used as to obtain, from the gas, when consumed at the rate of 5 cubic feet an hour, the greatest amount of light." The requirement of the 1868 and 1869 Acts was thus again revived, with the addition of safeguards as to the chimney and mode of using the burner. The burner prescribed by the Gas Referees, in accordance with this requirement of the Act, for testing the gas supplied by the three Metropolitan Gas Companies is the "Metropolitan" argand burner No. 2. It has since been prescribed in the Acts and Orders of a number of provincial gas undertakings; and the present Gas Companies (Standard Burner) Bill seeks to extend its prescription to the gas supplied by all the promoting Companies. That is to say, that just as Parliament in 1871 and subsequent years, in the Gas-Works Clauses Act Amendment Act, and an immense number of Private Gas Acts and Orders, adopted for provincial gas undertakings generally the provisions of the 1868 and 1869



Acts, and the prescription of the Gas Referees consequent thereon, in regard to the burner to be used for testing the gas supplied by the Metropolitan Gas Companies, so now Parliament is asked through the present Bill, to extend to a number of provincial gas undertakings the precisely similar provision of the London Gas Act, 1905, and the prescription of the Gas Referees consequent thereon. *If precedent in gas legislation counts for aught, the Bill should certainly and justly receive assent by Parliament.*

The foregoing historical review shows that the promoting Companies are merely asking to have restored to them the just and only defensible method of testing the illuminating power of gas, which was initiated by Parliament in 1868; and after being more or less in abeyance from 1876 to 1905, was in the latter year restored to the Metropolitan Gas Companies. That it was ever in abeyance has been shown to have been due to a misunderstanding, and to the impression, since known to be false, that finality had been reached by 1875 in the construction of argand burners. Parliament is now asked to remove the injustice inadvertently inflicted by it in regard to testing the illuminating power of their gas under which the promoting Companies have laboured for, in some cases, over thirty years.

Now that it has been shown that, on precedent, the promoting Companies have a right to their Bill, it is worth while to consider briefly some of the objections which are being raised to it in the Councils of a few of the local authorities concerned. The Town Councils of Reading, Plymouth, Cambridge, and Croydon, and the Wandsworth Borough Council, have all indicated opposition to the Bill [*vide* "JOURNAL," Vol. CVIII., p. 688, and *ante* pp. 57, 111, 186, and 188]. Moreover, on Thursday last a meeting, convened by the Town Clerk of Liverpool, of the various Local Authorities of the towns and districts supplied with gas by the promoting Companies, was held at the Westminster Palace Hotel, in London. As this meeting was private, no information is available as to what transpired. The chief grounds of opposition, however, brought forward in the meetings of the Councils enumerated above may be summarized as follows:

- (1) That the "Metropolitan" argand burner No. 2 obtains from the gas a greater amount of light than the burners now prescribed for testing the illuminating power of the gas supplied by the various promoting Companies.
- (2) That, as a consequence, the Companies will be able to effect a reduction in the quality of the gas, though the prescribed illuminating power remains unaltered.
- (3) That a reduction in the quality of gas, as measured by the statutory testings for illuminating power entails a reduction in the illuminating duty obtainable from the gas when burned in flat-flame burners vastly in excess of the reduction in quality, and that therefore the consumers' interests are prejudicially affected to a much greater extent than the reduction directly implies.

In addition to the foregoing objections, which are directly raised by the proposals embodied in the Bill, advantage may, it is suggested, be taken of its promotion to ask for the inclusion in it of provisions for the following objects, which (it may be parenthetically remarked) are totally irrelevant matters:

- (4) That, having regard to the general use of incandescent burners for lighting, and to the extended employment of gas for heating and power purposes, for all of which uses the illuminating power of the gas is of no moment, whereas its calorific power is of importance, a standard calorific power of the gas should be fixed, and provisions for the making of testings of calorific power should be included in the Bill.
- (5) That, as the consumption of gas does not now to such a great extent as formerly take place in the evening hours, the testing of the gas for quality should be permitted at other times instead of, as now, only in the evening.
- (6) That a limitation should be imposed as to the (maximum?) pressure at which gas may be supplied.
- (7) That sulphur restriction clauses should be re-enacted—*i.e.*, that, in addition to the existing requirement that the gas supplied must be free from sulphuretted hydrogen, a maximum limit should be fixed for the proportion of other sulphur compounds contained in the gas.
- (8) That the method and apparatus used for testing the illuminating power (and the calorific power if a standard of calorific power is imposed) should be those prescribed from time to time in the Notification of the Metropolitan Gas Referees.

It will be seen from this summary of the main grounds of opposition to the Bill that there is some prospect of it being assailed from many and widely divergent points. Some of the questions which enthusiastic but misguided or ill-informed opponents would raise are, however, so remote from the object of the Bill that it is difficult to regard them as being brought up seriously in connection with it. The first three points may, however, not unreasonably be thought to afford ground for legitimate opposition to the Bill if they can be supported by trustworthy evidence. Consequently, it will be useful at the present juncture to discuss them somewhat fully.

In regard to the first point—*viz.*, that the "Metropolitan" argand burner No. 2 obtains from the gas a greater amount of light than the burners which the Bill proposes it should supersede, this may be admitted as generally true. Precisely how much more light is afforded by it depends on the candle-power and nature of the gas, and on the efficiency of the burner now

prescribed in each Special Act or Order. But the difference is often substantial, especially when the gas supplied contains an appreciable proportion of carburetted water gas. It must be remembered that Sugg's "London" argand No. 1 and other early standard burners were devised for the consumption of coal gas such as was made about 1870. The dimensions of the parts of the "London" argand No. 1 were chosen by the late Mr. William Sugg, to the best of his ability, with a view to supplying the requisite amount of air to a flame of such gas. It may be unhesitatingly asserted that he would have chosen other dimensions for parts of the burner if the gas for which he had to design it had been such as is now commonly supplied. The "Metropolitan" argand burner No. 2 has, to the best of present-day knowledge, the requisite dimensions, coupled with means of adjusting the air supply, for the consumption of gas as now made. *It is obviously unfair to burn this gas in a burner designed forty years ago for the gas of that period.* Consumers' burners have changed enormously in the meantime; and the Gas Companies are entitled to claim that the standard burner by which the gas is tested should not be one which is ancient and obsolete. It has already been clearly shown that Parliament intended, when gas legislation in respect of the quality of the gas supplied was initiated, that the gas undertakings should have the benefit of the most suitable burner for obtaining from the gas the greatest amount of light, and thereby should share with their customers the advantages accruing from improvements in burner design. Parliament has in 1905 again disclosed the same intention, by re-granting to the Metropolitan Gas Companies the right, which they possessed from 1868 to 1876, to the use of the most efficient burner for the testing of their gas. *The Companies promoting the present Bill merely ask Parliament for the same measure of justice that the Metropolitan Gas Companies now have.* There is no reasonable ground for fear that the provisions of the Bill, if enacted, will result in the consumer being detrimentally affected by any slight falling off in the illuminating power of the gas. If it were admitted, however, that in a few cases a consumer might be slightly aggrieved thereby, it must be remembered that, on the other hand, the Companies have for over thirty years been subjected to harsher methods of determining the illuminating power of their gas than Parliament originally contemplated, and that presumably the consumer has been benefiting throughout this long period at their expense. They now ask that an end be put to the injustice from which they have suffered for so long.

(To be continued.)

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 315.)

THE Stock Exchange has not had a very bright week. Business was quiet, and there was a rather heavy account to be adjusted. The tone almost throughout had a dull tendency. Consols on Friday touched 82. The factors producing a lowering effect were manifold. Too sanguine views regarding the elections had been widely entertained, and disappointment was experienced that the returns (good as they were) were not better; the grave calamity which has befallen Paris had a sinister influence upon markets popular in the Bourse; and there were other minor causes. The week started unpromisingly on Monday. There was a disposition to close open accounts, and prices for the most part were easier. Tuesday was dull also. Gilt-edged securities were irregular, and Consols were rather lower. Business was inactive on Wednesday; and markets, with few exceptions, were weaker. Consols fell  $\frac{3}{16}$ . Thursday continued dull, and the leading departments failed to cheer up. Friday produced no change in the general attitude. Consols were at their lowest (falling another  $\frac{3}{16}$ ); and only in the speculative markets was there any brightness. On Saturday, there was a very slight recovery in the higher lines. Consols had a little rise, and rails were stronger; but most of the rest were uneven. In the Money Market, there was a good demand for the Stock Exchange which helped to put a stiffening into rates; but after the settlement was over, they relaxed materially. Business in the Gas Market was more active, and there were some nice rises (moderate, and not jerky) in many quotations. The half-yearly accounts are beginning to come out, and from those already to hand it is evident gas has been in good demand, and (speaking generally) the weakness of the coke market is the only "regrettable incident." In Gaslight and Coke issues, the ordinary was in excellent favour. Opening at 104 $\frac{3}{4}$ , it worked up to 105 $\frac{3}{4}$ —the closing mark, and a rise of a point. In the secured issues, the maximum was  $\frac{1}{2}$  better, at 89 $\frac{3}{4}$ ; the preference made from 104 $\frac{1}{2}$  to 104 $\frac{3}{4}$ ; and the debenture 82 $\frac{1}{2}$  and 82 $\frac{3}{4}$ . South Metropolitan was quiet at from 121 free to 122; and the debenture marked 82 $\frac{1}{2}$  and 82 $\frac{3}{4}$ . Commercial 4 per cent. was done at 111, and the 3 per cent. at 105—a rise of 1. Among the Suburban and Provincial group, Brentford new made 190, Brighton original 219 and 219 $\frac{1}{2}$ , Ilford "A" 146 and 146 $\frac{1}{2}$ , Tottenham "B" 112 $\frac{1}{2}$  (a rise of 1), Chester 110, and Sheffield 234. In the Continental Companies, European fully-paid changed hands at 24 $\frac{1}{16}$  and 24 $\frac{1}{8}$  cum div., Imperial at from 175 to 176 $\frac{1}{2}$ , ditto debenture at 94 $\frac{1}{2}$ , and Tuscan at 91 $\frac{1}{16}$  and 91 $\frac{1}{2}$ . Among the undertakings of the remoter world, Buenos Ayres was marked at 14 $\frac{1}{2}$ , ditto debenture at 98 $\frac{1}{2}$ , Cape Town preference at 53 $\frac{1}{2}$ , Melbourne 4 $\frac{1}{2}$  per cent. at 101 $\frac{1}{2}$ , Primitiva at 7 $\frac{1}{2}$  and 7 $\frac{3}{4}$ , ditto preference at from 53 $\frac{1}{2}$  to 53 $\frac{3}{4}$ , ditto debenture at 98 $\frac{1}{2}$ , and River Plate at 17 $\frac{1}{2}$ .



## ELECTRICITY SUPPLY MEMORANDA.

## Fixed Lighting Prices for Working-Class Householders—Hypotheses—Weaknesses of the Fixed-Price System—Cold Weather and Heating—Safety and Rules.

To the making by our electrical friends of fantastic schemes for capturing the custom of the working-class householder, there is no end. The fact that there has been a long succession of such projects sufficiently certifies the ineffectiveness, up to the immediate predecessor of the newest invention, of those that have gone before. Weaklings they have all been; and they now rest in peace. A new idea, however, has given our contemporaries something to talk about in this particular line; but it is a scheme that, we venture, on a long experience of the working-class consumer, to think is doomed to disappointing results for the originators. The project is feeble and uninviting in every particular; and it has our deepest sympathy. The wiring problem, in obtaining the working-class householder as a consumer of electricity, is undoubtedly an imposing one; but it is not the only one. It seems, however, to be considered the main one by a new venture called the Fixed Price Light Company, Limited, which owes its existence to Messrs. Siemens Bros. and Co., who have made use of a recent proposal of Messrs. Handcock and Dykes. The title of the new venture, in which we do not understand our electrical contemporaries are going to invest any of their surplus cash, discloses the principal feature of the scheme. The idea is to provide light at a fixed price per lamp per quarter, by arrangements made through four parties—the Fixed Price Company, the local electricity suppliers, the landlord, and the tenant. The fixed price is to include both wiring and light (from metallic filament lamps varying from 25 to 12 candles), but not lamp renewals. The consumer is expected to have not less than three rooms lighted. The weekly charges are to be 2½d. per lamp per week from April 1 to Sept. 30, and 3½d. per week from Oct. 1 to March 31. Of course, no meters are to be used; and "Stannos" wiring is the means by which cheap installation is to be obtained. It appears from the prices quoted that the charges are to be uniform whether a 25-candle or a 12-candle lamp is employed; and it may be supposed that in the decision as to the quantity of illumination required the Fixed Price Company is to be the sole arbiter. Fancy a 25 or a 12 candle light, in these days of cheap incandescent gas-burners, in any room of a workman's house at 3½d. to 2½d. per week! Poor people! Anything is electrically reckoned good enough for them. Consider, too, a man with a family earning (say) 25s. a week, living in a house containing five or six rooms, and requiring a light in each being called upon to pay week in week out for poor lighting only (without cooking) 1s. 6d. or 1s. 9d. per week in winter, and 1s. or 1s. 3d. in summer; and on top of this the cost of lamp renewals.

This is thought to be a project of competitive ability with the slot gas-meter system. The electricians have to become better acquainted with the working man, with his requirements, with his monetary capacity, and with his views as to obtaining value for his money. It is plain they know little of him as yet. Our friends of the "Electrician" are amusing when dealing with this subject. Assertion pours out; but either proof or figures in support are conspicuous by their absence. From the one little descriptive article in our contemporary, we will extract these gems of hypothesis: "The problem has been partially solved by the fact that, under suitable conditions of lighting, the metal filament lamp competes successfully with the incandescent gas mantle." [We are not told whether the suitable conditions exist in workmen's dwellings.] Then, again, "these prices [those previously named] work out at considerably less than the cost of gas on the slot-meter system, which is almost universally employed in the district in question"—that is, in the Rotherhithe New Road (where business is to be commenced by the infant Company), which is situated in the cheap-gas district of the South Metropolitan Gas Company. Still further: "The excellent lighting obtained with the Tantalum lamps, compared with that in similar houses where gas is in use, is most marked; and there should be a great demand in the neighbourhood for the 'new' light, particularly as it can be shown to be cheaper than gas." Let the "Electrician" proceed to show it then. In a leaderette on the subject, our contemporary also states: "There is no doubt that in practically all cases a much better light will be provided than with the usual gas-fittings; also—what is likely to be an important factor—at a lower cost than in the case of gas." There can be no doubt after these repeated declarations that our friends really believe what they say; and so the grounds of their belief would assuredly be as interesting to their readers as they would be to us. But the grounds are safely kept hidden. For this, perhaps refuge will again be taken, as a few weeks since, in the "Industrial Supplement," in that hackneyed phrase of evasion "figures can be made to prove anything."

After this little digression, let us return to the examination of the scheme. There is to be no check on the consumer other than his bare word, and the necessity for lamp renewals. The consumer, we read, will be expected to use his light reasonably and without waste; and in order to control him in this respect, the Company have decided not to include the supply of new lamps in his weekly rental, but to make the consumer pay for these. We admire this absolute abandonment to complete reliance in human nature. In gas supply, the working class householder is catered for through the prepayment meter. The most wasteful and careless are the best paying section of this class of consumer;

but it is only through the meters that they pay for their wastefulness and carelessness. There is a weakness in this respect in the fixed-price-per-point-of-lighting system. Another defect is that it is proposed that the lighting rental shall be collected by the landlord with the weekly rent for the dwelling. A landlord will not be prepared to jeopardize the letting of his property by having a charge foreign to the rent of the property tacked upon it for the benefit of other people, nor will he care for the responsibility of making the collection. In the winter months particularly, when the charge for lighting will be the heaviest, landlords of small property have already trouble enough to get in their rents without having an excess charge to collect. Still another defect of the system is that it does not provide for cooking and boiling as does the slot gas-meter system; and the working-class householder has to give up these conveniences unless he is prepared to enter into business relations with both the Fixed Price Company and the Gas Company. He will not do that. Another drawback of the system is that the small householder will in some cases be a difficult customer to deal with in the event of failure of supply. With him rights are rights. He must also be educated up to providing stand-by candles or else oil-lamps (which will mean further expense to him), in order to be prepared for collapses of the supply of current and of lamps. The cost of the replacement of metallic filament lamps will also be a source of worry and friction. Did someone ask the span of life we were prepared to predict for the Fixed Price Company? If so, we cannot give an answer. But there are grave doubts as to it being a long one, though in places hopes are trying to flourish on the ground that "the prices to be charged work out at considerably less than the cost of gas on the slot-meter system."

The cold snap of last week compelled one's thoughts to turn to the question of heating. It is such days as those we had (say) on Wednesday and Thursday of last week that cause people who have adopted electrical radiators to find out their great defect of inefficiency as heating agents, and to determine upon a change at the earliest possible moment. Sharp weather of the kind does as much good for gas companies in the competition for heating business as any factor that can be named, not even excepting expense. For it is only those to whom expense is no object who would dream of putting in electric radiators; and many of these, when the thermometer is low, and they are sitting in rooms that are supposed to be heated (this is an age of terminological inexactitudes) by electric radiators, physically realize the deception, and determine to transfer their patronage to gas. This has been a good season for the fitting of gas-fires; but, so far as we can gather, a bad one for electric radiators. People are finding them out; and their reputation as bad and unprofitable servants becomes accentuated with time, and spreads vigorously. That all refers to domestic heating. In large premises such as warehouses, halls, and churches, where electricity is used for lighting purposes, it is found that the former heating arrangements are no longer sufficient, and that something different must be adopted at considerable cost. This is a matter that is not usually estimated for when the change in lighting is proposed. There is St. Paul's Cathedral. In times past, air-warming by the aid of coke furnaces was the system of heating the historic building; and when supplemented by the heat given off by gas-jets, the plan was quite sufficient. Then electricity was brought into use for lighting purposes; and the need of a modern system of heating has become a matter of urgency owing to the growing complaints of discomfort in the winter. The result is that, in addition to the cost of installing the electric light, the authorities have had to go to the expense of putting in a low-pressure steam system. This is somewhat of an experiment for the heating of such a capacious building; and the extent to which the system will require to be applied is a matter of present experiment.

The information is to hand that the tragic fire at Messrs. Arding and Hobbs at Clapham Junction, which was caused just before Christmas by the bursting of an incandescent electric lamp, has involved the Insurance Offices in a loss of £130,000, of which amount the Phoenix Company will have to find the largest item—£33,000. Following upon this fire, the Phoenix Company publish a new edition of their rules; and it is seen that they are promptly putting into practical use for their own protection some of the disastrous experiences of recent times. We now read that "Flexible cords, except when used in connection with pendant lamps hung well clear of material, must not be used in shop windows containing inflammable goods." A similar condition is found in the rule dealing with special risks. "Drapers' shops, warehouses, stores, &c.," now have "Shop windows" as an additional sub-title; and to shop windows the restriction as to flexibles applies. The risk from the heat of electric lamps has not been overlooked; and it is stipulated that all lamps must be so fixed that there shall be no possibility of inflammable material being set on fire through lamp breakage. From "Temporary installations" flexible cord is debarred. It was thought that the old rules were sufficient to ensure safety. But the Insurance offices have been hard hit since then; and they are merely business people, and not philanthropists. By the way, when are we to have the publication of the promised proofs that the Kilburn fire was not caused electrically?

There was a large attendance at Fisherton Church on the morning of the 22nd ult., to witness the marriage of Mr. H. R. Hurle Bath, of Bloomsbury, and Miss Caroline E. Humphrys the fourth daughter of Mr. Norton H. Humphrys, of Salisbury.



## THE GASLIGHT AND COKE COMPANY.

### Half-Yearly Report.

THE following is the report on the working of this Company during the six months ending Dec. 31, which, with the accounts (an abstract of which appears on p. 309), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £10,000 towards the redemption fund (in accordance with the provisions of the Company's Act of 1903), and contributing £10,000 to the insurance fund, there remains a balance of £400,402 14s. 8d. The amount brought forward from the previous half year being £409,893 4s. 4d., there is a total sum available for distribution of £810,295 19s., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum, which will absorb £353,302 14s. 4d., and leave the sum of £456,993 4s. 8d. to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of 4½ per cent. compared with the quantity sold during the corresponding period of 1908. There has been an increase during the six months of 18,497 consumers, and of 35,153 in the number of gas-stoves sold and let on hire.

The Royal Assent was given to the Company's Bill in Parliament on the 16th of August last; and the amalgamation of the West Ham Gas Company with this Company took effect on the 1st of January.

The Directors had the pleasure of announcing a reduction, at the beginning of the year, of 1d. per 1000 cubic feet in the price of gas. This is the fourth reduction within 5½ years, and brings the price down to 2s. 8d. per 1000 cubic feet.

Notwithstanding the coal troubles in the North, the Company have received satisfactory deliveries of coal throughout the past few months; and the present stock at the works is ample for the Company's requirements.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distributing Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

CORBET WOODALL, Governor.

Horseferry Road, S.W., Jan. 20, 1910.

## SOUTH METROPOLITAN GAS COMPANY.

### Half-Yearly Report.

THE following is the report of the Directors of the Company for the six months ended the 31st of December, which, with the accounts [see p. 310], will be presented to the proprietors at the ordinary half-yearly meeting on the 9th inst.

1.—At the price of 2s. 2d. per 1000 cubic feet charged for gas during the past half year, the shareholders are entitled by the sliding-scale to a dividend at the rate of £5 9s. 4d. per cent. per annum. The profits made during the six months enable this dividend to be paid, and at the same time to increase by £12,901 the balance carried forward to the current account.

2.—The anticipation that a reduction in the price of gas would stimulate the consumption has been realized; the increase over the corresponding period being 4½ per cent. A slight improvement of trade in some parts of South London, as well as the activity of the Company's outdoor staff, has contributed to this satisfactory result.

3.—The disturbing effect in Northumberland and Durham of the Coal Mines Regulation (Eight Hours) Act is still a cause of anxiety. The Directors considered it a necessary insurance against interruption of supplies to lay down an increased stock of coal, in spite of the considerable cost entailed and the deterioration in quality which is certain to take place. It is hoped that matters will have settled down before the time comes for making fresh contracts, and that prices may then be more favourable to users.

4.—As regards working results, improvement in carbonizing can again be reported; the volume of gas made per ton of coal having risen to the satisfactory figure of 11,762 cubic feet. The effect of this has been that, notwithstanding the increased quantity of gas sent out, the coal used is less by 17,570 tons. There is again a considerable falling off in the return from residuals, chiefly under the heading of coke. The markets taking the surplus production have not been favourable, and endeavour is being made to counteract this effect in the future by encouraging a more extended use of this fuel within the Metropolis. Tar is lower to the extent of £1457, but now shows signs of improvement, mainly by reason of the better prices secured for pitch. The return from ammonia is practically unchanged, which is noteworthy if the smaller quantity of coal used is taken into account.

5.—Works costs have been heavier in the repairs necessary to plant; but there has been a good set-off in the saving of £7449 in carbonizing wages. Expenditure in the distribution department is still on the upward grade. A better and more extended service is required by the consumer, and recompense must be looked for

in thereby extending and increasing the Company's business. A branch office and show-room have been opened at Streatham, and are already very popular. Both in number and in money, the losses from slot-meters show a satisfactory diminution, especially having regard to the increased number in use.

6.—Many of the principal thoroughfares are now lighted with inverted incandescent burners, giving a greater illuminating power at a reduced cost; and their use is extending.

7.—The Directors record, with great regret, the death of their late colleague Mr. Edward H. Cardwell. He joined the Board seventeen years ago, and in that period won the esteem and regard of all with whom he became associated. It will be necessary at the extraordinary meeting to fill the vacancy caused by his decease; and Mr. Kenneth Phipson Hawksley, a duly qualified proprietor, has given notice of his candidature. One ordinary Director (Mr. Charles Carpenter) and one Auditor (Mr. Thomas Spooner Soden) retire by rotation. They are both eligible, and offer themselves for re-election. Mr. James D. C. Hunter has been re-elected an Employee-Director.

8.—It only remains to add that the Company's co-partnership continues to justify the expectations formed regarding it.

CHARLES CARPENTER, Chairman.

709, Old Kent Road, S.E., Jan. 24, 1910.

## GAS BILLS FOR 1910.

### [FIFTH ARTICLE.]

CONCLUDING the notices of the Bills treating of gas supply that are to be promoted in the ensuing session, a few more introduced by local authorities have to be dealt with.

The Little Hulton District Council Bill is the one containing the coke-oven gas project, to which special reference was made in our editorial columns last week. The ratepayers have, in public meeting, voted against the scheme going forward; but the question of taking a poll is still in suspension, so that the Bill cannot yet be regarded as having been finally disposed of. Apart from this, there is sufficient technical interest surrounding the proposal to justify an outline of its main features. The Council ask to be empowered to purchase from the Salford Corporation the portion of the gas canalization of the latter in the district for the sum of £7500, and of the Farnworth and Kearsley Gas Company at a price to be determined by agreement or arbitration in accordance with the provisions of the Lands Clauses Act. The Council require to be invested with all the rights of gas manufacturers and suppliers. Authority is sought for the Earl of Ellesmere and the Council to erect and maintain gas-works; but the Earl is not to furnish gas within the limits of supply except to the Council. Then follows a clause confirming an agreement with the Earl, which agreement is the subject of a schedule to the Bill. Turning to the schedule (which is a long document), it is seen that on or before March 31, 1911, the Earl is to supply to the Council coke-oven gas, upon specified terms and conditions, for lighting, heating, and other purposes. At the outset the supply of gas is to be limited to the portion of the Council's district now supplied by the Salford Corporation; but if the Council thereafter are in a position to supply any other part of the district, then the Earl is to furnish the gas required. The Council are not to procure from any other source a supply of gas during the continuance of the agreement. The Earl is to erect, at his own expense, all the necessary plant, exclusive of coke-ovens, upon scheduled land, and, in addition, two "benches" of retorts, which—in the event of a strike of the workmen employed by the Earl in connection with the coke-oven plant and machinery, or other unavoidable stoppage preventing the supply of coke-oven gas—are to be operated and worked by, and at the expense of, the Council. Inserted are several protective clauses. Regarding the quality of the gas, it is to have an illuminating power of not less than 14 candles tested by the "Metropolitan" No. 2 burner, is to be free from sulphuretted hydrogen, is to have a calorific value of 550 B.Th.U. gross, and is to be supplied at such initial pressure up to 10 inches as may be desired by the Council. Gas supplied after purification, but exclusive of any enrichment, is to be paid for at the price of 9d. per 1000 cubic feet for any quantity up to 400,000 cubic feet per day; but if, in any year ending on Dec. 25, the quantity of gas supplied, upon an average, exceeds 400,000 cubic feet per day, then the price is to be reduced from 9d. to 7d. per 1000 cubic feet. In the event of the Earl supplying at a less price to other persons, then, during the continuance of such supply, the lower price is to be applicable to the Council. The latter guarantee that if, in any year, the quantity of gas taken by them does not amount to 8 million cubic feet, then the Council are to pay the Earl for the deficiency between the quantity taken and the quantity guaranteed. If, too, the gas, after purification, requires to be enriched to reach the 14-candle standard, or, if the Council desire the gas to be of still higher illuminating power, then the Earl is to enrich the gas at the price of ½d. per candle power per 1000 cubic feet. The Council's obligations in respect of distribution plant will extend from the station meter on the scheduled land. The agreement has long duration. It is proposed that it shall have a definite span of 35 years, and then only to be determined on five years' notice in writing. If the agreement is determined under the clause just referred to, then



the Council have conditional rights of purchase of the land and plant on which the works stand. The clauses in the Bill are of ordinary form. The maximum price of gas is placed at 3s. 6d. per 1000 feet for 14-candle gas, tested by the "Metropolitan" No. 2 burner. The Council ask for sanction to the borrowing of the money required for the purchase of the distribution plant of the Salford Corporation within the Council's area and of the Farnworth and Kearsley Gas Company (with 40 years for repayment), £2000 for the laying of a new main and altering existing mains (with 40 years for repayment), £1000 for working capital (with 10 years for repayment), and such sums as the Local Government Board may sanction for the extension and improvement of the gas-works (repayment period at the discretion of the Board, but not exceeding sixty years), together with the amount necessary for paying the expenses of the Act (with five years for repayment). [Parliamentary Agents: Messrs. Lees and Co.]

The Mallow (Cork) District Council come forward with a compulsory Purchase Bill—the object of their desires being the property of the New Mallow Gas Company, Limited, who have also a Bill in Parliament. It is proposed that the purchase shall be either by agreement or arbitration; and this and the whole of the succeeding clauses referring to the transfer are in the ordinary form. The manufacturing and supply clauses are also of the customary character. An unusual proposition is that the price charged for gas "shall not at any time exceed such price as may be determined by the Board of Trade within one month after the price or consideration for the purchase of the undertaking of the Company has been determined." The prescribed illuminating power of the gas is 14 candles, tested by the "Metropolitan" No. 2 burner. Borrowing power is requested for the sum needed for the purchase of the concern, to be repaid within forty years; and for the extension and improvement of the undertaking and for working capital, such sums as the Local Government Board may sanction. [Parliamentary Agents: Messrs. Lees and Co.]

The question of the removal of the gas-works of the Matlock Bath and Scarthin Nick District Council is again to come before Parliament. The matter has been one that has engaged attention since 1896, in which year an Act was passed providing that the Council should, within seven years from Jan. 1, 1897, which was the date of transfer to them of the gas undertaking, remove the gas-works from the lands then occupied to some other site within the urban district of Matlock. In 1905, the time was extended to a further period of seven years. By the same Act power was given to the borrowing of £10,000 for the purposes of the removal and re-erection of the gas-works; but the works have not been removed, nor has the money been borrowed. Now the Council are asking that the provision as to the removal of the works should be repealed, and that they be empowered to maintain the existing works on their present site. This is the subject of the principal clause in the Bill; and then there follow a number of clauses giving ordinary powers—among them the old 10 and 15 per cent. discounts clause and the prepayment meter clause. Borrowing powers in respect of the gas-works are sought to the extent of £3000, for which (the proposed works being permanent ones) 40 years are named as the period of repayment. [Parliamentary Agents: Messrs. Roberts and Co.]

One part of the Middlesbrough Corporation Bill deals with gas and electricity. In connection with both commodities, the promoters contemplate power to supply prepayment meters, cookers, and fittings, demanding and taking therefor "such remuneration, or rents and charges, and making such terms and conditions, as may be agreed upon." An amendment of section 10 of the Corporation (Gas) Act of 1898 is proposed which will have the effect of substituting "not less than 12 candles" for the words "not less than 15 candles." It is also proposed to secure authority to allow discounts to large consumers of gas supplied for power purposes, not exceeding in any case 15 per cent., with the proviso attached that "such discounts shall be alike in terms and amount under like circumstances to all such consumers." The Corporation have by reason of the large increase in the demand for the supply of gas within the borough, expended money in providing gas mains and meters in excess of the sums which they were authorized to borrow for these purposes; and they now ask that all such expenditure (not exceeding £10,000) in excess of the amount authorized, be ratified. Provision is included for the repayment to the account or fund from which such expenditure was made of the whole of the money out of the loan to which sanction is now desired. Authorization is asked to the borrowing of not exceeding £10,000 for the purpose, to be repaid within thirty years, as well as to the borrowing of £50,000 for additional gas mains, meters, and fittings, with repayment in the same period. The following provisions relate to the vending of coke in the Corporation area:

All coke shall be sold by weight only, except where, by the written consent of the purchaser, it is sold by boat-load or by waggons or tubs delivered from the works where the same was made into the works of the purchaser.

If any person sells coke otherwise than is required by this section, he shall be liable to a penalty not exceeding £5 for every such sale.

Where any quantity of coke exceeding 2 cwt. is delivered by means of any vehicle to a purchaser, the seller of the coke shall therewith deliver, or cause to be delivered, or to be sent by post or otherwise to the purchaser or to his servant, before any part of the coke is unloaded, a ticket or note giving a statement of the correct weight of the vehicle, as well as the correct net weight of coke contained in the vehicle.

If default is made in complying with the requirements of this section

with respect to the delivery or forwarding of a ticket or note, or if the quantity of coke delivered is less than the quantity expressed in the ticket or note, the seller of the coke shall be liable to a penalty not exceeding £5.

If any person attending on any such vehicle having received any such ticket or note for delivery to the purchaser refuses or neglects to deliver it as required by this section, or, on being requested so to do, to exhibit it to any inspector of weights and measures or other officer appointed by the Corporation, he shall be liable to a penalty not exceeding £5.

If any person in charge of any vehicle in which coke is being carried, wilfully makes any false statement as to the tare weight of the vehicle, or wilfully does any act by which either the seller or purchaser of the coke is defrauded, he shall be liable to a penalty not exceeding £5.

Every person who shall sell or offer for sale coke in quantities not exceeding 2 cwt. in sacks only, shall carry such coke in sacks containing either 1 cwt.  $\frac{1}{2}$  cwt. or  $\frac{3}{4}$  cwt., and shall affix or cause to be affixed to the top of every such sack a metal label indicating the correct weight of coke therein. Any such person failing to comply with the requirements of this section shall be liable to a penalty not exceeding £5.

Any seller or purchaser of coke or person in charge of a vehicle in which coke is carried, or any inspector of weights and measures or other officer appointed by the Corporation may require that any coke, or any vehicle used for the carriage of coke, be weighed or re-weighed by any instrument stamped by an inspector of weights and measures. Provided as follows:

(a) No seller of coke, or person in charge of a vehicle in which coke is carried, shall be required under this section to carry coke beyond such distance not exceeding  $\frac{1}{4}$  mile as may be prescribed in that behalf by the Corporation;

(b) Where any such coke or vehicle has, at the instance of the purchaser, been weighed or re-weighed in pursuance of this section, and found to be of the weight stated in that behalf by the seller of the coke or the person in charge of the vehicle, the purchaser shall be liable to the payment of all reasonable costs actually incurred of, and incidental to, the weighing or re-weighing.

If any person obstructs any weighing or re-weighing authorized by this section, he shall be liable to a penalty not exceeding £5.

Any inspector of weights and measures or officer appointed for the purpose by the Corporation may stop any vehicle carrying coke for sale or delivery to a purchaser, and may weigh any load, sack, or other less quantity of coke found on such vehicle or which is in course of delivery to any purchaser.

If it appears to a court of summary jurisdiction that any load, sack, or less quantity so weighed is of less weight than that represented by the seller, the seller or person in charge of the vehicle shall be liable to a penalty not exceeding £5.

Any person who obstructs or hinders any inspector acting under this section shall be liable to a penalty not exceeding £5.

The Corporation also take power to create an accident fund to meet claims under the Employers' Liability or Workmen's Compensation Acts. The fund is to be formed by appropriations out of the various revenues, and it may accumulate until it stands at a maximum of £12,000. [Parliamentary Agents: Messrs. Durnford and Co.]

A Bill dealing with a variety of matters is being promoted by the Middleton Corporation; and one of its sections has reference to gas supply. But the provisions are merely to put the Corporation in possession of modern, and now usual, powers, including the prescription of the standard illuminating power of the gas at 14 candles, and its testing by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Baker and Co.]

In the Rhondda District Council Act, there is a clause, in the miscellaneous section, providing that a person shall not be entitled to demand from the Council a supply of gas, or the continuance of a supply, for premises having a supply of either gas or electricity from an installation other than that of the Council, unless he shall have previously agreed to pay the Council such minimum annual sum as will give a reasonable return on the capital expenditure and standing charges incurred by the Council to meet the possible maximum demand for the premises. [Parliamentary Agents: Messrs. Torr and Co.]

In the Warrington Corporation Bill, the Corporation seek, *inter alia*, to bring their gas powers up to date. From the preamble, it is seen that they have incurred capital expenditure in excess of their authorized borrowing powers for, among other things, the purchase of land for gas-works purposes at Winwick Road. In this instance, the expenditure has been advanced out of the gas-works reserve fund, and now amounts to £2083 16s. 6d. Certain amendments are to be made in former enactments relating to the charges for gas. A clause is inserted which proposes that "the Postmaster-General, in laying down any mains, pipes, wires, or other apparatus for telegraphic or telephonic purposes within the limits of the Corporation for gas supply shall not, without the consent in writing of the Corporation lay the same above, or so as to interfere with the access of the Corporation to any of the gas mains, pipes, or apparatus of the Corporation." Among a number of general powers, are found clauses providing for the payment of a standing charge, in addition to the price of the gas actually supplied, where a gas installation exists other than that of the Corporation. There is also a provision regarding a minimum charge for gas laid on to premises having a supply of electricity. These clauses are, *verbatim et literatim*, the same as those appearing in the Heywood Act of last session [see "JOURNAL" Oct. 12, p. 104]. In the financial section of the Bill, the Corporation ask for power to borrow, among other amounts, the sum previously referred to as having been expended in the purchase of land for gas-works purposes, with a period of repayment extending over sixty years. [Parliamentary Agents: Messrs. Baker and Co.]



## MUTUAL COMPENSATION SCHEMES.

THE particulars which have been given in the last two issues with regard to the operation of the Workmen's Compensation Acts during the year 1908, may now be supplemented by a few figures, covering the same period, in connection with the various mutual schemes entered into by employers and employed for the purpose of "contracting out" of the Act. This information is to be gathered from the Annual Report of the Chief Registrar of Friendly Societies, by whom all such schemes have to be certified. This document for 1908 bears the familiar signature of Mr. J. D. Stuart Sim.

On the passing of the Workmen's Compensation Act of 1906, it was pointed out that the measure altered to a considerable extent the provisions hitherto existing for enabling employers and workmen to "contract out." The scales of compensation in connection with such schemes are to be not less favourable to the workers and their dependants than those contained in the Act. If the workmen contribute, the scheme must confer benefits at least equivalent to those contributions in addition to the benefits to which the employees would have been entitled under the Act; and a majority of the workmen (to be ascertained by ballot) must be in favour of the scheme. The Registrar, however, is not deprived of the discretion given him by the Act of 1897 in comparing the benefits under a scheme with those under the Act. The scales can be considered as a whole; they need not be absolutely identical with those set forth in the Act. He can also take into consideration any extra benefits conferred under a scheme, and not mentioned in the Act. As regards the scale of compensation, the principal alteration brought about by the 1906 Act is, of course, that in case of incapacity the payment dates from the time of the accident—unless the incapacity lasts for less than two weeks, when no compensation is payable for the first week—instead of from a fortnight after it.

The returns for the year ending Dec. 31, 1908, show that during this period there were 32 schemes in active operation under the Act of 1906. They are divided under the headings of railways, factories, mines, and quarries. The Great Eastern—the only Railway Company represented—possess a scheme which was adopted by 28,628 of their workmen, out of 30,000. The men contributed in the aggregate £6034 during the year; and the Company, £12,241. The payments on death were £6286, and during incapacity £9799; the balance of funds at the end of the year amounting to £1801. The number of deaths resulting from injury was 38; while there were 2911 cases of incapacity. The average contribution of each employee worked out at 1d. per week. The twelve schemes in connection with mines were adopted by 16,702 workmen, out of a total of 17,227; their contribution being £6942, and that of the employers £10,189. The total payments were: On death, £1594; during incapacity, £9189; for other benefits, £2593. At the end of the year, the funds were £49,154. There were twelve deaths, and 3290 cases of incapacity. The average contribution of each workman was 8s. 3d. One scheme relating to quarries was adopted by the whole of the 770 employees, who contributed £229. The contribution of the employers was £565. The payments to dependants on death were £39; while £364 was paid during incapacity (223 cases), and £297 for other benefits. The average contribution of workmen was 6s.; and the funds at the end of the year amounted to £1005. In England and Wales, there were sixteen schemes in relation to factories of various kinds. These were adopted by 16,205 workmen out of a total of 16,539. They contributed in the aggregate £1172; the amount given by the employers being £7959. The payments on death were £1202; during incapacity, £5499; for other benefits, £2196. The funds at the end of the year totalled £8337. The number of deaths resulting from injury was five; and in all except one case dependants were left, to some of whom pensions were granted, in addition to the money returned as having been paid. There were 1185 cases of incapacity. The average contribution of each workman for the year was nearly 1s. 6d.; but in four of the schemes the whole of the contributions were paid by the employers. There were also two factory schemes in Scotland, which were adopted by the whole of the 2972 workmen employed, who contributed £466, to which the employers added £1776. The payments on death were £478; during incapacity, £1071; for other benefits, £63. The funds amounted to £4988. One death from accident occurred during the year; while the number of cases of incapacity was 310. The average contribution of each workman was 3s. 2d.

These factories cover a wide range of industries; but it is to be noted that the number of gas undertakings in connection with which mutual compensation schemes are in operation still remains at two—the South Metropolitan Gas Company and the South Suburban Gas Company. Once more, in the case of the South Metropolitan Company the whole of the 6192 workmen employed "contracted out" of the Compensation Act by joining the mutual scheme; their contributions for the year to Dec. 31, 1908, amounting to £165, and those of the Company to £1627. The payments on death and to dependants came to £702; but there was actually in the twelve months included in the return only one death. The cases of incapacity numbered 192, in connection with which £854 was paid. Other benefits absorbed £236; and these payments equalled the contributions (£1792) made by the Company and the

employees. In the case of the South Suburban Company, also, the whole of the 635 men employed joined the scheme; the workmen contributing £29, and the Company £197. No fatal accident occurred during the year; but a sum of £30 is returned under the heading of "On death and to dependants." There were 37 cases of incapacity, in connection with which payments amounting to £164 were made. Other benefits absorbed £32; and these sums equalled the contributions (£226) of the Company and the employees. It is estimated that the maximum amount payable under the Act in connection with the cases of incapacity would have been £124, as compared with the £164 actually distributed by the South Suburban Company under their scheme.

It seems that, in the aggregate, particulars were returned of 7740 cases of incapacity completed during the year by weekly payments; a sum of £19,679 being involved. In nearly 19 per cent. of the total number, the duration of incapacity was one week and under; the cost being £893, or an average of 12s. 2d. for each case. In 20 per cent. of the whole, the duration was over one week, and under two weeks; the cost being £1715, or £1 1s. 11d. per case. There were 43 cases (0.56 per cent. of the total number) in which the incapacity exceeded 26 weeks; and the cost of these to the funds was £29 10s. 11d. for each case, or 13s. 4d. per week of incapacity. It would appear from eight returns furnishing information as to the estimated maximum amount that would have been payable under the Act, that the workmen would have been entitled to receive £2815; whereas the sum actually paid to them under the respective schemes was £3080. In addition to those already mentioned, 42 cases of incapacity were settled by the payment of a lump sum, thus making the total number of cases completed during the year 7782, the cost of which was £22,945. In the aggregate, the 32 schemes were adopted by 65,277 workmen, whose contributions during the year amounted to £14,843—those of the employers being £32,730. There were 56 fatal accidents; and a total of 7919 cases of incapacity.

## LOCAL INCOME AND EXPENDITURE.

### Finances of Urban District Councils.

HAVING given some attention to the finances during the twelve months ending March 31, 1907, of the Borough Councils (*ante*, p. 229), we are now confronted with the succeeding instalment of the Local Taxation Returns (Part VI.) for that year. This deals with the accounts of Urban District Councils, other than Town Councils; the period covered being precisely the same—from March 31, 1906, to March 31, 1907.

The number of urban district councils in England and Wales, for districts other than boroughs, dealt with in the report is 811. This shows a decrease of one when compared with the previous year; there having been two new councils formed, while three have disappeared owing to incorporation, &c. Though not generally on so large a scale, the financial transactions of the district councils are in many ways similar to those of the borough councils. A considerable portion of the transactions recorded relates to water, gas, electric lighting, market, and tramway and light railways undertakings, which are all of a "reproductive" character. It is pointed out in the returns that the total receipts from these concerns were sufficient to cover 94.3 per cent. of the expenditure on them, including charges in respect of loans. A further large part of the transactions relates to the works of private improvement, the cost of which is recovered by the councils from owners or occupiers of property; and then, in addition, the receipts include sums from such undertakings as sewage farms, baths and wash-houses, slaughter-houses, hospitals, cemeteries, &c. Of the total number, 54 councils acted as local elementary education authorities.

The receipts of the urban district councils, excluding receipts from loans, amounted during the year 1906-7 to £10,724,289, including £1,524,000 on account of elementary education. The total receipts of the councils for the preceding year were £10,447,232. These receipts included sums received from county councils under the provisions of the Local Government Act, 1888, and also grants under the Agricultural Rates Act, 1896. The latter Act, however, does not apply to general district rates, which, in the case of the urban district councils, produced 85.8 per cent. (£5,013,139) of the total raised by rates (£5,840,533); and hence the amount of the grants is small in comparison with that of the total income from rates. Among the other receipts were: Gas-works, £887,996 (as against £871,891 in the preceding year); water-works, £663,151 (against £650,567); electric light undertakings, £282,893 (against £241,371); and tramways and light railways, £208,716 (against £153,110). It is pointed out in the Blue-Book that in making comparisons of the totals of urban district council financial items, the fact should always be borne in mind that the authorities included are subject to variation from year to year—fresh bodies being continually added, and others removed from, the list. So far as it has been possible to ascertain from the returns made, the receipts in respect of gas-works, just quoted, for the year 1906-7, included £662,815 from gas-rentals, and £193,234 from the sale of residual products. The receipts in respect of water-works included £461,077 from water rates, rents, or charges for domestic purposes within the respective districts of the councils owning the water-works. The amount raised during the twelve months



under review by means of public rates accounts for 54·5 per cent. of the total receipts; while the returns from the principal undertakings which produce revenue (water, gas, electric lighting, markets, and tramways and light railways), together with the sums recovered in respect of private improvement works, represent rather more than 23·8 per cent. of the councils' income.

In the twelve months ending March 31, 1907, the total expenditure of the councils, excluding that defrayed out of loans, was £10,640,892, as compared with £10,503,244 the preceding year; so that there was an increase in the outlay of £135,000. About £20,000 more appears under the head of elementary education; and loan charges are £63,000 heavier. The following items of expenditure (in which charges for interest and repayment of loans are not included) may be mentioned: Public roads and streets, £1,658,858 (as against £1,673,199 in the previous year); education, £1,355,426 (against £1,342,848); gas-works, £604,695 (against £574,823); public lighting, including public lighting by electricity, £489,481 (against £469,153); sewerage and sewage disposal, £455,061 (against £446,913); water-works, £381,368 (against £371,628); tramways and light railways, £134,834 (against £103,540); electric lighting, not being public lighting, £129,687 (against £118,698); and £2,887,588 for repayment of principal (otherwise than out of sinking funds or redemption funds), payments to sinking, &c., funds, and interest on loans, as compared with £2,824,639 in the preceding year. Of the principal and interest so repaid, and allocations to sinking funds, £250,009 was on account of gas-works, £382,935 of water-works, £161,445 of electric lighting, and £116,076 of tramways and light railways. The aggregate length of roads maintained and repaired by the councils at the commencement of the year 1906-7 was 2363 miles; and the outlay under this head amounted during the twelve months to £461,283, or at the rate of £195 per mile. The total length of roads other than main roads maintained and repaired was 11,357 miles; the expenditure being £863,086, or an average cost of £76 per mile.

The expenditure of the district councils out of loans (including certain sums spent in anticipation of loans) during the year 1906-7 amounted to £2,835,487. Of this, £108,833 was on gas-works, £257,378 on water-works, £215,957 on electric lighting, £440,714 on tramways and light railways, and £510,919 on sewerage and sewage disposal works. The total expenditure out of loans during the year was less than that of the preceding twelve months by £260,614. Large decreases appear in the expenditure on account of electric lighting, water-works, sewerage and sewage disposal works, and private improvements; but the outlay on elementary education and on tramways and light railways shows an increase. The total amount of the loans raised during the year was £2,793,697, including the following amounts: Gas-works, £103,233; water-works, £332,760; electric lighting, £161,672; tramways and light railways, £469,089; and sewerage and sewage disposal works, £540,249. The amount of loans raised was less by £474,617 than that raised in the previous year; the decrease being spread over most of the undertakings—one exception being tramways and light railways.

The amount actually repaid during the year in respect of loans (including payments out of sinking and redemption funds, but excluding unexpended balances of loans applied to the repayment of principal) was £1,696,337. The outstanding loans at March 31, 1907, amounted to £35,622,307. Of this debt, £8,582,717, or 24·1 per cent., was for purposes of sewerage and sewage disposal; £5,516,276, or 15·5 per cent., for water-works; £3,705,928, or 10·4 per cent., for education; £3,466,513, or 9·7 per cent., for gas-works; £2,927,234, or 8·2 per cent., for street improvements; £2,334,510, or 6·6 per cent., for electric lighting; and £2,043,783, or 5·7 per cent., for tramways and light railways. The loans outstanding in respect of what are termed the "reproductive" undertakings, and for works of private improvement, represent a large proportion of the debt; the aggregate for gas-works, water-works, electric lighting, tramways and light railways, markets, and works of private improvement being no less than £14,422,674, or 40·5 per cent. of the total debt. The loans outstanding during the year dealt with in the Blue-Book increased by £1,150,000; the largest increases being for tramways and light railways, elementary education, water-works, sewerage and sewage disposal, street improvements, and electric lighting. The amount remaining at the end of the twelve months in sinking and redemption funds for meeting loans repayable in this way was £566,056. The sum paid into the funds during the year was £221,491; and the amount taken out of them and applied to the repayment of principal was £213,943.

According to the 1901 Census, and taking into account the alterations of area since that time, the total population of the 811 urban districts other than boroughs was 6,808,318. The total assessable value of these districts for the purposes of the general district rates, or other rates out of which the general expenses of the district councils were defrayed, was £31,804,974. The rates raised by the councils, other than for purposes of elementary education, amounted to £5,157,702, and were equivalent to 3s. 2·92d. in the pound on the total assessable value of the districts for the purposes of such rates. This figure compares with 3s. 2·63d. in 1905-6. The total sum raised by the councils by means of rates during the year for the purposes of elementary education, amounted to £682,831, or (say) 1s. 3·33d. in the pound calculated on the assessable value for the purposes of the poor rate of the districts in which the amount was raised.

Comparative tables which accompany the returns show that the

receipts of urban district councils from all sources, other than from loans, increased from £8,399,739 in 1902-3, to £10,724,289 in 1906-7. In this period it should be pointed out, the receipts under the head of elementary education have gone up from £174 to £838,178. The total expenditure not defrayed out of loans increased in the five years from £8,358,596 to £10,640,892; the rise in the figures for elementary education being from £12,508 to £1,265,178. The receipts from rates, for purposes other than elementary education (including grants under the Agricultural Rates Act), which amounted to £4,940,679 in 1902-3, rose in 1906-7 to £5,161,654. Receipts from the most important undertakings which yield revenue—gas-works, water-works, electric lighting, tramways and light railways, and markets—show, it is pointed out in the Blue-Book, large increases during the last four years; while the annual expenditure in connection with them has also gone up considerably. In recent years, it is added, there has been a distinct slackening in the rate of increase of the debt of urban district councils. During the five years ended March 31, 1907, however, there was a rapid and continuous increase in the amount of outstanding loans for electric lighting and tramways and light railways. The item of elementary education also, of course, greatly increased in the years during which such loans formed part of the debt of the urban district councils. In the period between March 31, 1903, and March 31, 1907, the outstanding loans for electric lighting increased from £1,497,066 to £2,334,510; while those for gas-works showed little change—having merely gone up from £3,278,203 to £3,466,513.

## COMMERCIAL PEAT: ITS USES & POSSIBILITIES\*

THE book under review is intended as a companion to "Peat: Its Use and Manufacture," which was written by the same author, assisted by the late Mr. P. R. Björling. An extensive amount of information on this fascinating, though as yet unprofitable, subject has been collected in this volume. So much, indeed, that it would at last appear as though the pioneering work must be drawing to a close—giving place to a more profitable future.

So much ingenuity has been put into several of the best known processes for the utilization of peat, that success is well merited. The vastness of the possibilities of the peat industry are better understood when we realize that, compared with Ireland's 2,800,000 acres of peat bogs, Canada and the United States are known to possess 50,000,000 acres; and many other countries are vastly endowed (or otherwise) with peat land. The author gives chapter and verse for his belief in the great commercial possibilities in the production of alcohol from peat. Its suitability as a substitute for petrol and the cheapness of its production (said to be 3d. per gallon) seem to bear evidence to the feasibility of his argument.

The Woltereck process for the production of ammonia, in which the peat is subjected to moist combustion in special furnaces, maintained at a low temperature, is described in Chapter II. The process, which has been found to give a yield of 5 per cent. of sulphate of ammonia, has been successfully employed on peat containing upwards of 80 per cent. of water without any preliminary drying. It is well known that the greatest difficulty encountered in the utilization of peat is the very real one of drying a material containing some 90 per cent. of water; and it is very evident that only those methods which deal with this difficulty in a cheap and practical manner have any chance of achieving a financial success. A chapter is devoted to the value of peat for the production of nitrogenous compounds. Peat will contain anything from 1 to 2 per cent. of nitrogen. As an instance of the value of this constituent, the author states that a bog of 2500 acres, of a depth of 6 feet, with a content of 2 per cent. of nitrogen, is capable of yielding between 800,000 and 900,000 tons of nitrate of sodium.

Space will not allow of a description of the Ekenberg wet carbonizing process, in which peat is dried in a most ingenious manner and finally briquetted to produce fuel very nearly equal to coal. Several gas-producers have been manufactured for the use of peat. Messrs. Crossley Bros., who have devoted much attention to this problem, state that excellent results may be obtained from peat containing as much as 60 per cent. of water, while the production of sulphate was found on a number of tests to be, on an average, considerably over 100 lbs. per ton. An interesting description is given of Ziegler's peat-coking process which has, on a limited scale, established itself as a commercial success in Germany, though at present a plant at Dartmoor, erected in 1908, is the only one working in this country. The manufacture of paper from peat is another of the industries which may gain a footing from a properly-organized development of this waste material.

The drying of peat, its excavation and cutting, mincing, and squeezing, are all described in some detail, while illustrations are given of the various types of machinery and furnaces in use. No possible purpose to which peat may be put seems to have been overlooked by the many ingenious inventors who have linked their fortunes to this hitherto disappointing substance. A peat moss litter factory, with its baling press, its grinding willow, and

\* Commercial Peat: Its Uses and Possibilities. By Frederick T. Gissing. London: Charles Griffin and Co., Limited; 1909. [Price 6s. net.]



its rotating sieves, makes an interesting description. It is, indeed, a very evident fact throughout the book that the author has spared no pains to make his work complete.

No suggestion is made that dried peat should be used for ordinary gas-making purposes, though it is known that a ton of peat in a properly-dried state will yield 11,000 cubic feet of 17 or 18 candle gas. It could have been wished that more evidence had been shown in this work of the value of the various processes described from a dividend-paying point of view. Several of those in question were stated to be well established and profitable; but, unfortunately, no figures are given which would inform those interested as to what extent they are financially successful. Without these very necessary particulars, it cannot be said that the "possibilities" are put forward as fully as might be desired.

A practical demonstration in £ s. d. is necessary before business people will be convinced of the feasibility of peat being made a commercial success. The book is, however, full of information, is well illustrated, and is decidedly interesting and instructive. The author evidently has a thorough grasp of his subject, and succeeds in imparting some part of his enthusiasm to his readers.

## AMERICAN GAS INSTITUTE AND CALORIMETRY.

As mentioned in the account of the proceedings at the last annual meeting of the American Gas Institute which appeared in the "JOURNAL" for the 9th of November, the Committee on Gas Calorimetry submitted a report on their work during the year. It was presented by Mr. J. B. Klumpp, the Chairman, who offered a few explanatory remarks, from which we take the following particulars.

The work of the Committee was carried on, as in the preceding year, at the Wisconsin University; and it comprised the investigation of various calorimeters and methods of operation. The Committee went generally over the previous year's work, and found that the instructions then given were practically correct. They emphasize the necessity for care in the selection of apparatus, particularly meters, the interior water overflow of which causes trouble and discrepancies. A case came under their notice where a large sum of money was held up on a contract because an error of from 15 to 20 per cent. was made in the calorific value of the gas, due to faulty meter registration, arising from the cause named. The principal difficulty in regard to the accuracy of calorimeters in the past has been the temperature of the inlet water. In their previous report, the Committee said this should be the temperature of the room. They investigated the subject very thoroughly last year. With the room temperatures at 70° Fahr., and with water temperatures as low as 40° and as high as 90° Fahr., they obtained a curve that showed the error for various temperatures. With the water at 40° and the room at 70°, the error was as high as 20 B.Th.U. *plus*; with the water at 90° and the room at 70°, it was 18 B.Th.U. *minus*. This curve showed that if the water temperature was within 5° of the temperature of the room, the reading should be within 1 B.Th.U. of the heating value of the gas, provided everything else was right. This subject was further analyzed by determining the radiation of the calorimeter and the loss in absorption of sensible and latent heat. The radiation equalled from 5 to 6 B.Th.U.; but the results came within 1 B.Th.U. of the correct heating value when the water was within 5° of the temperature of the room. These readings are all shown in detail in the report. The Committee made an investigation of the effect of humidity on the calorimeter, and found that in extreme cases there was an error of 4 to 6 B.Th.U. That is to say, when the humidity was from zero to 30 per cent., the error was as high as 4 to 6 B.Th.U.; but if it was within 50 to 100 per cent., or normal conditions, the error was within 2 B.Th.U.

In their previous report, the Committee recommended that thermometers should be placed on the same level. They received a letter from the makers of the Junkers calorimeter in Germany stating that they were constructing them in accordance with this design. They also now make a calorimeter that has provision for cleaning, which the Committee found was a very necessary qualification. They consider that after it has been used for about two years it should be cleaned the same as a boiler—the scale or mud being taken out of the water-jacket. If the bottom of the calorimeter can be taken off without unsoldering, it makes a much more convenient and reliable instrument. The Committee still believe they can get thermometers to read accurately with 0.1 of 1°—that they can calibrate their meters to read correctly, and can weigh the water or measure it accurately, and get a heating value that will be within about 1 per cent. of the actual heating value of the gas.

The following are some extracts from the last

### REPORT OF THE COMMITTEE.

In 1907, the first Committee on Gas Calorimetry was appointed by the President of the Institute, and, after a year's investigation and experimental work, the report of the Committee was presented to the Institute in October, 1908.\*

The Committee, after a complete search of available literature on the subject, found little authentic information published

that would enable them to draw any real conclusions as to the best methods or the best instruments to adopt for commercial practice. It was therefore decided to obtain calorimeters of various types, and proceed with as thorough an investigation of the gas-calorimeter as was possible in the limited time at their command. The report of 1908 furnished a detailed description of the experiments undertaken and the methods adopted in arriving at the conclusions given. The experimental work with such instruments as were obtainable enabled instructions and precautions to be formulated which were considered necessary in assisting the average operator to a more accurate determination of the calorific value of the gas. The work undertaken at that time brought to light several important points that needed further investigation to confirm these deductions and conclusions; and to this end the Committee was continued, and further experimental work was undertaken during the past year. The result of these experiments, and the inferences deduced, seem to confirm the statements made by the Committee in 1908.

The report presented to the Institute last year covered a short description of the practice of gas calorimetry in both America and Europe, and gave reasons for the increasing use of the calorimeter as an instrument for determining the quality of a commercial gas. It went into the principles of gas calorimetry, and described the methods of general operation and the reason for selecting the units of measurement. An investigation of several types of calorimeters was then made, and the type embodying the principle of heating a certain quantity of water to a known temperature was generally approved and adopted as being the most practical method of determining the heating value of a commercial gas.

Four different makes of gas-calorimeters were tested: The Junkers, Boys, Simmance-Abady, and Sargent. Descriptions and illustrations of these instruments were given, showing the methods adopted by the inventors in utilizing the principle of water heating. The instruments were purchased direct from the manufacturers by operating concerns, whose purpose was to use them in daily work; and they were not specially prepared for scientific investigation. The Committee, appreciating the result of the publication of such an investigation, were exceedingly careful in the selection of a suitable location for their work, the adoption of most carefully calibrated meters and thermometers, which were checked by the best authorities, and in choosing operators whose work could be thoroughly relied upon and be unbiased.

Tests were made to determine the best type of meter for measuring the volume of the gas, a suitable type of governor for governing the pressure of the gas, and the most practical method of determining the exact quantity of water passed through the calorimeter. A careful study of the calorimeter proper was made to determine the most convenient and most accurate method of transmitting the heat from the gas to the water, the best type of gas-burner to use, and what was necessary in the way of thermometers that would give accurate temperature readings. This question of thermometers occupied a large proportion of the time spent in the investigation; and it was only after many calibration tests that some few thermometers were found which, with proper correction curves, were accurate enough to be adopted.

The work of the Committee was then devoted to the very important subject of the water supply. This was found to be one of the fundamental qualifications for accurate work; and the quantity of water to be used, and the inlet temperature and rise in temperature of that water, were made the subject of very careful study. Further tests on the general efficiency of the calorimeter were carried out, and gave results that confirmed previous investigations in Germany by Dr. Immenkötter, and confirmed the views of the Committee that the gas-calorimeter could be made and operated as an instrument of precision. The operating instructions given in the report of 1908 were compiled after a thorough study of the subject. They were intended to be concise and explicit; and it was hoped they would enable the average works operator to use a calorimeter with consistent results.

Finally, in the report for 1908 suggestions were made for further investigation. These covered the work which the previous Committee were unable to carry through, owing to the limited time at their disposal; and it was desired that these determinations should be made, if possible, by continuing the investigation. The suggestions consisted of determining the effect on heating value resulting from a difference in temperature between the inlet water and the room temperature, the effect on calorific readings resulting from a varying atmospheric humidity, and a determination of the heat lost through the products of combustion leaving the calorimeters above or below the atmospheric temperature. The work was continued along these lines; and the results, with those of some further experimental work carried on, are submitted in the present report.

This year [1909], as last, your Committee confined themselves to the water-heating type of calorimeter, and continued their investigation with some of the instruments previously tested, with the addition of some others obtained for comparative purposes. The investigation followed somewhat the lines laid down and suggested in the previous year's report as being desirable to continue; and the results obtained signified the correctness of the deductions then made.

Appreciating that one of the greatest and most frequent causes for discrepancies in results was the variation in the temperature of the inlet water from that of the measured gas and the surrounding air, a series of experiments were undertaken to determine

\* See "JOURNAL," Vol. CIV., p. 904.



what this discrepancy was, and then an analytical determination of the individual causes and confirmation of the results. The results of this test go to prove the conclusions and instructions given in 1908, that the temperature of the inlet water should be approximately the same as that of the gas and the atmosphere of the room. A series of experiments were made to determine the effect of varying the temperature of water at the outlet. This work was, of course, limited by the capacity of the calorimeter for water, and the rate at which the water could be made to pass through the instrument. The limits of this were comparatively close; and results confirmed last year's investigation.

From the observations made in these tests, it was apparent that there was some discrepancy in the readings, due to the difference in humidity between the gas and air supplied and the products of combustion. So preparations were made to vary artificially the humidity of the gas and air delivered to the calorimeter. The result of this test showed that the error caused by the humidity of the air is a relatively small quantity, seldom exceeding a figure that will cause excessive discrepancies in the final results. This observation is directly opposed to the results observed in determining the value of a gas by readings of illuminating value, which show greatly the effect caused by variations in humidity.

Several calorimeters were obtained by the Committee for the purpose of comparison. They consisted of one other Junkers, two instruments of a further improved Sargent type, and a Graefe calorimeter—the last a cheaper article now being placed upon the American market. The details of the last comparisons are included in the reports, as tending to conclude the work of the preceding year. An investigation was further made to determine what could be obtained in the way of a serviceable thermometer that would be accurate at all points in the scale, and show positively the difference in the inlet and outlet water temperatures. The results of this work are given by a description of these thermometers and a set of calibration curves obtained from a test of a pair received by the Committee. The conditions of gas supply and storage were exactly as before, and consisted of taking all samples direct from the city mains supplying the laboratories. These samples were stored in gasholders of 60 cubic feet capacity each. From these holders the gas was supplied to a service line connected to each calorimeter; and uniform pressure was maintained through a Connelly governor.

Because the correctness of the determination of the heating value of a gas depends so largely on the accuracy of the measuring devices, all water-weighing buckets, meters, and thermometers were very carefully calibrated before using them to make tests on the various instruments. This was done in every case as was described in last year's report. In all the tests in this investigation, the quantity of water used was determined by weighing in copper buckets. The buckets were available in sufficient numbers to supply each calorimeter; and they were all made of the same weight, so that a common counterbalance could be used. The water was weighed on a torsion balance sensitive to 0.001 lb. in 10 lbs. Each bucket, with the inside wet, was carefully balanced against the counterweight. This was done to facilitate weighing. Before balancing the wet bucket, it was shaken in an inverted position for about 5 seconds to remove the drip.

The meters used in the tests were all calibrated against 0.5 cubic foot bottle which had been previously calibrated by weighing the volume of distilled water at 62° Fahr. contained in the bottle. With this device all meters were regulated to an accuracy of 0.05 per cent. Each test on the meter consisted in passing 0.5 cubic foot of gas through at the rate to be used subsequently, which necessitated two fillings of the bottle. The meters were tested under the same pressure, and approximately the rate of flow at which they were to be used in the subsequent tests. They were again tested after the investigation was concluded. All the thermometers used in the tests were carefully compared against those of the University of Wisconsin, which had been calibrated by the Bureau of Standards at Washington and the German Bureau of Standards; and correction curves were constructed and used with each thermometer.

The Committee then proceed to deal in detail with the matters alluded to in their report. On the subject of the variation in heating value caused by a difference in temperature between the room and the inlet water, they say:

In many places where a calorimeter is installed, the water supply is taken directly from the city service-mains. In the winter, the water is much colder than the room; and this is especially true in a cold climate. In other cases, the water supply may be much warmer than the room. The purpose of this series of experiments was to determine the error that arises when the water supply is not the same as the temperature of the room. This was practically constant, for it varied only from 68° to 70° Fahr.; and the temperature of the water varied from 40° to 90° Fahr. The rise in temperature of the water at the outlet of the calorimeter over the inlet in all tests was approximately 15° Fahr., and the rate of combustion about 7 cubic feet per hour, which had previously been determined as a satisfactory point of operation.

The results of these tests show that the heating value gradually decreases as the temperature of the water at the inlet approaches and surpasses the temperature of the room. Below the room temperature, the curve bends down; and above it, the curve

bends up. The change in heating value is much slower below than above the room temperature. There is a point of inflection in the curve, and at this point would be the temperature at which the calorimeter should be operated to get correct results. The exact point of inflection of this curve is not at once apparent, and it becomes necessary to analyze the sources of loss and gain at the various temperatures. If the proper corrections were made at each temperature, the resulting curve should be a straight line, since the sample of gas was homogeneous, and the calorimeter constant in its operation.

The sources of error to be investigated are: (1) Radiation or absorption of heat by the calorimeter body; (2) the sensible heat in the air and gas supplied and in the products of combustion; (3) the latent heat in the vapour carried by the products of combustion.

(1) That heat is absorbed from, or radiated to, the atmosphere by the calorimeter is due to the fact that the water supply entered the instrument at temperatures ranging from 30° Fahr. less to 20° Fahr. more than the room temperature. These various amounts of heat are determined by allowing the water to flow through the calorimeter without having any flame inside, but having the combustion chamber and vent for the products of combustion set exactly as in the other tests. The temperatures at the inlet and outlet were then taken, and it was observed that when water colder than the air flowed through, the outlet temperature was greater than the inlet temperature; and when the water at the inlet was warmer than the room, the outlet thermometer showed a lower temperature. The average amount of water passed while 0.2 cubic foot of gas could be burned at the rate of 7 cubic feet per hour was 7.339 lbs. Then per cubic foot of gas the total water would be 36.695 lbs. The heat absorbed or radiated per cubic foot of gas burnt is therefore the product of 36.695 and the change in temperature. The data and computations are tabulated below:—

Temperature of Inlet Water, Deg. Fahr.	Change in Temperature of Water, Deg. Fahr.	B.Th.U. per Cubic Foot.	How Disposed.
40°0	.. + 0°2430	.. 8°920	.. Absorbed.
53°3	.. + 0°1044	.. 3°835	.. "
59°4	.. + 0°0792	.. 2°905	.. "
70°1	.. - 0°0036	.. 0°132	.. Radiated.
79°2	.. - 0°0018	.. 0°066	.. "
88°7	.. - 0°0216	.. 0°793	.. "

At 40° Fahr. there are 8.92 B.Th.U. absorbed; at 70° Fahr., practically no heat is absorbed or radiated; while at 90° Fahr., there is only about 0.8 B.Th.U. radiated. These figures furnish one reason why the water supply should be at the temperature of the room; for then there is a thermal balance.

(2) The heat balance between the dry incoming and outgoing gas can only be obtained from an analysis of the combustible gas and the products of combustion, from which data the air supplied for combustion and the volume of the products of combustion can be computed. The combustible gas and the air supply bring in a given amount of sensible heat constantly, since the gas and air temperature did not vary appreciably during the test. At different stages in this series of tests, the products of combustion leave at temperatures different from the respective gas and air temperatures; and therefore heat is either absorbed or radiated, depending on whether the products leave at a lower or higher temperature respectively than the incoming gases. The design of the calorimeter is such that the products of combustion are cooled to the temperature of the base of the instrument, which is practically the temperature of the inlet water. Since the combustible gas is composed of some hydrocarbon gases whose combustion forms water vapour, a cubic foot of dry combustible gas burnt with the required amount of dry air will in general form a smaller volume than the combined volume of incoming gases. If, then, the incoming gases and the products of combustion, both dry, were at the same temperature, the total sensible heat in the incoming gases is still higher than the heat in the products.

In determining the sensible heat in the dry gas, that admitted and discharged may be easily calculated by observing the temperature of the room and of the exhaust products of combustion. These are shown in the following table, giving the actual heat units absorbed and discharged by the calorimeter, due to the sensible heat in the air, gas, and products of combustion.

Tests.	Room Temperature, Deg. Fahr.	Exhaust Temperature, Products of Combustion, Deg. Fahr.	Sensible Heat in Amount Gas Admitted, B.Th.U.	Sensible Heat in Products of Combustion Discharged, B.Th.U.	Actual B.Th.U.
1-4	.. 69°0	.. 45°6	.. 8°245	.. 4°572	.. + 3°673
5-8	.. 68°5	.. 54°2	.. 8°180	.. 5°435	.. + 2°745
9-12	.. 68°5	.. 63°2	.. 8°180	.. 6°340	.. + 1°840
13-16	.. 69°5	.. 72°4	.. 8°305	.. 7°263	.. + 1°042
17-20	.. 70°8	.. 81°5	.. 8°460	.. 8°170	.. + 0°290
21-24	.. 70°4	.. 88°6	.. 8°410	.. 8°885	.. - 0°475

This table was constructed by taking the temperature of the room, the thermal capacity of the gas and air as indicating the sensible heat admitted to the calorimeter above 0° Fahr., and the exhaust temperature and thermal capacity of the products of combustion giving the total sensible heat discharged above 0° Fahr. The difference in these two readings indicates the sensible heat absorbed or given up by the calorimeter. It is apparent that the difference in the specific heat of the incoming and outgoing gases, and the change in volume, have only a slight influence on the heating value. Since the products of combustion of a gas



containing hydrogen are always going to be less in volume than the incoming gases, a small gain is always found when the inlet water is approximately the same temperature as the room. In commercial work, this error is negligible.

(3) The combustible gas as it enters the calorimeter is usually saturated with water vapour; and in the tests to ascertain the gain or loss of latent heat of the vapours in the gases, precaution was taken to saturate it. The air supply may be saturated to various degrees, depending on the weather conditions. Tests of the products of combustion leaving the calorimeter in all cases were only a few degrees higher than the inlet water. Tests by Dr. Immenkötter and Professor Junkers also showed that the products are saturated at the temperature of this water. If they are cooled far below the room temperature, the vapour content at the low temperature may be much less than that of the gases entering the calorimeter. Should the products leave at a temperature higher than that of the room, and be saturated, a greater amount of vapour is carried away than is brought in; and thus the latent heat of condensation is lost from the calorimeter. The combustible gas enters at 70° Fahr., and saturated 1 cubic foot of dry gas is equivalent to 1.024 cubic feet of gas saturated at 70° Fahr.; hence the vapour brought in per cubic foot of dry gas at 70° Fahr. is 0.024 cubic foot. Calculating from the analysis of the sample of gas given in the report, the dry air required for combustion in each case is 5.406 cubic feet. This air was admitted in each case at different temperatures and percentages of humidity. The required dry air in these conditions varies from 5.405 cubic feet in tests 1-4 to 5.408 cubic feet in tests 21-24; and the required saturated air for these temperatures was 5.490 cubic feet in tests 1-4 up to 5.552 cubic feet in tests 21-24. The volume of aqueous vapour then included in the air would be 0.085 cubic foot in the first test to 0.144 cubic foot in the last. This volume of aqueous vapour in the air, plus the volume of that in the gas, which was in all cases 0.024, made a total volume of 0.109 to 0.168 cubic foot, or, expressed in pounds, from 0.00481 to 0.00748 lb. The above figures determine the weight of aqueous vapour carried in by the gas and air under actual conditions, as shown by the various temperatures and pressures for each set of tests.

To determine the weight of aqueous vapour discharged in the products of combustion, we first calculate the volume of dry products from the analysis of the gas submitted. This gives a volume in all tests of 5.2187 cubic feet. The exhaust temperatures in each instance are taken as the actual temperatures, and run from 45.6 to 88.6° Fahr. Therefore the volume of the dry products must be expressed at these temperatures, and run from 4.98 to 5.422 cubic feet. The calculated volumes of these products saturated at the same temperature above run from 5.035 to 5.706 cubic feet. The volume of aqueous vapour in the products at this temperature would then run from 0.055 cubic foot in tests 1-4 up to 0.284 cubic foot in tests 21-24. Comparing the quantity of the products with the aqueous vapour in the air and gas admitted, it is necessary to reduce everything to a standard volume and pressure. Therefore this aqueous vapour corrected to 60° Fahr. and 30 in. bar. would be 0.0543 up to 0.2570 cubic foot, and the weight of it would be 0.00258 lb. in tests 1-4 up to 0.01223 lb. in tests 21-24.

From the above figures we have the total weight of aqueous vapour taken in and discharged; hence it is necessary to determine the total heat carried in and carried out by the vapour. Calculating this as the heat, both sensible and latent, above 32° Fahr., we have the total heat introduced to the calorimeter running as follows: Tests 1-4 give 5.3054 B.Th.U.; while tests 21-24 give 8.2504 B.Th.U. In the same way the total heat carried out in aqueous vapour runs from 2.8277 B.Th.U. in tests 1-4 up to 13.5631 B.Th.U. in tests 21-24. This gives the total heat absorbed or lost by the calorimeter from the air and gas going in and the products going out under the actual conditions of temperature and pressure; and it must be corrected for standard temperatures and pressures for a cubic foot of dry gas (0.976) to agree with the previous investigation, which gave the following result:—

Tests.	B.Th.U.	Tests.	B.Th.U.
1-4 . . . . .	+ 2.74	13-16 . . . . .	- 0.98
5-8 . . . . .	+ 1.74	17-20 . . . . .	- 3.31
9-12 . . . . .	- 0.36	21-24 . . . . .	- 5.79

It is apparent that at the higher temperatures at which the products of combustion leave the calorimeter the loss in heat energy due to the latent heat of condensation increases very rapidly, and the actual amount is large. It is necessary, therefore, to regulate the damper at the exit of the products of combustion, so that they leave at a temperature approximating that of the inlet water.

Assuming the air temperature of 70° Fahr. and the barometer of 28.7 inches, which were the mean figures during the tests, we find one cubic foot of saturated gas would be equivalent to 0.976 cubic foot of dry gas, and it would therefore carry 0.024 cubic foot of water vapour. This 0.976 cubic foot of dry gas would require at its temperature 5.406 cubic feet of dry air, which would be equivalent to 5.406 cubic feet at 0 per cent. relative humidity to 5.547 at 100 per cent. humidity. The difference between these two would be the volume of water vapour carried by the air required for combustion. It would be equivalent to nil at 0 per cent. relative humidity, and to 0.141 cubic foot at 100 per cent. humidity or saturation, measured at 70° Fahr. and 28.7 inches of the barometer. The sum, then, of the vapour carried by the gas plus the vapour carried by the air would be 0.024 cubic foot at 0 per cent. to 0.165 cubic foot at 100 per cent. Reducing this to

60° Fahr. and 30 inches gives 0.02252 to 0.1548 cubic foot; or expressed in pounds, it would be from 0.001072 for 0 per cent. to 0.007375 at 100 per cent.

The actual volume of dry gas burnt has been 0.976 cubic foot. From former calculations, 5.219 cubic feet of dry products of combustion are obtained from 1 cubic foot of saturated gas, which is equivalent to 5.358 cubic feet of gas saturated. The difference, 0.139 cubic foot, is the volume of water vapour carried out by the products of combustion, measured at 70° Fahr. and 28.7 inches. Reducing this to 60° Fahr. and 30 inches gives us 0.1305 cubic foot. This would weigh 0.00621 lb., which is the weight of water vapour carried out of the calorimeter by the products of combustion. Subtracting this quantity, which is constant, as the products always leave saturated, from the weight of water vapour carried into the calorimeter by the air and gas under the different conditions assumed, we have the following quantities of water vapour gained or lost by the calorimeter: 0.00514 lb. was lost at 0 per cent. and 0.00117 lb. was gained at 100 per cent. Multiplying this mass of water vapour by its heat of vaporization at 70° Fahr., we have the actual heat in B.Th.U., which was gained or lost by the calorimeter by the combustion of one cubic foot of saturated gas at 70° Fahr. and 28.7 inches. Correcting to 60° Fahr. and 30 inches, we have—

Humidity.	Corrected.	Humidity.	Corrected.
0 per cent. . . . .	- 5.900	75 per cent. . . . .	- 0.303
25 " . . . . .	- 4.155	100 " . . . . .	+ 0.858
50 " . . . . .	- 2.130		

One cubic foot of saturated gas at 70° Fahr. contains 0.976 cubic foot of dry air, carries 0.024 cubic foot of aqueous vapour, requires 5.406 cubic feet of dry air for combustion, and yields 5.219 cubic feet of dry products of combustion, equal to 5.358 cubic feet of saturated products, and will carry 0.139 cubic foot of aqueous vapour in products of combustion, or 0.1305 cubic foot at 60° Fahr. and 30 inches of the barometer.

The Committee then give particulars of their tests of various calorimeters, and come to the following

#### CONCLUSIONS.

After this second year's investigation, your Committee are convinced that the general instructions and precautions given in the report of 1908 are correct, and need but little modification. A few words might be said, however, in regard to the general selection of calorimeters and measuring instruments.

With reference to the gas-meter, the specifications as given in 1908 are to be commended. Further experience has shown that the meter with the internal overflow has been the cause of many erratic readings in some very important investigations. We recommend that this type of meter be discarded, and only that with the exterior water-gauge glass be used, and that the meters be calibrated and tested at the pressures and rates of flow at which they will be employed.

With reference to thermometers, we recommend that great care be used in their selection, and that those that are used in measuring the inlet and outlet water temperatures should be calibrated in every case. We would recommend for all commercial purposes the selection of thermometers in accordance with the description noted in the report.

The type of calorimeter to be used was described in last year's report; and the Committee have few remarks to make further on this point, except that it is preferable to have an instrument that is so made that the interior is accessible for cleaning purposes. After continual service with impure water, there will be deposited mud or scale on the interior water channels, which will tend to decrease the efficiency and general accuracy of the calorimeter.

The placing of the thermometers on the same level is recommended, as last year it was shown that suitable calorimeters can be made with this object in view.

This work has enabled us to extend the field of our investigation, as suggested in the 1908 report, and enables us to reaffirm last year's directions for the use of calorimeters. It clearly shows the relative effect of the several possible sources of error not covered by last year's work.

#### A Centenarian Pensioner of the South Metropolitan Gas Company.

—We have received from Mr. Walter T. Layton, the Editor of the South Metropolitan Gas Company's "Co-partnership Journal," an advance page of the issue for the current month, containing a short notice by him of Mr. John Durant, who to-morrow will celebrate the hundredth anniversary of his birth. The late Sir George Livesey in the "Co-Partnership Journal" for September, 1908, gave some particulars of the life of this old and faithful servant of the Company, who worked as a bargeman from 1842 to 1883. He is the last survivor of those who were in the Company's service in 1850. Mr. Layton says he is sure he is expressing the feelings of every co-partner in wishing "the good old gas worker all the peace and comfort it is possible for him to enjoy during the remainder of his life here." He adds: "In John Durant we have a link with the days when gas lighting was as great a wonder as the aeroplane. This old, old man connects us with the period before the battle of Waterloo, when London was without many of the comforts of civilization which are now available in regions which were at that time unexplored."



## LONDON AND SOUTHERN JUNIOR ASSOCIATION.

The proceedings at last Friday's Meeting of the London and Southern District Junior Gas Association—which was held at the Cripplegate Institute, Golden Lane, E.C., under the chairmanship of Mr. W. J. LIBERTY, the President—were of a varied character. The first item on the *agenda* was a paper; and this was followed by the discussion of a series of questions.

Mr. C. E. ROSEVEAR, Distribution Superintendent to the Hythe and Sandgate Gas Company, was the writer of the paper, which was entitled

### NOTES FROM HYTHE.

In opening, the author explained that his object in presenting the notes was to put before the members the present state of the Distribution Department of the Hythe Gas Company as compared with that which existed nine months ago, when he was appointed Distribution Superintendent. On taking up his duties, he found much that needed attention and revision; and eventually he had no alternative but to discharge the men who were there (with the exception of two), and take on a fresh lot. In place of the unsatisfactory method then in vogue for dealing with maintenance materials, he had maintenance books made out, in which a record is kept by the storekeeper of all materials issued for maintenance, and for whom. The fitter has to obtain a signature in his book for attendance and material employed. The result of this has been that, with fortnightly attendance, the consumption of mantles for nearly 200 burners is only about fifteen. Previously mantles had been taken from the stores at the rate of forty or more per week. The stock of old cookers he had cleaned up, and new parts and fittings supplied; and the meters were tested. He also set about compiling a list of the syphons, and prepared a schedule of the mains, with their sizes—the positions and depths being added as ascertained. In addition, he caused accurate records to be kept of all services laid and materials used for them. Particulars of all free fixing are kept; and details of estimates and charge work are entered in a fittings cash book.

The number of consumers at the date of his arrival on the scene, last May, was about 1025; whereas there have since been added 160 new supplies—an increase of about 16 per cent. On Oct. 1, owing to a re-arrangement of the area of supply between the Folkestone Gas Company and the Hythe Company, the latter lost 81 consumers. As a matter of fact, when he first went to Hythe they, as occasion required, took gas from Folkestone; whereas the position now was that they supplied Folkestone with a certain quantity. For the year ended June 30, 1909, the leakage amounted to about 21 per cent.; while for the six months to Dec. 31 it was only about 6 per cent. This great reduction was due to several things—such as removing wooden plugs and properly capping off the mains, exchanging slow and stopped meters, and remedying escapes on mains and services; but it was chiefly through fixing the station meter on the outlet of the holder. On the new main to Saltwood (completed in October last) there are nearly 100 consumers, of whom only 18 are old customers transferred to the new main.

There is competition in Hythe, from the Folkestone Electricity Supply Company; but he was glad to say he had turned electricity out, either wholly or partially, of a good number of places. In this connection, he cited an incident at the Hythe Summer Theatre, where electricity was replaced by gas during the past season. For some years the theatre had been lighted by electricity, but without giving real satisfaction; and on the opening night of the concerts last season, the lights failed entirely in the auditorium. On many other occasions the illumination was poor; and at last the patience of the proprietor (Mr. Cardiff) came to an end. He wrote to the Company stating that he considered the lighting most unsatisfactory and the charges excessive. His concluding sentence was: "For your own credit, as well as in common justice to me, I rely upon you to see to it at once that my lighting bears some relation to its enormous cost." An interview followed, when Mr. Cardiff indignantly protested to the Chief Engineer of the Electricity Company against charges for light which had not been supplied, thereby breaking the contract between them. This resulted in the Company intimating that they would be sending in their accounts weekly, with 24 hours' grace; and if they were not paid, the supply would be cut off. This was in spite of the original contract for fortnightly accounts, with seven days' grace.

One day, hearing Mr. Cardiff make public allusion to the trouble, Mr. Rosevear approached him in reference to a supply of gas, with the result that at 8 o'clock the following morning Mr. Cardiff informed him that he wanted gas in for lighting by 7 that evening. By 9 a.m., three fitters were hard at work fitting up the stage, fly, and foot lights; the assistance of a local gas-fitter and another man being also requisitioned. The service from the main was 150 feet long, and had to cross a road, under rails on which trams passed about every twelve minutes. This meant a considerable delay, as the horses had to be taken out, and the trams pushed over the trench. However, by 7 o'clock the arrangements were nearly completed; and about 7.30 the lights were being tried. Of course, there was still much to be done; but in the short time at his disposal, Mr. Rosevear was able to provide the following lights: For the auditorium, four standard inverted burners; for the stage, one 2-light Graetzin lamp with parabolic reflector and

five standard inverted burners, while the fly-lights consisted of four bijou burners inside Chinese lanterns, with a row of 25 flat-flame burners for the footlights; in the dressing-rooms, there were two bijou burners in one case, and one bijou and one standard in the other; and for the ticket office, there was a standard burner.

Mr. Cardiff was delighted with the effect, and publicly congratulated the Gas Company on the good light provided. When the costs were ascertainable, they were advertised in the local papers, much to the chagrin of the Electricity Company, as they showed a saving, by using gas, of £1 1s. 4d. per week of eight concerts.

Mr. Rosevear also secured for his Company the contract for lighting the new post office at Hythe. In the sorting room some of the pendants are 10 feet long; and the lighting consists of 19 Bray inverted burners. The entrance to the building is illuminated by a 700-candle power Lucas lamp; and the letter-box, clock, and mails notice by a two-light Graetzin lamp. The rooms above for the use of the postmaster are now being fitted up. There is also a proposal afoot to erect a roller skating rink; and Mr. Rosevear is looking forward to installing there a Keith high-pressure system of lighting.

At the conclusion of his paper, the author was asked a number of questions; and to these he replied as they were put to him.

Mr. ROSEVEAR said, with reference to his statement that the reduction in the leakage account was chiefly owing to the removal of the station-meter from the inlet of the holder to the outlet, that they did not now register the gas going into the holder. The reason why this was done was because, as no doubt many of the members were aware, the Hythe Company had an arrangement with the Coalite Company for a supply of gas. The Coalite Company said their plant would be capable of manufacturing a very much larger quantity of gas than the Hythe Company could take; and by thus placing the meter, of course, they only paid for such gas as they actually did require. They only had the holder pressure. This threw 4 inches; and the meter took 1-10th inch. As to maintenance, when he went to Hythe, he found each man had been in the habit of taking out whatever mantles he wished. He, however, prepared maintenance books, in which the men had to get a signature from the consumer for mantles and also for attendance at the premises. The reduction by this means was from 80 mantles to 15 in a fortnight, for nearly 200 burners. Of course, their own gas-works plant was still in existence; and it was used by the Coalite Company, who had taken over the works entirely. The Hythe Company got a profit on all the gas they supplied to Folkestone. In November and in December, the Folkestone Company took 1½ million cubic feet—that was, 3 million feet in all. At Hythe, they had two rates for gas. For lighting and heating, the charge was 4s. 2d. per 1000 cubic feet; and for power, 3s. 7d. Sandgate they used to supply at 3s. 4d., because the Folkestone Company also supplied the place at this rate. In 1908, the Hythe Company was put down as a 20 million cubic feet undertaking. In 1909, 26 millions; and he expected that for 1910 it would be from 40 to 50 millions. In each of the last two months, they had sent out over 4 million cubic feet of gas. Their practice was to fix cookers free up to 10 feet, and heating stoves up to 15 feet. They took the gas from the Coalite Company purified and ready for sale; and they paid so much per 1000 cubic feet for it, measured by the station meter. They had no gas examiner at Hythe. Really, he wished they had, because he felt sure if they had an official gas examiner they would get on much better. There was only one holder. The inlet and outlet were very near together; and what went in passed almost straight out again. The Coalite Company were supposed to supply them with 16-candle gas; but he could not say whether there was any penalty attaching to a breach of this agreement. He had no calorimeter with which to test the heating power of the gas. As to other matters, if consumers wished to have their meters tested, the Company would do this themselves. If, however, customers desired them to be sent away for testing, they had to pay the cost. It was generally found that people were willing to accept the Company's test. Electricity was supplied at the present moment at 6d. per unit; but there had been talk of reducing the charge to 5d. The Gas Company, too, were considering the advisability of making a reduction next July—the beginning of their financial year. For maintenance, the Directors had decided to make an all-round charge of 6d. per burner per quarter, for all kinds of lamps, inside and outside. For this, they cleaned globes, but did not renew them; and they only allowed one mantle per burner per quarter.

The PRESIDENT said they did not come across a Hythe gas-works every day; and when they did, it was interesting to have someone to tell them about it. He would venture to say that it was owing in a great measure to one of their members, Mr. Rosevear, going down there that things were in such an improved state. The work that he had accomplished reflected great credit on Mr. Rosevear.

Mr. L. F. TOOTH (the Senior Vice-President), in proposing a hearty vote of thanks to the author, said the position of Hythe was certainly unique. They were indebted to Mr. Rosevear for having given them the benefit of his experience.

Mr. S. A. CARPENTER (Hon. Secretary), seconding, remarked that they had learnt some things, not to follow, but to avoid.

The resolution was carried with applause, and briefly acknowledged by Mr. Rosevear.



## A PRESENTATION.

The PRESIDENT said that this being the first meeting in the New Year he was pleased to pass on to the members greetings which had come to the Association from Mr. J. W. Helps, the President of the Institution of Gas Engineers, and Mr. J. Paterson, the President of the Senior Southern District Association of Gas Engineers and Managers. Among other letters he had had, he might mention those from Mr. S. W. Shepherd, President of the Yorkshire Junior Association, Mr. Corbet Woodall, Mr. D. Milne Watson, Mr. F. W. Goodenough, Mr. J. M. Campbell, of Margate, and Mr. W. B. Farquhar, of Ilford. They all wished the London and Southern Junior Gas Association prosperity during the coming year; and he was sure the members would highly appreciate these good wishes. In addition to the twenty new members welcomed at the last business meeting, there were now fourteen others—making 34 since the beginning of the session. Another matter to which he wished to refer was the annual dinner, for which they had already had some sixty acceptances. Beyond these, there were the new members; and, further, it had been decided to give all members the privilege of introducing a friend. In connection with this function, he might say that the Joint Council of the Junior Associations of England were intending to hold their meeting in London in February; but as the date came so near the dinner, the Association wrote to Mr. A. T. Holton, of Manchester, the Secretary of the Joint Council, and asked him to fix the meeting for March 5, so that the business could be transacted in the afternoon, and the visitors could be present at the dinner the same evening. Mr. Holton had accepted the invitation, and was making arrangements accordingly. As to Dr. Colman's lecture on March 18, it would be the privilege of every member, subject to the Council agreeing, to introduce a friend; and if they intended taking advantage of this, they should let the Council know at once. He had already had intimations that some of the Seniors, and others connected with the gas industry, intended to be present on the occasion. The duties of the President of an Association of this character were multifarious, and very pleasant; but he did not think there was any that had given, or would give, him greater pleasure, during his second year of office, than the one he had now to perform. He might recall that on Mr. J. G. Clark relinquishing recently the office of Hon. Secretary, which he had so ably filled for three years, it was decided by the Council not to let him go without some slight recognition of his valuable services. Mr. Clark took on the secretaryship when the Association was a small one; and he put all his energies into the work, and helped to make the Association what it now was. A small Sub-Committee in whose hands the matter was left had therefore had framed the following resolution, which was passed at the last annual meeting; and he had the greatest possible pleasure in asking Mr. Clark, in the name of the Association, to accept it:—

The Annual General Meeting of the London and Southern District Junior Gas Association herewith places upon record its hearty appreciation of the valuable services rendered by Mr. J. G. Clark during the three years he has held the office of Honorary Secretary; and on his relinquishing that office, tenders to him its sincere thanks for the energy and time given, and the interest he has at all times displayed in everything that pertains to the welfare of the Association.

Mr. CLARK (who was the recipient of hearty applause when the testimonial was handed to him) remarked that it was adequate compensation for any work connected with the Association to know that in performing it he had made such a large number of friends. It was a suitable occasion on which to say how much he himself felt indebted to the Association—that was, how much he had profited from contact with the members. The Association was composed of representatives of every branch of the gas industry; and with the growing complexity of their business, they could not have too much mutual intercourse. Whenever he had felt doubt on any subject, and had known a member capable of giving him the information he desired, he had taken full advantage of the opportunity of securing it; and this was a facility that was open to all the members. He thanked them very much for the excellent testimonial they had given him; and could assure them that he would continue, as he had always done, to take a great interest in the Junior Association—knowing that he had himself profited by the Association, and that its existence could not fail to be of benefit to others as it had been to him.

## QUESTIONS.

A list of questions (most of which had been sent in to the Hon. Secretary before the meeting) was then submitted to the members; and answers to them were suggested by different speakers. The first one was as follows:—

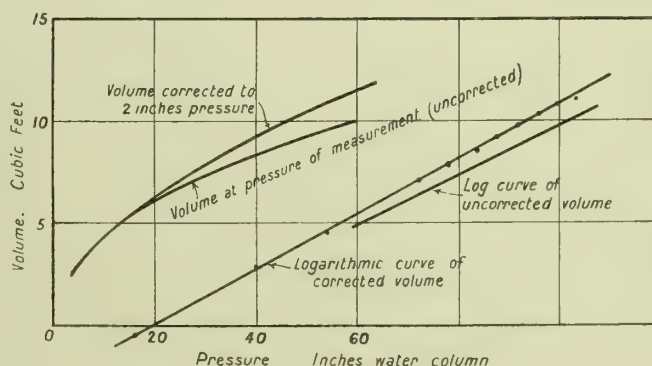
*What is the Relation between the Pressure at an Incandescent Burner and the Volume of Gas Passed? Does the Square Root Law Hold in Practice.*

Mr. J. G. CLARK remarked, after a pause, that perhaps, as the member responsible for putting the question, he might be allowed to give an answer. He thought it was an important question, dealing, as it did, with a subject that was often cropping up. It would be a good thing to be able to know how much a burner would pass at a high pressure, from the knowledge of what was the consumption at a low pressure. In its practical aspect, the

problem appeared to be rather a complex one. It was a well-known fact that the discharge of gas through an orifice was proportional to the square root of the pressure, all other conditions remaining constant. If the gas was discharged into a chamber, the pressure in which was that of the atmosphere, then the pressure which determined the discharge was the pressure behind the orifice. This was, of course, the condition existing in bunsen burners where practically the whole of the pressure energy of the gas was converted into velocity. If any condition should arise where the gas was discharged from the orifice into a chamber where the pressure was not that of the atmosphere, then the discharge would depend upon the differential pressure. As a general statement—

If  $p_1$  = the pressure behind the orifice  
 $p_2$  = the pressure in the discharge chamber,  
 then discharge is proportional to  $\sqrt{p_1 - p_2}$

From a practical point of view, it must be remembered that, when gas was burned in a bunsen burner, the burner became heated. The heating effect reached the injector, and to this extent modified its dimensions. At the same time, the gas, in passing through the heated injector, also became heated, with, of course, change of volume. This heating effect would increase with the consumption, and therefore with the pressure. Summarizing the matter, they saw that a change of pressure would alter the conditions in the following ways: (1) Increase of static pressure behind the injector. (2) Modification of the nipple by expansion due to heat. (3) Heating of the gas in its passage through the injector. The two latter effects would vary enormously with different types of burners. It appeared, therefore, that the effect in practice was rather complex, and anything like mathematical analysis failed. Under these circumstances, the only thing to be done was to resort to experiment. He had made, a few days previously, an experiment which was interesting as bearing on the question. An upright burner, having a single hole nipple pierced in a thin metal plate, was subjected to pressures varying from 2.2 inches to 60 inches; the gas being consumed at the burner-head in the ordinary way.



Four curves were shown; two with pressure plotted against volume, and two logarithmic curves of the same quantities. The slope of the logarithmic curves shows the following relations—

Volume discharged at pressure of measurement is proportional to  $2.05 \sqrt{P}$

Volume discharged corrected to 2 inches pressure is proportional to  $1.82 \sqrt{P}$

The pressure of measurement was practically identical with the pressure behind the nipple. The diagram showed that the volume discharged, if measured at the pressure behind the injector, is practically proportional to  $2\sqrt{P}$ ; so that, if a correction is made in accordance with Boyle's law, a very near approximation should be obtained. The calculation would then be as follows:—

Let  $V_1$  = volume discharged at pressure  $P_1$  and measured at  $P_1$ .  
 $V_2$  = " " " " " "  $P_2$  " " " " " " at atmospheric pressure,

$$\text{then } V_2 = V_1 \times \sqrt{\frac{P_2}{P_1}} \times \frac{P_2 + A}{A}$$

where  $A$  is the pressure of the atmosphere, which is, of course, the datum of gas pressures.

The corrected volume  $V_2$  was the volume to be charged to the lamp and to be paid for. If they measured gas at 54 inches pressure, it was necessary to add 13½ per cent. to arrive at the volume at standard pressure. In conclusion, he suggested that the subject might form a very instructive and interesting research. It meant taking a number of typical burners, and running them through a range of pressures, to see whether some general method of calculating could be arrived at. Perhaps one of the members would undertake the work. As he had already pointed out, the degree to which burners became heated varied enormously; and on this account it would be unsafe to generalize from the experiment he had described.

Mr. E. G. STEWART remarked that some "C" burners were provided with five holes; but he noticed that the burner Mr. Clark had experimented with possessed only one. Did Mr. Clark think that with five holes the increased friction at a high velocity would alter his law?



Mr. CLARK said he did not think so. There would be five times the friction, but there would also be five times as many holes. He selected purposely a one-hole burner, because this was the most efficient form of nipple they could have for high-pressure work. He had more in mind the inverted system, in which they had to propel the gas against its gravity. He thought if they had (say) a three-hole nipple, the proportional effect would be much the same.

Mr. PARK asked whether Mr. Clark had considered the question from the point of view of the specific gravity of the gas.

Mr. CLARK remarked that, if the specific gravity varied, that was another question. When it was stated that the volume was proportional to the square root of the pressure, this was assuming that the specific gravity was constant. The experiment he had referred to was carried out within a short period, so that the specific gravity would be quite constant. This element did not therefore enter into the question. Of course, there were certain cases where specific gravity must be taken into serious consideration, as for instance certain high-pressure air-gas systems. Assume that the mixture supplied to the burners was, gas two parts, and air three parts, and that the specific gravity of the gas was 0.46. Then the specific gravity of the mixture would be the arithmetical mean, that is—

$$\frac{(46 \times 2) + (1 \times 3)}{5} = .78$$

In designing installations for such a system, this higher specific gravity must be taken into consideration because, not only was the mixture of higher gravity than pure gas, but for a given gas consumption the quantity to be supplied would be  $2\frac{1}{2}$  times as great. The effects of specific gravity and pressure might be combined as

$$V \text{ is proportional to } \sqrt{\frac{P}{S}}$$

The PRESIDENT said Mr. Clark had set himself a most interesting question. He presumed one of the points that would concern most of those present, as they had to do with high-pressure gas, would be the amount charged for the difference in pressure. Mr. Clark had furnished them with this information. Given gas at a pressure of 54 inches of water, or 4 inches of mercury, the consumption equalled 88 cubic feet at high pressure, as against 100 cubic feet at ordinary pressure. With regard to the future, he thought it would be very nice to devote an evening to this subject; and he did not know anyone in the gas industry better able to take up the question than Mr. Clark.

*In Photographs of High-Pressure Installations, the Writer has Noticed that the Mantles often Appear quite Black, though the Lamps otherwise show up well. What is the Reason, and what is the Remedy?*

Mr. WEDD said that the cause of what the questioner drew attention to was excessive exposure; and he did not know that any certain remedy could be suggested. It might, however, be beneficial to use a 10 per cent. solution of bromide in the process of developing.

*It is Proposed to Light a Public Building or House in the Following Way: A Live Carcase of Bye-Pass Tubing is installed, terminating in a Pilot-Light at each Burner. The Fittings are not Provided with Taps, as the Supply of Gas to the Burners will be Controlled by Switches or Taps Placed in More Convenient Positions, as, for Example, just inside the Door of Each Room, in the case of a House. What will be the Advantages and Disadvantages of such a System?*

The PRESIDENT said he presumed that, by having a switch outside the door of a room, it would be necessary to light up all the burners, whether they were wanted or not.

Mr. BEHENNA pointed out that the separate pipes could be arranged with Norwich switches near the door, so that as few or as many burners as might be desired could be lighted up.

A MEMBER said a disadvantage in having the switches far away would be that, if any length of time passed without lighting up, the pipes would be charged with air, and there would be trouble in lighting, unless they had mercury seals to all the fittings.

*What are the Advantages and Disadvantages of a Great Quantity of Liquor in the Hydraulic Main—that is, Good Depth and Width at the Dip?*

Mr. E. G. STEWART remarked that one big disadvantage was the fact that they got greater oscillation. He knew of a place where there were two hydraulics, one on either side of the bed. Six retorts discharged into one main, and four into the other. On one side, where the six pipes were, they got  $\frac{1}{2}$  inch oscillation; and on the other side, with the same area, but four pipes instead of six, they had from  $1\frac{1}{2}$  to 2 inches. This was one great disadvantage of having a large area at the dip. Another was that it gave the tar a good opportunity to fall to the bottom out of the way. A lot depended on the arrangement of weir-valves and tar-cocks on the main.

Mr. WEDD thought it should not be overlooked that there must be sufficient liquor available at the dips to prevent any possibility of unsealing of the dip-pipes by back-pressure.

*Whether, in these Days of Keen Competition, Compulsory Deposits are an Advantage to a Gas Company?*

A MEMBER expressed the opinion that it entirely depended on the consumer. If there was a customer they were rather afraid

of, they should by all means insist on a deposit; but in the case of a man who could be trusted, this should not be done.

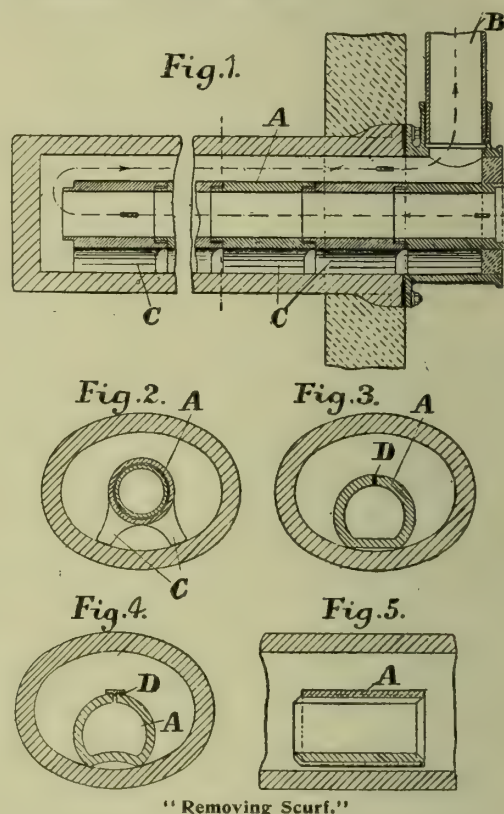
Mr. ROSEVEAR said that at Hythe they assumed everyone to be an honest man, and never took a deposit, either in connection with ordinary or prepayment meters. They had nearly 1200 consumers—700 of them on the prepayment system—and they had about three defaulters annually.

*We have very keen competition at Ilford. They are placing all kinds of Electricity Apparatus—Irons, Radiators, and so on—Free of Charge on Trial. Is this a sign for the Gas Companies to start something in the same direction?*

The PRESIDENT thought that all articles consuming gas for industrial purposes should be pushed as much as possible. In the case of such appliances, his answer to the question would most decidedly be "Yes."

## REMOVING SCURF FROM RETORTS.

A patent has been taken out for France by M. Rudolph Tenckhoff, for an appliance for removing scurf from gas and other retorts by the introduction of a current of air conveyed into the retort by means of a pipe consisting of several parts which can be detached from each other from the outside. By this arrangement, the air can be directed on to any desired point, and a uniform removal of the scurf ensured. The accompanying diagrams show several applications of the invention.



"Removing Scurf."

The pipe A consists of several pieces fitting one into the other; the joints being made up with fire-clay. In the ordinary way, no air can escape at the joints of the pipe. But the ends may be subsequently parted by means, for example, of a hook introduced into the pipe, so that the air may issue through the interstices produced. The heated air passes away by the ascension pipe B after the opening of the lid of the mouthpiece.

In the applications of the invention represented in figs. 1 and 2, the pipe ends are provided with feet C, by which they are supported from the floor of the retort. In those represented in figs. 3, 4, and 5, they rest directly on the retort, and are flattened or bulged as shown. On the opposite side, the pipe ends have a slit D, which prevents the pipes from being cracked by expansion or contraction. The slit is closed before the pipes are put in position (see fig. 3), or it is covered by a small plate laid upon it (see fig. 4). In some cases, however, it may remain open.

The arrangement described is applicable not only to horizontal, but also to inclined, semi-inclined, and vertical retorts of all kinds; the forms of the pipes and their positions in the retorts being varied as required.

A pressure main of reinforced concrete, 36 inches diameter inside and 334 feet long, is in use at Salt Lake City. The maximum static head which it withstands is about 20 feet of water. The thickness at the top of the section is 6 inches, and at the sides 7 inches. The bottom is constructed in the form of a section of an octagon, with a minimum thickness of 6 inches, and the reinforcement consists of  $\frac{3}{8}$ -inch square twisted steel bars, spaced 8 inches on the centres. This conduit has been in use seven years, and, according to the City Engineer (Mr. G. O. Chaney), is in first-class condition.



RELATIVE ADVANTAGES OF GAS & ELECTRICITY

Discussion at Manchester.

At a Meeting of the Manchester Association of Students of the Institution of Civil Engineers, last Wednesday evening, at the Chartered Accountants' Hall, Manchester, the subject for discussion was the "Relative Advantages of Gas and Electricity." In the circular sent out to members by the Hon. Secretaries, it was suggested that the following prices be used for comparisons of cost: For lighting—Gas at 2s. 6d. per 1000 cubic feet; electricity, at 3d. per B.T.U. For heating, cooking, and power—Gas at 1s. 8d. per 1000 cubic feet; and electricity, at 1d. per B.T.U. The points set for discussion included street lighting, indoor lighting, heating, cooking, power, comparisons of cost of the rival systems, ventilation and health, cleanliness, convenience, safety, and decoration. In the absence of Mr. J. G. Newbigging, M.Inst.C.E., President of the Association, Colonel H. T. CROOK, the immediate Past-President, took the chair. Those present included several prominent members of the Manchester and District Junior Gas Association.

STREET LIGHTING.

Mr. FRANK H. ROBINSON, Assoc.M.Inst.C.E., Engineering Assistant at the Manchester Corporation Gas-Works, opened the discussion on the side of gas. Street lighting, he said, was a subject upon which the most animated discussions took place between gas engineers and electricians, and was often the cause of much argument in council chambers, as it touched the public purse. In dealing with this part of the subject, he wished it to be understood that neither flat-flame burners nor carbon filament lamps were referred to, as these were out of date, and it was not in the best interests of either industry to use them. Low-pressure incandescent gas-burners were, in his opinion, very suitable for lighting the streets. They gave a steady, well-diffused light, and were easily adapted to existing columns without great expense and auxiliary plant. It might be argued that the mantles were fragile. Well, so were metallic filament lamps. When an incandescent mantle did break, there was still some light produced by the remaining part of the mantle; but when an electric lamp broke, that part of the street was plunged into total darkness without a moment's warning. At Hastings, some metallic filament lamps had been installed in close proximity to ordinary incandescent gas-lamps; and the following extracts from letters to the local papers showed what the people thought of them: "The spending of the ratepayers' money has produced something less efficient than they had before." "No one ventures to say the new light is better than the old one—indeed, anyone with eyes in his head can see for himself that it is far poorer." "The result of the lighting is a lamentable failure; it is distinctly worse than before." A similar example to this was to be found at Gildabrook Road, Eccles, where the Salford Corporation incandescent gas lighting changed to the Eccles Corporation electric lighting with metallic filament lamps. It was just like passing from day into night to go across the boundary from Salford into Eccles.

COST.

Turning to the question of cost, Mr. Robinson demonstrated his points by the following particulars on the blackboard—assuming a total illuminating power of 180 British standard candles, and the hours of lighting 4000 per annum.

Gas Lighting with Upright Burners.

	Yearly Cost.
Three burners, each 60 c.p., chimneys, rods, and mantles, Total 5s. Depreciation, 20 per cent. . . . .	1s. 0d.
Gas, 4000 hours at 3 cubic feet per burner, equals 36,000 cubic feet at 2s. 6d. per 1000 . . . . .	4 10 0
Thirty new mantles for three burners, at 3d. . . . .	7 6
Chimneys, 15 at 2d. . . . .	2 6
Fixing above . . . . .	4 0
Lighting and cleaning . . . . .	1 0 0

Total cost per lamp per annum . . . . . £6 5 0

Electric Metallic Filament Lighting.

	Yearly Cost.
Two osram lamps per annum, 180 c.p. each—British . . . . .	£1 7 0
Current, 4000 hours at 220 watts per hour, equals 880 units at 3d. per unit . . . . .	11 0 0
Cleaning and general maintenance . . . . .	15 0

Total cost per lamp per annum . . . . . £13 2 0

This comparison, it was explained, was made between the three cheap upright incandescent gas-burners of a total illuminating power of 180 candles, and a modern osram lamp of 180 c.p., of an efficiency of 1·2 watts per candle, and taking the actual figures given in the makers' catalogues, which would certainly not be to the disadvantage of the lamp. The cost given for lighting, cleaning, mantles, &c., in the case of the gas-lamp was the actual expenditure in Manchester for such a lamp. If tantalum lamps were used instead of the osram, the difference between gas and electricity would be still greater, for the highest efficiency of these lamps was 1·7 watts per candle.

SYSTEMS COMPARED.

The next systems compared by Mr. Robinson were high-pressure gas lighting and electric arc lighting. The latest example of high-pressure lighting with inverted burners was that in Fleet Street, London. After much investigation, the authorities had

adopted this system as the best means of lighting the streets at the present day. In Germany and many other places in Europe, high-pressure gas lighting was rapidly displacing electric arc lighting; Berlin being foremost in this respect. The whole of the streets in that city were in future to be lit in this fashion. An average of eleven large towns on the Continent gave the cost of electric arc lighting—enclosed and flame—as 81·5 per cent. higher than high-pressure gas lighting, with 22 per cent. less candle power. High-pressure inverted burners would give 60 candles per cubic foot of gas, and consume 25 feet per hour. Thus, for gas alone, at 2s. 6d. per 1000 feet, 1000-candle power for one hour cost 0·5d. Flame arcs with alba carbons gave 3·4 candles per watt. Therefore, for current alone, at 3d. per unit, 1000-candle power for one hour cost 0·9d. Again, the maintenance and renewal of carbons was a heavy item to be reckoned with in the case of arc lamps. The actual cost per annum of the high-pressure gas-lamps in London was £15 2s. 6d., including gas, mantles, cost of compression, and general maintenance, reckoning gas at 2s. 3d. per 1000 feet. One point of advantage might justly be claimed for the electric light, that was the ease of lighting and extinguishing the lamps; but this advantage was disappearing with the advent of automatic lighters, worked from the gas-works by a wave of pressure at dusk and dawn.

INTERIOR LIGHTING.

Proceeding to discuss the relative merits of gas and electricity for interior lighting, Mr. Robinson said that until the introduction of the pneumatic gas-switch somewhere about three years' ago, electricity had the undoubted convenience, not possessed by gas, of ease in lighting and extinguishing from a distance. There were now several gas-lighters on the market for distance control which had taken away this advantage. In the Alexandra Palace, London, Keith's high-pressure inverted lamps had been installed; and they were all worked and controlled from the compressor room. In fact, the majority of new installations of high-pressure lighting were controlled from switch-boards. Then as to the cost of interior lighting with inverted gas-burners at ordinary pressure and osram lamps, taking 1000 hours' lighting for a candle power of 60 in each case, they obtained the following results:—

Gas Lighting.

Gas, 3 cubic feet per hour at 1000 hours equals 3000 cubic feet at 2s. 6d. . . . .	7s. 6d.
Mantles, four at 6d. . . . .	2 0
Depreciation of burner . . . . .	6
Total cost per 1000 hours . . . . .	10s. 0d.

Electric Lighting.

Current, 80 watts per hour at 1000 hours equals 80 units at 3d. . . . .	£1 0 0
Half life of two lamps at 4s. 3d. per lamp . . . . .	4 3
Total cost per 1000 hours . . . . .	£1 4 3

NOTE.—Two 40 watt lamps are required for 60-candle power (British). Life of lamp, 2000 hours.

Thus, with the best metallic filament lamp, the full efficiency as stated by the makers and the maximum life of the lamp taken, electricity was still two-and-a-half times dearer than gas, even when a low efficiency and a good allowance for mantles and depreciation of burner were allowed with the gas-burner. In West Ham, a large drapery establishment had given up electricity for gas. The 153 electric lights—arc and filament—had been replaced by 143 inverted high-pressure gas-lamps. There was now a much better light; and the lighting bill was less than half its former amount with electricity. The inverted burner, with its soft, shadowless light and higher efficiency, had come to stay. It was as much an advance on the upright burner as the metallic filament electric lamp was on the carbon filament lamp. Electricians could no longer claim their lamps to be superior as regarded a light without shadow.

HEATING AND COOKING.

As to heating, Mr. Robinson said it was an accepted fact that the same amount of heat might be obtained from 6 cubic feet of coal gas as from a unit of electricity. Gas at 1s. 8d. per 1000 cubic feet would give 30,000 B.Th.U. for 1d.; while electricity at 1d. per unit would give only 3424 B.Th.U. On this score alone, electricity was hopelessly beaten in heating. Then, in cooking, gas held a foremost place easily with its cleanliness, ease of manipulation, and general economy. An electrical engineer made the admission, a few weeks ago, at a meeting of electrical engineers, that electricity could never seriously compete with gas for cooking and heating so long as 6 cubic feet of gas yielded as much heat as a unit of electricity. In regard to questions of ventilation and health, Mr. Robinson said that some time ago experiments were made in well-ventilated rooms lit by gas and by electricity, with a view to ascertaining the relative foulness of the air after lighting by the two systems for an equal period—persons being in the room the whole time. At the conclusion of the tests, the air in the room after gas had been used was less charged with carbonic acid than after electricity had been used; the reason being that gas heated the air more than electricity, and the upward current of air was therefore moving at a greater rate than with electricity, so changing the air much oftener. The stuffiness of rooms was not so much due to the burning gas as to bad ventilation. As to gas-fires, let them see what the doctors as a body thought of them where health was concerned. No less than 1000 gas-fires had



been fixed during the past two years for the medical profession in London alone. This was their answer to the question. On the score of cleanliness and convenience, Mr. Robinson said they must give way to electricity. But the advantage in convenience, he submitted, was fast disappearing with the introduction of the pneumatic gas-switch, spark ignition, and other distance lighting devices. In this connection, he pointed out that now and then electricity proved extremely inconvenient by suddenly failing.

#### THE QUESTION OF SAFETY.

Electricians had talked a good deal about the safety of electricity as compared with gas. But what about the fatal fire a few years ago in the Dingle Tunnel, Liverpool; the explosion at the Victoria Hotel, Manchester, last year; or the recent fire, with terrible consequences, at Clapham Junction—all due to electricity? Many such instances could be recorded. In Glasgow, 61 fires in six years were due to defective wiring alone. The report of the London Fire Brigade showed that last year the fires caused by electricity exceeded those caused by gas in proportion to the number of each class of consumer. With electricity, the mischief went on unseen until the place was on fire or blown up. On the other hand, a leak of gas was detected by the smell; and it was only a fool who went to look for an escape with a light in his hand.

#### DECORATIVE WORK.

For decorative work, electricity was admirably adapted—especially when flexible wiring was used. This, however, was not so decided an advantage as it was, owing to the introduction of flexible metallic tubing and the inverted gas-burner with artistic designs for gasaliers and brackets which it had introduced.

#### APPLICATION TO POWER.

As to power, there was a large field of usefulness for both forms of energy. Each was excellent when used in the right place. Where gas was reasonably cheap, the gas-engine as a prime mover was very good, on account of the small space necessary, the ease in starting, and little attention required during running. The ruling factor, however, was one of cost. When electricity could be generated by a gas-engine generator set on a person's premises, for an inclusive cost of  $\frac{3}{4}$ d. per unit and under, with town gas, then the purchase of electricity from an outside concern was obviously a waste of money. Electricity generated in such a way rendered a place less liable to stoppage of work through failure of supply—a thing which often happened with a town supply of current. A modern gas-engine cost 0.3d. per B.H.P. hour for gas alone, with gas at 1s. 8d. per 1000 cubic feet; while electricity, at 1d. a unit, cost 0.75d. per B.H.P. hour, or  $2\frac{1}{2}$  times as much as gas at these prices. It was evident, therefore, that at the present prices of current in most places, it was cheaper and more reliable to use a gas-engine as a prime mover. If isolated motors were then required, as in a modern machine shop, it was best to generate the current on the premises with large gas-engines. The modern system in engineering shops of having each large machine or group of machines driven by its own motor, had opened a new field for electricity which it ought to monopolize. In harbour work, for cranes, &c., steel and iron works, metallurgy generally, railway and tramway traction, mines, elevating and conveying work, and the transport of materials generally, ship lighting—such were the true spheres for electricity. In these, the demand was fairly continuous—a most important point with the electrical engineer. But unless current was supplied below  $\frac{3}{4}$ d. per unit, it was cheaper, as he had said, to generate one's own electricity by a gas-engine. In concluding, Mr. Robinson said if electric current were charged for in the same understandable way as gas, it would require to be raised in price in the majority of towns. Instead of this, each town seemed to have its own fancy way or method of charging, often below cost price, in order to divert business from the gas undertaking, instead of making it compete on a fair basis. Even with these fancy methods of charging, in 33 towns having a population of 30,000 to 40,000, and each owning its electricity works, twelve made losses, only nine put anything away to the depreciation and reserve fund, and only five contributed to the rate fund. Such a record was not to be found in the gas industry.

#### THE CASE FOR ELECTRICITY.

Mr. J. G. CUNLIFFE, who followed to support the cause of electricity, at first apologized for not having prepared statistics to place before the meeting in favour of his case, and then made the assertion that the fact of the room in which they were assembled being illuminated by the electric light was proof of its superiority over the old illuminant. Having confessed that he was more interested in the application of electricity than in its making, Mr. Cunliffe went on to give a *résumé* of a conversation he had recently with the Managing-Director of the Temperance Billiard Halls Company—a concern having numerous halls in the North—for which light is required all the day through. This Managing-Director, a keen business man, with an eye to the £ s. d. of the question, had been inundated with figures and facts from both sides and tried both illuminants. Having the discussion of that evening in view, he (Mr. Cunliffe) asked this gentleman what his opinion was on the subject; and his reply was to the effect that, in regard to cost, there was practically no difference, and the whole thing was settled by the outlay on lamps. There was no doubt, added Mr. Cunliffe, that the reason electricity was not more favoured for lighting purposes was owing to the failures and breakages of the filament lamp, which was at present undeveloped; but it was surely reasonable to assume that when its devel-

lopment came—when the filament lamp became almost unbreakable—gas would be altogether out of it. Another drawback was that electricity could not be stored efficiently; and the consequence was very heavy standing charges. On the blackboard, Mr. Cunliffe illustrated the difficulties electrical engineers had in dealing with the "peak" load. He said the method of charging, based on the fact that since storage of electricity was much more wasteful than gas storage electrical equipments had to be built to produce the maximum power required at any time, was also a difficulty. It was due to these complicated tariffs for electricity that it was not in greater use for domestic purposes; but when this had been altered—as it would be shortly—and electricity became reasonably cheap, he anticipated its use would spread much more widely. For some years now electrical engineers had been devoting special attention to the establishment of a standard method of charging the consumer; and when this had once been accomplished, electricity would be more largely used for domestic supply. Then the gas people should recognize that up to quite recently the equipment of electricity stations had been most costly, and that as time went on the cost would be less and the prices fall considerably. In a few years, electricity would be so cheap as to become a more serious rival to gas. As to the dangers arising from electricity, many of the accidents were due to faulty wiring; but before long wiremen would have to be qualified by examination, and hold a certificate of proficiency before being employed. At any rate, there was no danger of their being suffocated in their sleep by electricity; and he might add that, although there were over 200 miles of overhead wires in Manchester, there had only been six wires down in six years. He claimed that the superiority of electricity over gas for traction and power was clearly demonstrated by the plants put down.

Mr. PAGE said it seemed to him there were instances where electricity would be more useful than gas and cases where gas would be preferable to electricity. He did not think the deciding factor was so much that of cost always as usefulness and cleanliness. He questioned Mr. Robinson's figures as to the lighting and cleaning of street-lamps—namely, £1 per lamp per annum.

Mr. ROBINSON replied that this was the actual cost of the work in Manchester.

Mr. PAGE, continuing, said he thought the present price of the osram lamp was 10s. 6d., and not 13s. 6d. as set out by Mr. Robinson.

Mr. ROBINSON replied that he took his price from a catalogue he obtained from the firm a fortnight ago.

Mr. PAGE gave details of two cases where, by the installation of electricity for gas, the occupier of the house had saved—in the first, the cost for the year being £5 7s. 3d., as against an average of £5 11s. 8d. for the previous three years, and in the second £19 6s. 4d., as against £22 7s. 9d.; that being light for light.

Mr. RIDGWAY, from the general tenour of his remarks, evidently favoured the application of electricity for use at large docks, steel works, and for driving cranes. He supplied interesting details of gas-producer plants at different large works, and admitted that for the lighting-up of the sheds and roadways at large docks the incandescent lamp had proved very satisfactory.

#### THE QUESTION OF MANTLES.

Mr. F. THORP, Vice-President of the Manchester and District Junior Gas Association, twitted Mr. Cunliffe about his remark that because the room was lit by electricity it must be taken that it was better than gas. It was to them, as gas engineers, incomprehensible why a room like that was lit by electricity when it could be better illuminated by gas, and at one-third the cost of electricity. He then went on to say that the question of the cost of mantles was very often remarked upon. During a debate the Junior Gas Association had with the electrical engineers some time ago, he made a statement that he had in his house two mantles which had been in use ten months without breaking. The remark was received with derision. But although two years had elapsed, these two mantles were still there and in use.

The CHAIRMAN: But do they give the same light?

Mr. THORP replied that the light was practically the same. Asked the make of the mantles, he said one was a Welsbach; but he could not at the moment say what was the make of the other. Turning to deal with Mr. Cunliffe's observations about the difficulties electrical engineers had with the "peak" load, Mr. Thorp pointed out that gas engineers were much in the same position, having in the summer months hundreds of thousands of pounds' worth of plant standing doing nothing, because of the lightness of the load compared with the winter months. Then as to the method of charging, those connected with gas undertakings were treated most unfairly compared with their opponents, the electrical undertakings. If the gas people were allowed the same privileges electrical engineers had in this respect, he did not think electricity would have "a ghost of a chance" against gas. He illustrated this point by showing what had been done in Manchester, and humorously remarked that they could do with a little Tariff Reform in this respect. Incidentally, he mentioned that, with the exception of railways, there was more money sunk in gas undertakings in this country than in any other concern. Referring to what had been said by a previous speaker about the usefulness of the flame arc for outside work, Mr. Thorp submitted that they had gas-lamps quite as good, if not better, for the purpose. They had lamps from 10 and 20 candle power up to 3000-candle power, which was sufficient for any purpose. Civil engineers appeared also to favour the use of high-pressure gas



for lighting in preference to electricity. His personal feeling in regard to the flame arc was that it should be made almost a criminal offence to use it. Fixed at street corners, its intense glare was not only injurious to the eyes, but the cause of many accidents.

Mr. BECKETT said he had been interested in the relative advantages of gas and electricity as applied for pumping purposes; and having gone carefully into the matter, he had come to the conclusion that it was best to have the bulk of the work done by electricity, and the smaller portion of the pumping done by gas power. Gas was certainly cheaper per 1000 gallons pumped; but this was not always to be considered in such work.

Mr. D. V. HOLLINGWORTH, F.C.S., a member of the Junior Gas Association Council, dealing with Mr. Page's questioning of the table of costs given by Mr. Robinson, said he would supply the former with what he called "a further horrible example."

Gas.

One 64-c.p. incandescent burner, consuming 4 c. ft. per hour, for 1800 hours = 7200 c. ft., at 2s. 6d. per 1000	=	0 18s. 0d.
Renewals, 6 mantles at 4½d. each	=	0 2 3
		£1 0 3

Electricity.

Two osram lamps, 32 c.p., at 17.3 watts per c.p., for 1800 hours' energy consumed at 149 units at 3d.	=	£1 17 3
Renewals, 6 lamps at 4s. each	=	1 4 0
		£3 1 3

This proved, said Mr. Hollingworth, that, light for light, and with the prices agreed upon for the purposes of the discussion, the osram lamp—the best electric lamp on the market—was three times more expensive than gas. On the question of the pollution of the atmosphere by gas, Mr. Hollingworth quoted from eminent authorities—such as the members of the "Lancet" Commission, Professor Lewes, Professor Frankland, and Dr. H. H. De Vœux—who had conclusively shown that, neither from an incandescent burner nor from a gas-fire, was there given off any trace of carbon monoxide, acetylene, or, indeed, any deleterious gas whatever. In view of such evidence, he thought it was "high time the vitiation bogey was laid for ever." He considered that in the pollution of the atmosphere the electricians were by far the worst offenders; as by their clumsy methods of burning coal under

steam-boilers, 97 per cent. of the sulphur from the coal was disseminated in the air, whereas by the scientific methods used by gas engineers, the great bulk of the sulphur from the coal was retained in the gas-works, to become a source of revenue to the department. Therefore it seemed to him the least said about sulphur pollution the better for the electricians. In regard to flame arc lamps, Mr. Hollingworth wondered if those advocating its use were aware that in the manufacture of these lamps the electrodes were made of hollow tubes of hard carbon, inside which were cores of softer carbon, impregnated with various metallic salts according to the colour of the flames desired. These salts, when strongly heated—as they were in the electric arc—were volatilized, and gave off extremely dangerous fumes of hydrofluoric and hydrochloric acids. Further, he had it upon the authority of a distinguished professor of chemistry that all forms of arc lighting gave off extremely noxious fumes of nitrous oxide and nitric acid. In view of these facts, he thought the advocates of flame and other arc lighting had, on hygienic grounds, an awkward case to answer.

The discussion was continued by Mr. Mellor, Mr. Patterson, and others on the side of electricity; the chief point made being that, with the march of invention, electricity must become an even greater rival to gas than was the case to-day.

GAS PEOPLE HAMPERED.

Mr. Robinson was not afforded the opportunity of replying, owing to the lateness of the hour.

The CHAIRMAN, in closing the discussion, said it must be admitted that, but for the introduction of electricity, we should not have had the rapid advance which had been made in recent years in gas lighting. Personally, he did not like the electric light for domestic purposes, as he could not read by it. He thought for the drawing table and the study incandescent gas was the best. One of the arguments used in the discussion had impressed him very much—that was, the better conditions under which electricity competed with gas in towns where the two undertakings were owned by the local authority. It was evident that the gas people were not fairly treated, and, being the older industry, were hampered by a mass of legislation, and bound as it were hand and foot in every way. If they were free to deal with gas in the same way as with electricity in respect to loads, the position of the gas undertaking would be greatly improved.

This concluded the proceedings.

TESTING SUCTION GAS-PRODUCERS WITH A KÖRTING EJECTOR.

WE have received from Mr. C. M. Garland, of Urbana (Ill.), a print of a paper prepared by him, in association with Mr. A. P. Kratz, assistant in the Mechanical Engineering Laboratory of the University of Illinois, giving an account of the method adopted by them for testing a suction gas producer described in the paper, and used in their tests of gas-producers in the laboratory. The authors say their method reduced to a minimum the labour of carrying out the tests; and the tedium accompanying the making of the calculations was relieved by elaborate forms of computation drawn up by them and appended to the paper.

The tests were made on an Otto suction gas-producer rated at 60 H.P. and 8000 cubic feet of gas per hour. The plant as originally installed consisted of the producer A (fig. 1), the wet scrubber B, the gas-receiver C, and a 22-H.P. engine. In order to facilitate the testing of the plant, the connection to the latter engine was blanked, and a Schutte-Körting steam-ejector of 12,000 cubic feet hourly capacity was placed in the gas-main at F. This ejector was used to draw the gases from the producer, and

deliver them to the wet scrubber G, where the steam used by the ejector was condensed.

The condensed steam and condensing water passed out at the overflow M, while the gases issued through the separator N and into the dryer H, constructed from a gas bell or holder, and filled with straw, and used to separate the suspended moisture from the gases before they entered the meters I and J, of 8000 and 3500 cubic feet hourly capacity respectively. These were connected in parallel for capacities greater than the first-named quantity per hour; the larger meter alone being used for lower capacities. From the meters the gases were discharged into the atmosphere above the roof of the laboratory. A gauge-box L was adapted to receive thin plates with orifices, and was used in calibrating the meters by means of air. The meters having been blanked from the gas-main, compressed air was admitted at K, and expanding passed through the meter to be calibrated and let out at the orifice in L. After the calibration, the inlet to the box was blanked. The producer is of the contained vaporizer type, with grate and without charging bell; the specifications stating that it is only to be used twelve hours at a time. During some of the earlier tests, the cast-iron vaporizer was cracked. A steam-jet was then used

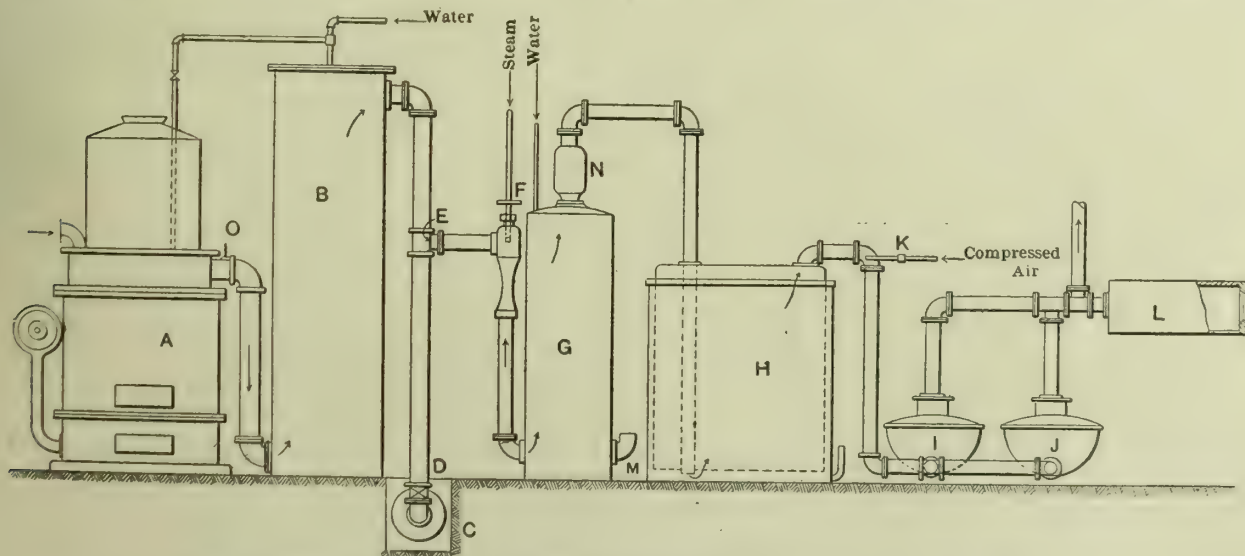


Fig. 1.—General Arrangement of Suction Gas-Producer Plant tested with a Körting Ejector.



to supply the moisture, and the vaporizer was blanked off. The weight of steam was measured by passing the jet through a calibrated orifice in a thin plate.

The test was started with the producer full and with a clean fuel bed. The coal fired during the test was weighed, and at the end of the test the fire was cleaned—the fuel bed being brought to as near the starting condition as possible—and the producer filled. In order that the error in determining the weight of coal fired in this manner might be known, the producer when cold was filled a number of times, and the weight of coal required was noted. The average of these weights was taken to be the true weight of coal required to fill the producer; the probable error in filling with a given weight of coal being estimated from the results. In running, it was endeavoured to make the tests of such duration as to bring the probable error of filling down to 2 or 3 per cent.

The temperature of the gas leaving the producer was taken at O by means of a platinum-rhodium thermo-couple and a Siemens and Halske milivoltmeter, calibrated to read direct in degrees Centigrade. The temperatures in the fuel bed were taken with Hoskins thermo-couples and galvanometer; the latter reading in degrees Fahrenheit. Other temperatures were taken with mercury thermometers. The temperatures in the fuel bed were taken in three horizontal zones, 10, 18, and 24 inches, respectively, above the grate. In each zone, readings were taken 3 inches from the lining on each side, and in the centre of the fuel bed. The results are given in the following table:—

Temperatures in the Fuel Bed.

Time.	Zone No.	Temp. 3 Inches from Near Wall.	Temp. at Centre.	Temp. 3 Inches from Far Wall.
		Deg. Fahr.	Deg. Fahr.	Deg. Fahr.
10.05-10.10 a.m.	1	2100	2037	2025
10.25-10.30 "	2	2350	2225	2275
10.43-10.55 "	3	..	2200	2400

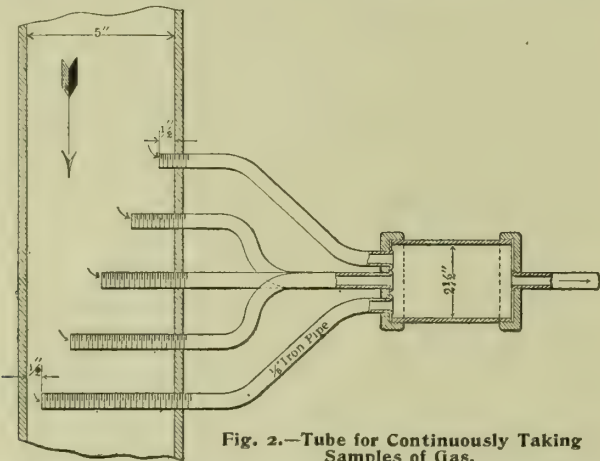


Fig. 2.—Tube for Continuously Taking Samples of Gas.

By means of the sampling-tube illustrated in fig. 2, samples of gas were taken continuously for test by a Junkers calorimeter and for analysis by a Hempel apparatus. The results of the analyses are given in the following table.

Gas Analysis by Volume.

No.	Time.	Per Cent. CO <sub>2</sub>	Per Cent. O <sub>2</sub>	Per Cent. CO	Per Cent. CH <sub>4</sub>	Per Cent. H <sub>2</sub>	Per Cent. N <sub>2</sub>	B.Th.U.
	A.M.							
1	6.23-9.05	5.7	0.5	22.9	2.1	12.2	56.6	134
2	9.10-10.37	4.1	0.2	27.9	1.6	11.1	55.1	142
	P.M.							
3	10.39-12.25	3.3	0.1	28.4	1.5	9.5	57.2	137
4	12.30-2.52	4.3	0.2	26.9	1.8	10.6	56.2	139
5	3.00-4.35	3.6	0.1	28.6	1.8	9.0	56.9	139
6	4.40-6.05	4.1	0.3	27.4	1.8	10.0	56.4	138
	Aver.	4.20	0.23	27.01	1.77	10.40	56.40	138.1

As already stated, the weight of steam fed to the producer was determined by the use of a calibrated orifice. By means of a small laboratory aspirator, a sample of the gas leaving the producer was drawn successively through a calcium chloride tube and a small gas-meter; the weight of moisture being determined by the calcium chloride tube and the volume by the meter. The percentage of moisture determined by this method was used merely as a check; that used in the computations being obtained by calculating the weight of water decomposed from the analysis of the gases and the analysis of the fuel. The difference between this quantity and the total weight of moisture carried into the producer gives the weight of moisture in the gas leaving it.

The volume of gas generated by the producer, and measured by the meters, was also checked by computing the volume of the gas generated from the analyses of gas and coal. In the anthracite producer, where the loss of carbon in soot and tar is small (probably not more than 1 per cent.), this offers an excellent means of checking the volume of gas, and also of computing the weight of air used. Gas analysis—where continuous samples are taken by the form of sampling-tube illustrated—should be accurate within 1 per cent. The greatest error is likely to be made in the sampling of the coal. With a fine coal, such as pea or buckwheat, and a sample representing from 10 to 20 per cent. of the total weight of coal fired, the error in sampling should not exceed 2 per cent. The maximum error in determining the volume of gas and weight of air used should not exceed 5 per cent., if the error in filling the producer is 2 per cent. The probable error is therefore much less. In most of the tests, the volume of gas computed from analysis has checked within 5 per cent. the volume determined by the meters. The meters are known to be accurate well within 2 per cent.

In the testing of large producers of the bituminous type, it is often difficult to measure the volume of gas by any mechanical means. In such cases, if the carbon lost in the soot and tar is estimated from a sample of the soot and tar, and this amount is deducted from the total weight of carbon in the coal, the volume may be computed from the analyses of the gas and coal, and may be relied upon within 5 per cent., provided the sampling is correct. The graphical log-sheet (fig. 3) illustrates the uniformity of the conditions that were maintained throughout the test.

As already mentioned, the authors prepared forms to facilitate the computations; and they are appended to the paper. There

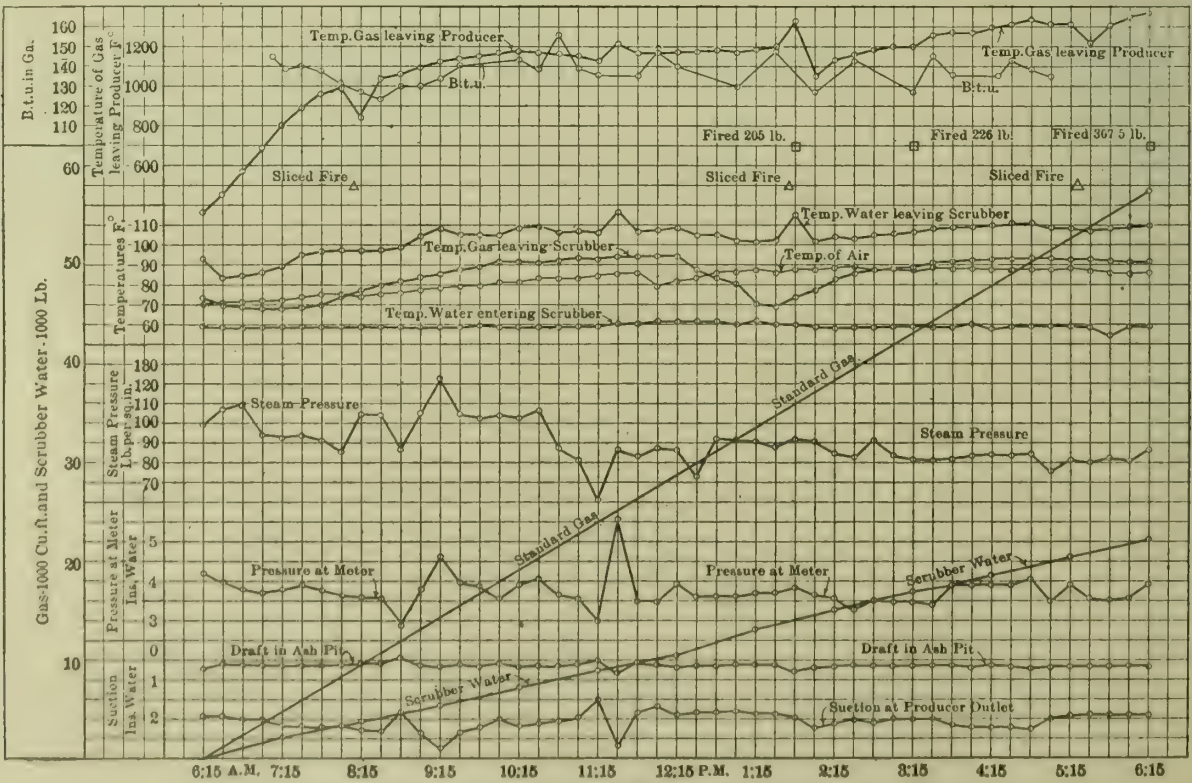


Fig. 3.—Graphic Log of Test of Suction Gas Producer.



are two and a guide-sheet. Form No. 1 is used only for the presentation of the results of the tests; No. 2 contains all the items used in the computations; while the guide-sheet contains all the formulæ and their derivation. In following out the authors' method, the average corrected quantities are taken from the original data sheets and put on form No. 2; and the computations are made by following the guide-sheet. After No. 2 is completed, the results are transferred to No. 1.

## REGISTER OF PATENTS.

### Discharging-Chargers for Gas-Retorts.

ALDRIDGE, J. G. W., of Victoria Street, Westminster, S.W.

No. 26,056; Dec. 2, 1908.

This invention relates to discharging-chargers for gas-retorts, as described in patent No. 10,480 of 1902 and No. 5375 of 1906. It has for its object "to prevent waste of coal and ensure even charges in the retorts." A further object is to facilitate the repair of the discharging-charger chain.

The arrangement protected consists of a sliding apron plate adjustable between the end of the machine and the mouth of the retort; shield plates hinged at the lower part of the coal-shoot, and pressing against the sides of the chain, so as to prevent the coal escaping over the sides of the chain when the chain is being charged; an automatic sliding plate, placed in front of the shoot, also for preventing the escape of coal; hinged devices for keeping at a definite level the hinged push-plates that push the charge along the retort bottom, so that the coal is levelled on the return stroke; and adjustable and renewable wearing strips on the bottom of the chain, "so that the chain shall be kept in good working order for a considerable period without any renewal of the main parts being necessary."

Referring to figs. 1, 2, and 3, the bed-plate A of the machine is supported on rollers B; and the front or retort section is hinged to the bed-plate so as to swing vertically. It is carried on rollers journaled at the ends of pivoted levers C, whose other ends have counterbalancing weights sufficiently heavy to ensure that the pivoted apron-plate section shall incline upwards, while the whole of the bed-plate is run forward by a hand or power operated pinion D working in a rack on its underside. A stop T on the apron-plate comes against the bottom edge of the retort mouthpiece to prevent its going too far.

In the arrangement shown, the apron-plate is operated or adjusted by a hand wheel E provided with a ratchet wheel and pawl held in

engagement by a weighted lever F, which prevents the apron-plate from moving back accidentally from the retort mouthpiece, and is released by a pedal when it is desired to withdraw the apron-plate.

The levers carrying the weights have slots whose sides engage with stops in the form of nuts G on a threaded rod, so that the line of movement can be altered. These stops prevent excessive movement of the apron-plate either upwards or downwards.

When the chain passes on to the apron-plate, its outer end is pressed down on to the floor of the mouthpiece, "so that all inequalities of setting of the retorts are provided for (in the direction of the retort) by the longitudinal movement of the bed-plate and vertically by the rise of the end of the apron-plate."

The coal-shoot I (fig. 4), which is of the same cross section as the top of the chain, is fixed at its lower end to the bed-plate frame by plates and extended towards the rear to facilitate rapid delivery of coal. In the interior of the shoot are mounted longitudinal hanging flaps J, whose lower edges can be regulated by adjusting screws, to vary the distance between them, and so regulate the amount of coal passing into the chain. In order to prevent coal falling over the sides of the passing chain, external hanging flaps K, pressed inwards by springs and provided with wearing strips, bear against similar wearing strips on the upper edges of the side plates L of the chain; and to prevent the escape of coal at the forward end of the shoot, a vertical plate M is arranged in the front of the shoot, with the bottom edge curved to arch shape. In order to clear the saddle-bars on the chain as it passes, the plate is arranged to slide vertically in guides, and two double inclined planes are fixed to its lower edge, which slide over the saddle-bars, so that the plate is lifted automatically on meeting a saddle-bar.

### Suction Gas-Producer.

FARNHAM, R. V., of Wemyss Bay, N.B.

No. 26,199; Dec. 4, 1908. No. 11,675; May 18, 1909.

This combined patent relates to generators or gas-producers of the kind wherein the fuel is fed at each fresh charge direct on to a vertically movable support, co-operating with a temporary horizontally movable support so that the gases arising from the fresh charge are caused to pass through the incandescent fuel resting above the fresh charges, and the volatile matters and hydrocarbons are resolved into fixed gases.

The novelty of the invention consists in the particular construction of generator employed. It comprises a central combustion chamber of fire-brick located within a metal casing provided with means for effecting the destructive distillation of the coal; the combustion chamber having the fire-grate at its lower end, and its upper end being contracted and surmounted with a hopper, through which is fed the fuel. The

Fig.1.

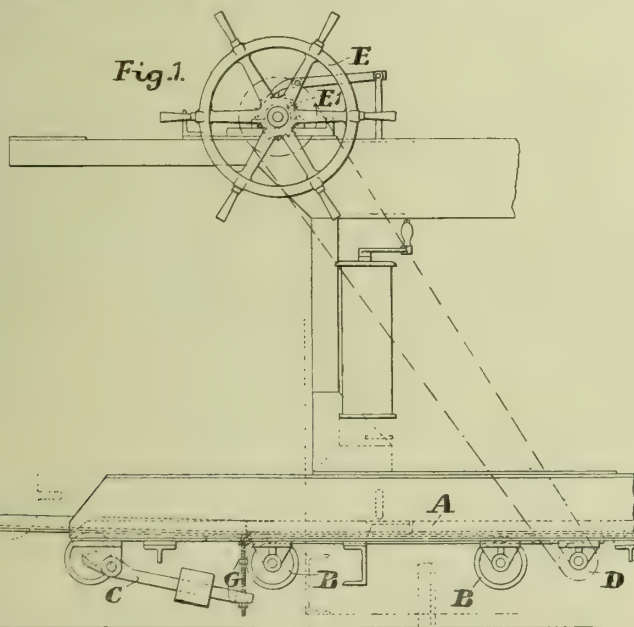


Fig.3.

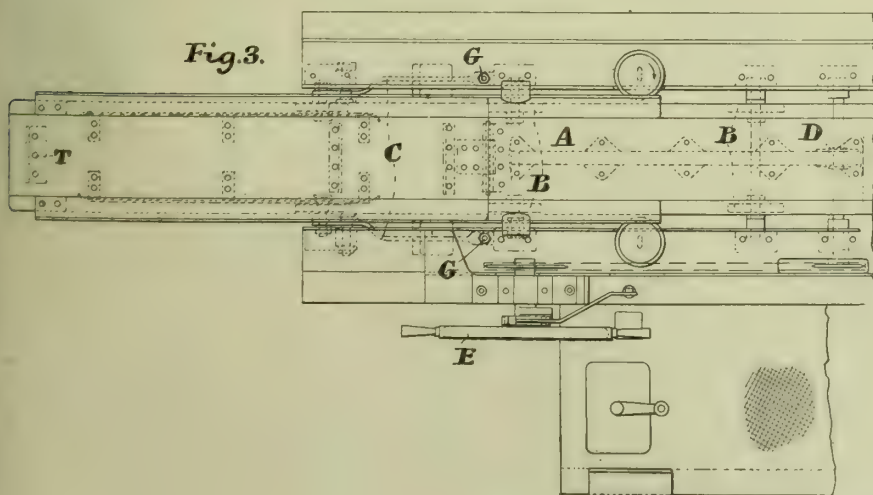


Fig.2.

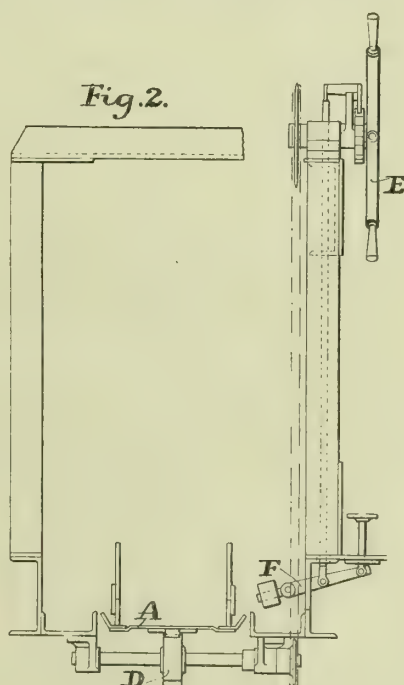
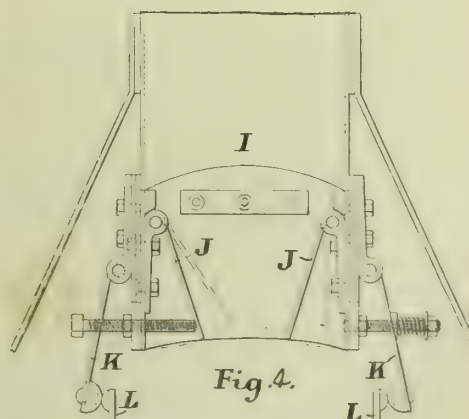


Fig.4.





fire-grate is capable of being raised vertically to carry with it the incandescent fuel or compress the fuel in a space above the grate; and for this purpose devices for lifting the grate are operated from outside the generator casing. In conjunction with the grate there is provided, at about the height to which it is intended to be raised, a channel-shaped guide, in which a perforated metal plate is arranged to be slid horizontally, so as to pass through the incandescent fuel after the grate has been raised, and to support all the fuel in the combustion chamber temporarily after the grate is lowered. When the grate is lowered, the space left between the supporting plate and the fire-grate (after the fire-grate has been cleaned by a cleat to prevent the formation of clinker) is fed with fresh fuel through a lateral opening just above the grate, and which fuel may be fed forward by a screw conveyor or the like. When the supporting plate is withdrawn, the fresh fuel is quickly ignited by the incandescent fuel now dropped upon it, and the volatile matters arising from it are resolved into fixed gases in passing through the incandescent fuel.

### Timing Device for Gas-Controllers.

HORSTMANN, A., G. O. H., E. H., & S. A., and EDGAR, W. T.,  
of Bath.

No. 32; Jan. 1, 1909.

This invention relates to clockwork gas-controllers and time switches fitted with cam equation mechanism for varying the position of the points of discharge in relation to a time dial. It further relates to the kind of mechanism which rotates on an axis—particularly to the arrangement of the cams whereby they are rigidly mounted on one common spindle capable of being altered in relation to the gear-work which rotates them.

The following advantages are said to be obtained: As both cams are fixed in relation to each other in accordance with a predetermined time chart (such as the schedule of the times of lighting and extinguishing), the date to which they both relate is recorded on a dial plate or index, and can be altered at will. As both cams are rigidly fixed in relation to each other, inaccuracies due to back-lash (which occur where individual spindles are used for each cam) are eliminated. As the combined cams are made to actuate their attendant discs, cams of a greater eccentricity may be used than is possible where cams are mounted on individual spindles. As both cams are rigidly fixed in relation to each other, the mechanism itself may be used to record time in its annular rotation.

In the specification of patent No. 27,849 of 1904, there was described mechanism revolving on its own axis and carrying discharging pins whose angular position in relation to the axis was varied automatically by means of two cams mounted on separate axes to which were imparted regular motion by means of a worm; and the main object of the present invention is to avoid certain inconveniences associated with the use of the arrangement formerly patented, without increasing the size of the whole mechanism.

### Thermo-Electric Pyrometers.

PEAKE, W. S., and the CAMBRIDGE SCIENTIFIC INSTRUMENT  
COMPANY, LIMITED, of Cambridge.

No. 370; Jan. 7, 1909.

This invention relates to thermo-electric pyrometers in which a thermo-couple of (say) platinum and an alloy of platinum is connected by base metal leads to an indicating or recording instrument at some distance from the thermo-couple itself; the object being to increase the accuracy of the readings obtained, and to render unnecessary any device for maintaining the junction between the leads and the thermo-couple at a constant temperature, by causing the readings to be independent of the temperature of the end of the thermo-couple to which the leads are connected.

One feature of the invention consists in the employment of leads composed of dissimilar metals or alloys, such that their thermo-electromotive force, when in direct contact, is equal to that of the thermo-couple for the same temperature difference. This need only apply within the range of temperature met with at the "cold" end of the thermo-couple. A further feature consists in the employment of leads each of which is composed partly of a metal or alloy dissimilar to that of a corresponding part of the other, the other portions of both leads being composed of the same metal or alloy.

### Disc Valves.

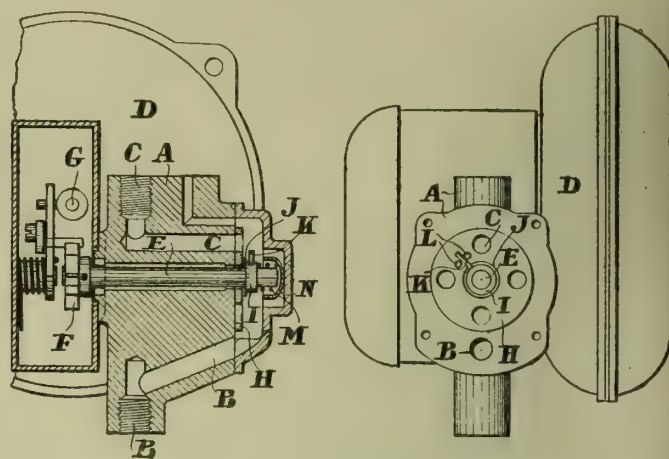
TOURTEL, J. M., of Chiswell Street, E.C., and MEALING, W. R., of  
Twickenham, S.W.

No. 1072; Jan. 15, 1909.

These disc valves are particularly designed for use with gas apparatus of the kind in which the lighting and extinguishing are effected by increasing the pressure in the mains; but it is also applicable to apparatus where a valve is required which is easily turned and is used for the opening and closing one or more passages.

The disc valve used for controlling the supply of gas is placed within a supply chamber, and is furnished with an operating rod which passes from the chamber and freely through the valve to outside the chamber. The rod is provided at the end which projects through the chamber with means for turning it (such as a ratchet-wheel) and bearing within the chamber a collar or enlargement, between which collar or enlargement and the face of the valve is placed an elastic washer, which is compressed by a spring tending to force the rod outwards—thus securing a gas or water tight joint. The rod also bears within the chamber a projection, which engages with corresponding projections or the like upon the valve so as to form a connection for the purpose of enabling the rod to turn the valve.

The part A has formed in it the gas inlet B and outlet C, which are opened to each other or closed by the movements of the disc H, which



Tourtel and Mealing's Disc Valves.

has four equidistant holes. The disc is placed over the spindle E, which is furnished with a shoulder I carrying a pin K, which, by fitting between two pins L on the disc, conveys all rotary motion of the spindle to the disc. A spring M, fitted under the anti-friction cap N, presses against the collar, and causes it, through the medium of the elastic ring J, to hold the disc in close (but easily movable) contact with its face on the piece or block A. The cap is held in place by a cover which forms one side of the gas-passage.

The spindle is connected to the ratchet mechanism F controlled by the rod G, which is moved by a diaphragm (not shown) in the case D. The arrangement allows a certain amount of flexibility between the spindle E and the disc H, and yet ensures a gas-tight joint for both. It also allows for any slight irregularity in fitting, whereby the spindle might not be exactly at right angles to the face of the valve. This would not be possible if the spindle and the disc were solidly connected together or made in one piece.

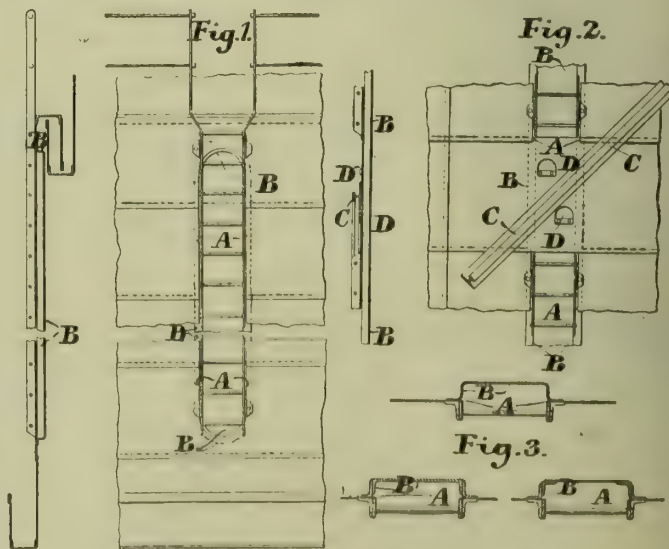
### Ladders for Gasholders.

CLAYTON, L., and CLAYTON, SON, AND CO., LIMITED, of Leeds.

No. 8913; April 15, 1909.

The patentees commence their specification by saying: The usual practice in ascending and descending spirally-guided gasholders, and also what are termed the "flying" lifts of ordinary gasholders, is by an iron ladder fixed to the outside of the shells; but as the spaces between the shells are limited, the ladder is obliged to be fixed close to the sheets, and thus the limited foothold provided (due to the staves of the ladder being a very short distance from the face of the gasholder) renders the operation of ascending and descending very dangerous. The object of the invention is to construct holders in such a manner at the part where the ordinary iron ladder is situated as to make room for the foot, and thus obviate the danger referred to.

With spirally-guided holders, a recess is formed in each of the various lifts of a depth and width to suit the ladder, and consisting of a vertical opening left in the plates and filled in behind by a trough (of similar depth and width to that of the opening) riveted to the side sheets of the holder. Opposite the recess thus provided is fixed a ladder, secured to the side of the holder by angle ears or otherwise. At the part where the spiral guide crosses the recess, the side sheets may be continued across the opening, in order that the guide may be riveted to them, and so retain its support; holes being provided in the plates for the foot so as to form a continuation of the ladder.



Clayton's Ladder Arrangement for Gasholders.

Fig. 1 is a front elevation and sectional side elevation of the lifts of a holder at the part where the spiral guide does not cross the ladder, provided with a ladder recess according to this invention. Fig. 2 shows a portion of one of the lifts of a gasholder at the part where the spiral guide crosses the ladder. Fig. 3 shows sectional plans of various ways of making the ladder recess.

In fig. 1, the sheets of the gasholder are cut away so as to form a



vertical opening A, which is filled in behind by a trough B, of similar depth and width to the opening. In fig. 2, the side sheets above and below the central side sheet are similarly cut away so as to form a vertical opening filled in behind by a trough. The central side sheet is continued across the recess formed by the trough in order to receive the spiral guide C, which may be riveted to it and so retain its support. The ladder in this example is made in two parts attached by angle ears to the face of the gasholder in front of the recess formed by the trough, while the central side sheet is formed with holes D for the foot, so as to form a continuation of the ladder.

The trough may be formed out of a single plate as shown in fig. 3, or it may consist of angle-bars and a channel plate, or of Z angle-bars and a flat plate.

### Discharging and Conveying Coke from Coke-Ovens.

SCHNIEWIND, F. W. C., of New York.

No. 10,483; May 3, 1909.

This invention relates to apparatus for discharging and conveying coke from coking-chambers or like structures—the coke so discharged being conveyed, generally, to a receiving station, where it is discharged into cars for railway transportation or into other storing devices.

One object of the invention is to provide apparatus so arranged that the coke from each retort can be transferred to a coke-receiver without undue jarring and in a gradual manner, "so that the coke will neither jam in the retort being emptied nor be broken up—thus avoiding injury to the oven walls and undue crumbling of the coke, with a consequent material reduction in the amount of coke breeze or waste coke dust formed." Another object of the invention is the provision of means by which the coke may be covered during the discharging operation and during transportation to the discharge station by a movable cover or lid. The apparatus is particularly designed for discharging coke-ovens in which the ovens proper are emptied through their lower ends.

Sixteen claims form part of the specification, which extends to five printed pages, and is illustrated by three sheets of detail drawings.

### Clockwork Devices for Lighting and Extinguishing Gas-Burners.

SPARKS, E., of Tufnell Park, N.

No. 19,941; Aug. 31, 1909.

This invention relates to improvements in patent No. 11,751 of 1902, where was described a gas-cock operated by clockwork through a weighted lever, which, when raised by the clockwork, was moved from one to the other of its two oppositely inclined positions, and thus opened or closed the cock. It also proposed to rotate (to open or close) a gas-cock by clockwork through a weighted lever, which, when raised and released, fell always in the same direction, and in its fall rotated, by means of a pawl mounted on a bell-crank lever, a ratchet-toothed wheel secured to a gas-cock.

The present invention has reference to a particular construction and form of one-way weighted lever for this purpose, and to a preferred form of cock for use with such lever. The weighted lever which is pivoted axially of the gas-cock is provided with a shield, adjustable as to position and adapted to be engaged by the usual tappet of the control disc; and this lever, when raised by the contact of the moving tappet with the shield, and allowed to fall, rotates the ratchet-wheel to the extent of one tooth by means of a pawl pivoted on the lever. The cock, to the stem of which the ratchet-wheel is fitted, is preferably of the types described in patent No. 8690 of 1908 or No. 2630 of 1909.

**Rochdale Corporation and Vertical Retorts.**—Last Thursday, a Sub-Committee of the Gas Committee of the Rochdale Corporation, accompanied by Mr. T. Banbury Ball, the Engineer, paid a visit to the St. Helens Gas-Works, and inspected the Glover-West vertical retorts in operation there. It may be remembered that in December last the Rochdale Town Council approved of plans for extensions and alterations at the gas-works, to cost some £25,000; one of the proposals being to rebuild the old retort-house, and instal vertical retorts in the new structure. The Sub-Committee are also to inspect the Woodall-Duckham retorts before reporting to the full Committee.

**Use of Water by City Departments in Boston (U.S.A.).**—The use of water by city departments was the subject of a report some time ago by Messrs. Metcalf and Eddy to the Boston Finance Commission. According to an abstract in "Engineering Record," it has been the practice since 1900 in Boston to furnish water free of charge to the various municipal departments, with the result that extravagance and waste were observed to exist. In many of the school houses water was allowed to run continuously through the fittings, not only in school hours, but also during nights, holidays, and possibly vacations. In an investigation of the records of water consumption by 35 schools in 1905, it was found that only eight, or 23 per cent., showed a consumption of less than 5 gallons per pupil per day; eleven schools used or wasted more than 20 gallons; four more than 40 gallons; and one more than 100 gallons per day per pupil. The reporters believe that the loss of revenue to the Water Department of Boston resulting from furnishing free water to other city departments during 1908 probably exceeded \$320,000. The consumption of water per head in Boston during 1907 was 157 gallons per day; and Messrs. Metcalf and Eddy believe that not less than 60 gallons of this amount is waste. They suggest as a remedy for checking the excessive waste the use of the Deacon system, which is already installed, but not used, according to the Water Department, because of lack of available funds. They recommend that the former custom of charging city departments at regular rates for water used by them be re-established, and that hydrant rentals be fixed at not less than \$15 per hydrant. It is stated that the Water Department, by furnishing free water to other departments, loses annually a sum equivalent to about 10 per cent. of its gross income.

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### The Preparation of Tar for Road-Making.

SIR,—I often read with interest your reports of meetings of our various British Junior Gas Associations, at some of which meetings papers of very considerable interest are given, which show an amount of ability in their preparation and discussion which is very gratifying to anyone who is concerned about maintaining the quality of our gas-works official staffs. Some of the work reported in your issue of Jan. 18 is of this good quality; but at the meeting of the Scottish Junior Gas Association the paper given by Mr. Butter, of the Perth Gas-Works staff, calls for some different criticisms than it received at the meeting. I hope it may not be considered ungracious for a senior to offer these criticisms; my only anxiety being to prevent the making of mistakes in the early days of the use of prepared coal-gas tar for the making and preserving of roads.

I desire at once to offer a word of warning, and to say that the preparation of refined tar is not likely to be the simple and smooth running process Mr. Butter seems to suggest.

Mr. Butter, I suppose, was speaking from his knowledge of tar as he finds it in Perth. Therefore, his conclusions, so far as one can arrive at any by a perusal of his paper, must not be taken as applying to tar produced in the British Isles generally.

Mr. Butter speaks of certain tar compos as being "preferable" for road-preservation purposes, because these are prepared from tars from which all deleterious constituents have been removed. Now as the removal of these constituents requires complete distillation of the tar to be used, Mr. Butter's description of apparatus suitable for the preparation of refined tar (viz., an old boiler-shell, &c.) may be very misleading to anyone who imagines that by any such incomplete apparatus properly refined coal tar can be prepared, suitable for road making, either by pressure spraying or any other method—even by the wonderful tar-spraying machine of which Mr. Butter advocates the use after removing "all loose binding and extraneous matter" from the roads.

To advocate the erection of such plant to prepare tar for such a purpose seems to me quite a contradiction of the arguments which favour the use of refined tar freed as far as possible of all deleterious constituents, and having added to it certain other constituents of a nature helpful in the required direction.

Moreover, the instructions contained in the paper are contradictory. In the instructions as to the use of an old boiler for the preparation of refined tar, it is stated that, after the water and naphtha are removed, the tar is ready for use. And then for certain purposes it is recommended that part of the "oil" be returned (but there is no explanation as to which oil is referred to), and the naphtha obtained is sent to an ever-ready market.

The incompleteness of the description of the Perth plant and its working to enable it to turn out pitch and oils or refined tar according to demand, are evident to anyone who understands the subject. But how the finished road-surface on the Carse of Gowrie can be "caused by vaporizing the tar and forcing the vapour into the road at the high pressure mentioned, leaving no deposit whatever on the surface," passes my comprehension. And as I look in vain at the discussion and reply for any light on the subject, I would warn intending experimenters that they are likely to fail if they try to preserve roads with refined tar prepared in accordance with such instructions, and applied after that fashion; and the development of tarred roads in the district where such experiments are tried is likely to be very slow, however reasonable a figure the tar was supplied at.

St. Helens, Jan. 28, 1910.

SAMUEL GLOVER.

### Gas-Service Pipes to Lamps.

SIR,—In reply to "Secretary's" letter relative to above, I think the usual practice is for the service from the main to the bottom of the lamp-pillar to be paid for by the gas supplier. The rising pipe in the lamp—that is, the pillar pipe—is usually supplied by the lighting authority.

Jan. 27, 1910.

INSPECTOR OF LIGHTING.

SIR,—Our practice is to lay 30 feet, voluntarily and (without prejudice) free of charge. If the service is more than 30 feet long, the council pay towards the cost; but the service remains the property of the gas company.

But what is the position in the following circumstances? The council own the lamps, columns, and lighting appliances. The existing gas-lamps within 10 feet of the mains are converted to electric lamps; and the council require a supply of gas to one lamp 70 feet from the gas-main.

These circumstances were not anticipated; and there is no provision for our guidance. Should the council pay the whole of the cost; and then would the service remain the property of the gas company?

Jan. 27, 1910.

MANAGER.

### Dessau Vertical Retorts at Sunderland.

SIR,—Mr. Dru Drury's corrected figures of results in this week's "JOURNAL" are, indeed, both creditable and interesting.

As one who may lay claim to a large amount of work and experiences in the carbonization of coal in vertical retorts of various designs, I can give appreciative welcome to the results obtained at Sunderland, both by steaming and non-steaming the charge. I, however, lost all my love for steaming because it so seriously broke down the healthiest part of the best conditions—i.e., illuminating power; and it had beside other disadvantages.

Referring to the "JOURNAL" for the 18th inst., I find you say (p. 147): "In fact, those interested [I am one] in the system see no reason—using coal of the quality of that employed at Sunderland—why a



production should not be realized of considerably over 14,000 feet of 14.5 candle gas." I have written it before, and again repeat, that in October, 1903, 14,300 cubic feet of over 14.5-candle gas was obtained at Exeter, using steam. I am deeply list in the Sunderland results, as between steaming and non-steaming. The increase in volume and loss in illuminating power, practically run tandem—viz., 3.5 per cent. and 4.5 per cent. (approximately) over and under non-steaming and steaming conditions. A very rare experience I venture to think!

It would be interesting to know if the plant used at Sunderland—after (say) the foul main—is apparatus that has been used before? I mention this, only because, at Exeter, with a fourth vertical retort, erected in a new position, we used the old coal and cannel testing plant from the hydraulic main to the gasholder. With heats up, and carbonization in fair go, we resorted to steaming the charge, and were very much puzzled to find a rapid rise in the illuminating power, despite the fact the steaming was a dragging-down process, with expectations of seeing a marked reduction in the illuminating power.

Investigation proved—in plain language—we were driving a hungry pack of hounds through a butcher's shop.

Dartmoor, Jan. 28, 1910.

T. SETTLE.

### Lectures to Juniors—A Suggestion.

SIR,—During recent years, the heads of the great gas companies have given considerable attention to the technical training of their employees; and many are the advantages offered to those who have the prescience to take heed of the efforts of "the powers that be." Still I think that a point is missed. Nothing is done to interest in the practical production of gas those juniors who are not employed at the works. I think that the lectures now given would prove of greater advantage to ambitious juniors if they could be given opportunities to see gas in the making, and also be initiated in what to them are the mysteries of the bye-products.

Would it be too much to ask for a series of peripatetic lectures at Beckton, on Saturday afternoons, open to juniors in all departments?

London, Jan. 24, 1910.

O. B.

### Suggested Conferences of Gas and Water Companies' Secretaries.

—A correspondent, a Fellow of the Institute of Chartered Secretaries, writes: "Is it not possible for secretaries of gas and water companies to meet and discuss topics of vital interest to our profession in the same way as our engineer colleagues? I throw out the hint in the hope that some one from our leading companies may take the initiative; and doubtless many, like myself, will be glad to associate themselves with the movement."

**Repairing Leaky Gasholder Plates.**—A correspondent asks: What is the best thing to do with a gasholder when the bottom plate begins to get perforated? He says four or five holes have rusted through his holder about 4 and 5 inches from the angle iron at the bottom. He wishes to know how best to stop these holes. The holder is 40 feet diameter, 12 feet high, and weighs slightly over seven tons. He adds: The holder could easily be dispensed with for at least three months during the summer, as there are two other holders of the same size on the works.

**Buenos Ayres (New) Gas Company.**—A meeting of the Buenos Ayres (New) Gas Company was held on Monday last week, at the offices of the Company, to determine whether an application should be made to the Court for the appointment of any person in the place of, or jointly with, Messrs. Frederick C. im Thurn and Ross Pinsent, the Liquidators appointed by the Company, or for the appointment of a Committee of Inspection. The Chairman (Mr. F. C. im Thurn) said that proxies representing £134,900 in debenture stock and £283,000 in share capital had been received. There was no opposition to the gentlemen named.

**Walker and Wallsend Union Gas Company.**—At the annual meeting of the Company on the 11th inst., the Directors will report that, notwithstanding that the continued general depression in trade caused a further decrease in the consumption of gas last year, the revenue account is satisfactory; the gross profits being more than sufficient to meet all the necessary appropriations, and pay the maximum dividends authorized in accordance with the sliding-scale. Manufacture was discontinued at the old Walker works in April last; and since then gas production has been carried on entirely at the new ones. The Directors state that their anticipations as to the savings accruing thereby have been fully realized. The profit for the year was £11,924; and the balance carried forward was £5208—making a total of £17,132. After payment of the interest on mortgages, &c., the dividend on the preference stock, and the proposed dividends on the ordinary 10 and 7 per cent. stocks (at the rates of 12 and 9 per cent. per annum respectively), there will be left a balance of £5289 to be carried forward. The quantity of gas sold for private consumption last year was 223,188,000 cubic feet.

**Suggested Use of Discs in Prepayment Meters.**—In the course of a letter to the "Manchester Guardian," on the subject of prepayment meters, Mr. J. D. Affleck says: "The sooner current coin ceases to be used in these meters, the better it will be, as the very fact that the meter contains money is a great temptation to the young, as well as to a band of thieves known to the police as 'the slot thieves.' To overcome this pilfering evil, I would suggest that discs be used instead of pennies—shopkeepers to be appointed agents for these discs by the Manchester Corporation on the same lines as branch post offices. Agents would buy direct from the Corporation, and payment would be made at the time of purchase—a small commission being paid to such agents. Then a housewife, making her weekly purchases, could at the same time obtain as many discs as she required, and could leave them about her house without risk of temptation to the young people, as the discs would only be good for use in the meter—each having the Corporation number and crest printed on. Anyone trafficking in these goods without a licence would be liable to prosecution. The collections need then be made less frequently."

## LEGAL INTELLIGENCE.

### TICEHURST GAS COMPANY'S AFFAIRS IN COURT.

At the Dewsbury County Court, last Friday, His Honour Judge GENT held a special sitting to hear a claim made by Messrs. Firth Blakeley, Sons, and Co., Limited, Engineers, of Thornhill, Dewsbury, against Mr. Albert W. Lunt, described as an Architect, of Heathfield, Sussex, for £43 13s. 2d. for a gas purifier and fittings. The defendant brought in a third party—Messrs. Edward O. Preston and Co., of Tokenhouse Buildings, London, E.C.

Mr. T. P. PERKS appeared for the plaintiffs; Mr. HAROLD NEWELL, for Mr. Lunt; and Mr. BARNES, for Messrs. Preston and Co.

Mr. PERKS, at the outset, announced that Mr. Newell consented to judgment for the amount claimed, and would pursue his remedy against the third parties.

Mr. NEWELL said Mr. Lunt was Managing-Director of the Ticehurst and District Water and Gas Company. Mr. Preston was a financier, and a very rich man; and the dealings of the Company were really controlled by him. In July last, a purifier was needed; and Mr. Lunt consulted his principal, Mr. Preston, who told him to get some estimates out. Mr. Preston was really the Financial Manager of the Water and Gas Company; and he received the moneys, and found money for it. When Mr. Lunt had got out the estimates, he went to Mr. Preston's premises in London; and Mr. Preston instructed him to see his (Mr. Preston's) confidential clerk, Mr. Brown, in another room, and get him to order the purifier by telephone. He went, and Mr. Brown ordered the purifier by telephone. Mr. Newell handed up to his Honour a document in pencil written by Mr. Brown, referring to the conversation upon the telephone, and also a letter written there and forwarded to Messrs. Firth Blakeley. The price of the purifier was £26. Mr. Lunt simply acted as Mr. Preston's agent.

Mr. Lunt bore out this statement. He said Mr. Preston was a financier and company promoter; and he was really the controller of the Company named.

Mr. BARNES: You are a Director of this Gas and Water Company, are you not?

Witness: Yes.

Who had the control of the Company?—I was the Manager.

The Company for some considerable time has been in low water?—Yes.

It has been necessary to obtain advances in order to keep things going?—Yes.

When the Company were in low water, they approached Mr. Preston, did they not, to make advances?—I do not know anything about that. I know Mr. Preston came into the concern again when it got into low water.

His HONOUR: Came in again?

Witness: Yes; he was the original promoter. The undertaking got into other hands, and he took it over again.

The purifier was to be paid for out of the rentals?—It was to be.

Mr. BARNES: Those were received by the Gas Company.

Mr. NEWELL: Received by Mr. Preston.

Witness: Mr. Preston had the control of all the moneys.

His HONOUR: He received the gas and water rentals?

Witness: He received every penny. Mr. Preston said he was to arrange terms of payment, if he could; and he also assured him (witness) that he would personally guarantee payment, if the Company could not.

Mr. NEWELL: Who paid your wages?

Witness: Mr. Preston.

By his own personal cheque?—Yes. The Directors gave no order for the purifier.

Mr. BARNES, who had no evidence to call, submitted that the plaintiffs had not made out a case. Mr. Preston was in the position of mortgagee; and the Company knew, and Mr. Lunt knew, that they could not have got the purifier from Messrs. Firth Blakeley without first approaching Mr. Preston.

His HONOUR said Mr. Preston was in a position analogous to a mortgagee, who was carrying on a business over the heads of the Directors. They consented to his management and control, and abstained from ordering the purifier; but they either sent or allowed Mr. Lunt to go to Mr. Preston to see whether he would give the order for it or not. He thought that the defendant was justified in concluding that, when he ordered the purifier, he did so as the servant of Mr. Preston. He would therefore give judgment against the third party, Messrs. Preston and Co., for the debt and costs.

### RIGHT TO OPEN STREETS IN NEW YORK.

There has lately been given by the Appellate Division of the Supreme Court in New York a decision in an action brought by the Municipality against the New York Mutual Gaslight Company on the question of the right to open and occupy streets for gas-mains. The full text of the judgment, which was the unanimous one of five judges, has just been given in "Progressive Age," from which the following particulars have been taken.

The complainants alleged that by an Act passed in 1866, whereby the Company were authorized to manufacture and sell gas, provision was made that no public street or highway in the city should be "dug into, injured, or defaced," without the permission of the municipal authority having the supervision of such street. This permission, however, might be dispensed with if the majority of the owners of the property immediately adjoining should give their consent in writing to the work being done. Two years later, the Board of Aldermen gave the Company the necessary authority, for a period of thirty years, to lay their pipes in the streets, subject to similar restrictions as those applying to the New York and Manhattan Gas Companies. On the



strength of this permission, the Company opened the streets and laid down their mains, without, it was said, first obtaining the consent of the majority of the parties interested in the adjoining property. It was submitted by the plaintiffs that the right of the defendants to open the streets expired on April 30, 1898, and that since then they had opened the streets and laid mains without any legal authority to do so, and had consequently been guilty of a trespass. Application was made for an injunction to restrain them from making further excavations, and to compel them to remove their pipes with all convenient speed; or, in the alternative, to obtain from the plaintiffs a new franchise. The Court were asked to direct that an account should be taken of the amount of damage the plaintiffs had sustained by reason of the alleged unlawful occupation of the streets by the defendants.

For the defence, it was stated that the Company had carried on their business for a period of nearly forty years without objection from the plaintiffs or the public, but, on the contrary, with the express consent of the consumers and property owners and the duly constituted authorities in the City and State of New York. The defendants further alleged that they had, in accordance with the law of 1866, obtained the consents of the majority of the owners of the property immediately adjoining the parts of all streets and highways in the city dug into, injured, or defaced by them.

To the Company's defence the plaintiffs demurred, on the ground that it was insufficient in law; but the demurrer was overruled, and hence the appeal.

In the course of their judgment, the Court said: Chapter 37 of the laws of 1848, authorizing the formation of gaslight companies, provides in section 18 that "any corporation formed under this Act shall have full power to manufacture, sell, and furnish such quantities of gas as may be required in the city, town, or village where the same shall be located for lighting the streets and public and private buildings, or for other purposes; and such corporations shall have power to lay conductors for conducting gas through the streets, lanes, alleys, and squares in such city, village, or town, with the consent of the municipal authorities, and under such reasonable regulations as they may prescribe." The defendant Company was not incorporated under the General Act of 1848, but by special Charter under the Act of 1866, which provided that "no public street or highway in the city of New York shall be dug into, injured, or defaced without the permission of the municipal authorities first had and obtained: Provided that such permission shall not be required if the majority of the owners of the street or highway so dug into, injured, or defaced shall give their consent thereto in writing." Section 5 of the Act provides that the Company "shall be subject to all the provisions, duties, and obligations contained in, and be entitled to all the benefits and privileges conferred by, an Act entitled, 'An Act to Authorize the Formation of Gaslight Companies,' passed Feb. 16, 1848, and the Acts amendatory thereof and additional thereto, except that all Acts and parts of Acts inconsistent with sections 1, 2, 3, and 4 of this Act are repealed and declared to be inoperative so far as the same are applicable to this Act."

We think that the proviso in section 1 of the Act—viz., that no public street shall be dug into without the permission of the municipal authority, provided that such permission shall not be required if the majority of the owners in interest of the property immediately adjoining such street shall give their consent in writing—is inconsistent with that portion of section 18 of chapter 37 of the Act of 1848 which provides, "and such corporation shall have power to lay conductors for conducting gas through the streets, lanes, alleys, and squares in such city, village, or town, with the consent of the municipal authorities, and under such reasonable regulations as they may prescribe;" and that therefore by section 5 of the Act of 1866 the provision was repealed and declared to be inoperative, so far as the same is applicable to this Act; that by the Act of 1866 the franchise given by the State was perpetual, full, and complete, and required no secondary franchise from the City, by the consent of the legislative body, to make it effective within the interpretation of the provisions of section 18 of the Act of 1848. And, further, that these provisions in regard to permission to dig, either by the municipal authority or by the majority of the adjoining property owners, was the administrative consent to the particular place, time, or circumstances of such digging, provided for in other provisions of law, under the cognizance and control of the administrative officers in charge of the streets.

The defendants having a perpetual franchise from the State, subject to no limitations by the local legislative body, the permission given by the resolution of the Common Council, with its limitation of thirty years, to lay pipes, was ineffective as a limitation upon the power given by the Legislature under the franchise granted to the defendants. Even if the Board of Aldermen had power to limit the permission for thirty years, that limitation applied only to the right to lay pipes. Having been once granted and acted upon, no right was reserved affecting the continuance and maintenance of the pipes so laid under permit, and certainly no right to order their discontinuance and removal. As the State had given a perpetual franchise subject only to a condition subsequent on a permit to dig into the streets, when that permit had been granted and acted upon the power to continue was a necessary incident of the franchise granted by the State, and not subject to interference or revocation by the local authority. As the answer alleges that the defendants have obtained the necessary permission, and that they have not "dug into, injured, or defaced any street or highway without the consent of some one of the municipal authorities duly authorized by law in respect thereto," it is not insufficient in law. The demurrer was properly overruled; and the judgment should be affirmed.

**Manchester Gas Officials' Salaries.**—The list of increases of salaries prepared for the March meeting of the Manchester City Council shows a total of £3300, of which the Gas Committee are responsible for £530. It is recommended by the Committee that the salary of Mr. J. G. Newbigging, the Chief Engineer, be advanced from £1100 to £1200 per annum; that of Mr. J. R. Hill, the Manager at the Bradford Road Station, from £450 to £475; that of Mr. F. P. Smith, Accountant, from £400 to £425; that of Mr. G. W. Tooley, Manager at the Rochdale Road Station, from £375 to £400; that of Mr. T. Williams, Chief Cashier, from £375 to £400; and that of Mr. F. J. Caldecott, Chief Rental Clerk, from £350 to £375.

MISCELLANEOUS NEWS.

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 291.]

The accounts of the Company for the six months ended Dec. 31, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. Deducting the amount redeemed, £101,655, the total amount of the Company's existing capital powers is £21,541,410. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807 11s. 9d.) to the amount of £27,452,192 11s. 9d. The expenditure is shown in the following items:—

Expenditure to June 30, 1909 . . . . .	£13,505,836 10 1
Expenditure during the half year to Dec. 31, 1909—viz.,	
Buildings and machinery in extension of works . . .	£1,728 8 8
New and additional mains and service-pipes . . .	15,610 9 11
Do. do. meters . . . . .	24,293 16 4
Do. do. stoves . . . . .	34,553 5 3
	76,186 0 2
	£13,582,022 10 3
By depreciation of plant . . . . .	£3,677 3 11
By depreciation of meters and stoves . . . . .	42,099 18 11
	45,777 2 9
Total expenditure . . . . .	£13,536,245 7 6
Nominal amount added on conversion . . . . .	13,656,540 0 0
	£27,192,785 7 6
Deduct amount of capital redeemed under Company's Act of 1903 . . .	101,655 0 0
	£27,091,130 7 6
Balance of capital account. . . . .	361,062 4 3
	£27,452,192 11 9

The balance applicable to the redemption fund and to dividend on the ordinary stock is £820,295 19s.; and the following statement shows how it is proposed to appropriate it:—

Dec., 1908.		
£412,298	.. Net balance brought from last account . . . . .	£409,893 4 4
364,687	.. Net revenue for the half year . . . . .	410,402 14 8
£776,985	.. Contribution to redemption fund . . . . .	£820,295 19 0
10,000	.. Dividend on the ordinary stock—	10,000 0 0
(£4 10s. 8d. p. ct.)	£4 13s. 4d. per cent. per annum on £15,141,545 . . .	353,302 14 4
£343,662		
£423,323	.. Balance carried to next account . . . . .	£456,993 4 8

The following is the revenue account:—

Expenditure.

December Half Year, 1908.		£ s. d.	£ s. d.
£561,955	Manufacture of gas—		
83,880	Coal, including all expenses thereon . . .	489,615 8 4	
	Oil, " " less value of oil tar . . .	67,056 14 5	
33,753	Coke and breeze used in the manufacture of carburetted water gas . . .	33,93 7 6	
	Salaries of Engineers and other officers at works . . . . .	14,652 0 4	
14,891	Wages . . . . .	87,283 16 8	
90,948	Purification . . . . .	11,311 12 0	
12,685	Repair and maintenance of works and plant, materials and labour, less received for old materials, £4980 9s. 3d. . . . .	188,462 8 10	892,075 8 1
175,049	Distribution of gas—		
	Salaries and wages of officers (including rental clerks) . . .	47,420 3 10	
45,308	Repair and maintenance of mains and service-pipes, &c. . . . .	51,421 17 4	
54,994	Repair and renewal of meters . . .	62,278 4 8	
52,015	" " stoves . . . . .	55,996 16 7	
55,486	Gas fittings, including labour (automatic meter supplies) . . . . .	31,817 5 1	248,934 7 6
34,139			19,572 18 10
19,953	Public lamps—lighting and repairing . . .		
	Rents, rates, and taxes—		
5,895	Rents payable . . . . .	5,891 0 4	
142,326	Rates and taxes . . . . .	143,444 15 1	149,335 15 5
2,750	Management—		
202	Directors' allowance . . . . .	3,750 2 0	
	Company's Auditors and Assistant . . .	202 0 0	
8,184	Salaries of General Manager, Secretary, Accountant, and clerks . . .	9,067 6 7	
22,831	Collectors and cashiers . . . . .	22,879 9 0	
5,766	Stationery and printing . . . . .	6,644 14 0	
5,740	General charges . . . . .	6,526 18 9	49,070 10 4
	Co-partnership for the half year . . .		13,000 0 0
828	Parliamentary charges . . . . .		2,087 1 1
1,478	Law charges . . . . .		1,066 19 7
7,559	Bad debts . . . . .		8,220 11 10
	Depreciation fund for works on leasehold lands . . . . .		500 0 0
500	Annuities to officers and workmen, including contribution to officers' superannuation fund . . . . .		25,888 2 3
25,284	Workmen's compensation account . . .		1,664 17 2
1,695	Stamp and Conveyance Duties under the Company's Act of 1903, on Account . . .		12,000 0 0
	Public officers—		
766	Gas Referees and Official Auditor . . .	873 4 2	
504	Public testing-stations . . . . .	650 14 11	1,523 19 1
			1,424,040 11 2
£1,467,519			614,583 19 2
559,545	Balance carried to net revenue account . . . . .		2,039,524 10 4
£2,027,054			



## Receipts.

		£	s. d.	£	s. d.
December Half Year, 1908.	Sale of gas—				
£1,418.616	Per meter, at 2s. 9d. and 2s. 4d. and 2s. 2d. per 1000 cubic feet . . . . .	1,457,395	11 11		
74,638	Public lighting and under contracts . . . . .	68,319	4 6	1,518,714	16 5
£1,493,251					
28,743	Rental of meters (ordinary) . . . . .			28,183	1 3
42,362	Rental of stoves . . . . .			45,372	13 1
63,901	Rental of fittings . . . . .			71,198	18 5
£258,864	Residual products—				
15,337	Coke, less £34,711 15s. 9d. for labour, &c. . . . .	228,880	5 0		
43,865	Breeze, less £6338 14s. . . . .	19,244	5 11		
75,844	Tar and tar products . . . . .	40,357	7 4		
	Ammoniacal liquor and sulphate of ammonia . . . . .	79,041	15 6		
£393,910				367,516	13 9
£4,591	Rents receivable . . . . .			4,640	17 5
233	Transfer fees . . . . .			297	10 0
£2,027,054				2,039,524	10 4

The three statements relating to the reserve, insurance, and depreciation funds, stood as follows on Dec. 31: Reserve fund, £67,922; insurance fund, £126,900; depreciation fund, £72,326.

The following statements relate to the working:—

## Statement of Coal Used, &amp;c.

Description of Coal.	In Store June 30, 1909.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1909.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common. . . . .	114,820	972,156	804,782	1,750	280,744
Cannel . . . . .	4,082	..	483	..	3,599
Total . . . . .	118,902	972,156	*805,265	1,750	284,343

\* In addition to this quantity of coal, 7,237,568 gallons of oil and 19,191 gallons of spirit were used during the half year.

## Statement of Residual Products.

Description.	In Store June 30, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, Dec. 31, 1909.
Coke—tons . . . . .	31,449	509,842	105,520	428,821	6,950
Breeze—tons . . . . .	1,309	78,767	10,280	68,348	1,448
Tar, from coal only—galls. . . . .	659,043	7,970,289	7,622,325	45,112	961,895
Ammoniacal liquor—butts . . . . .	22,030	240,181	237,495	2	24,714

## Statement of Gas Made, Sold, &amp;c.

Quantity Made.	QUANTITY SOLD.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*12,109,500	445,772	10,846,734	11,424,918	46,863
†11,473,469	462,224	10,315,009	10,905,873	48,959

\* Including 2,965,507,000 cubic feet of carburetted water gas. † Dec. half year, 1908.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £171,458; oil and petroleum spirit, £36,405; coke, £4073; tar and ammoniacal liquor and products, £93,179; and sundries, £220,820. The figures this time last year were: Coal, £158,609; oil and petroleum spirit, £40,883; coke, £11,717; tar and ammoniacal liquor and products, £107,441; and sundries, £213,665.

## SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 291.]

The following are the principal portions of the accounts of this Company for the six months ending the 31st of December.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to June 30, 1909.	£5,044,545	1 5
Expenditure during half year to Dec. 31, 1909, viz:—		
New and additional mains and services . . . . .	£5,917	6 2
New and additional meters . . . . .	3,271	13 4
New and additional stoves . . . . .	6,893	7 6
		£18,082 7 0
Total expenditure . . . . .	£5,062,627	8 5
Balance . . . . .	266,192	11 7
		£5,328,820 0 0
Nominal amount added by conversion, less premium . . . . .	2,996,520	0 0
Total . . . . .	£8,325,340	0 0

The following is the revenue account:—  
Expenditure.

Manufacture of gas—			
Coal into store . . . . .	£332,081	10 4	
Purification . . . . .	10,100	13 5	
Salaries of Engineer and Officers at works . . . . .	14,263	0 6	
Wages (carbonizing) . . . . .	47,902	0 1	
Repairs and maintenance of works and plant, less £4557 12s. 4d. received for old materials . . . . .	116,430	0 2	
			£510,874 4 6
Co-partnership . . . . .			16,000 0 0
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes . . . . .	£29,902	1 8	
Salaries and wages of officers, including rental clerks . . . . .	19,163	12 1	
Repairing and renewals of meters . . . . .	25,696	4 2	
Repairing and renewals of stoves . . . . .	4,854	7 1	
Repairing and renewals of gas-fittings . . . . .	35,054	18 2	
			144,671 3 2
Public lamps, including £19,067 6s. 10d. for labour and materials, less £14,855 5s. 2d. received for the same . . . . .			4,212 1 8
Rents, rates, and taxes—			
Rents payable . . . . .	£1,116	12 3	
Rates and taxes . . . . .	44,094	13 5	
			45,211 5 8
Management—			
Directors' allowance . . . . .	£2,687	14 11	
Salaries of Secretary, Accountant, and clerks . . . . .	3,404	14 1	
Collectors { Ordinary . . . . .	6,200	13 10	
Slot meter . . . . .	9,050	3 9	
Stationery and printing . . . . .	3,479	13 1	
General charges . . . . .	9,853	0 2	
Company's Auditors . . . . .	112	10 0	
			34,788 9 10
Law charges . . . . .	£1,246	2 7	
Parliamentary charges . . . . .	6 6	8	
			1,252 9 3
Bad debts . . . . .			2,193 12 9
Stolen from 4318 slot meters broken open . . . . .			361 12 5
Pensions and officers' and workmen's superannuation, sick, and accident funds . . . . .			7,900 13 10
Gas Referees and Official Auditor . . . . .			251 11 0
Total expenditure . . . . .	£777,695	4 1	
Balance carried to net revenue account . . . . .	220,978	4 3	
			£998,673 8 4

## Receipts.

Sale of gas—			
Michaelsmas at 2s. 2d. per 1000 feet . . . . .	£261,761	9 10	
Christmas, at 2s. 2d. per 1000 feet . . . . .	379,970	2 0	
			£641,731 11 10
Public lighting . . . . .			16,565 14 0
			£658,297 5 10
Meters in use (346,853)—			
Company's meters at rent: Ordinary, 97,667; slot, 240,978 . . . . .	£38,397	11 7	
Company's stoves at rent: Ordinary, 78,044; slot, 195,393; fires, 26,516. . . . .	30,415	16 0	
			68,806 7 7
Residual products—			
Coke, less labour and cartage . . . . .	£140,096	0 6	
Breeze, less labour and cartage . . . . .	5,119	12 6	
Tar and tar products, less labour . . . . .	30,711	1 1	
Sulphate of ammonia . . . . .	54,489	6 2	
			230,416 0 3
Rents receivable . . . . .			1,536 8 6
Transfer fees . . . . .			98 12 6
Gas-fittings . . . . .			39,518 13 8
Total receipts . . . . .			£998,673 8 4
Total amount paid in salaries for half year, £35,517 4s. 6d. . . . .			
" " " wages " . . . . .	£269,431	2s 11d.	

The net revenue account shows a sum of £255,378 7s. 11d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 were as follows: Reserve fund, £181,171; renewal fund, £29,658; insurance fund, £99,273. The following statements relate to the manufacturing operations of the Company:—

## Statement of Coal.

In Store June 30, 1909.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store December 31, 1909.
Tons.	Tons.	Tons.	Tons.	Tons.
140,385	671,680	563,205	831	248,029

## Statement of Residual Products.

Description.	In Store June 30, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1909.
Coke—cwt. . . . .	553,320	6,964,385	1,906,786	5,438,299	172,620
Breeze—yards . . . . .	10,178	128,058	44,974	82,065	11,197
Tar—gallons . . . . .	719,346	5,347,527	5,608,218	39,347	419,308
Ammoniacal liquor—butts . . . . .	9,885	197,883	195,573	..	12,195

## Statement of Gas Made, Sold, &amp;c.

Quantity Made.	QUANTITY SOLD.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
6,624,378	177,577	6,076,126	6,335,690	23,743 incandescent 11 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £136,358; coke and breeze, £5672; tar, sulphate, and ammoniacal liquor, £43,955; and sundries, £298,946. The figures this time last year were: Coal, £75,852; coke and breeze, £27,493; tar, sulphate, and ammoniacal liquor, £43,288; and sundries, £293,012. A sum of £15,123, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £52,149. The figures last year were £37,185 and £49,509.



## LONDON COUNTY COUNCIL AND GAS SUPPLY.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present a report on the legislative measures proposed for the coming session, as well as those passed last year. Among the former is the Gas Companies' Standard Burner (No. 1) Bill; and as any opposition on the part of the Council to this Bill has to be undertaken in accordance with the provisions of the Borough Funds Act, 1872, the Committee recommend that approval be given to the issue of a notice by advertisement of the Council's intention to consider the subject at their meeting next Tuesday.

In the portion of the report dealing with the legislation of the past session, the Committee refer to the Act of the Gaslight and Coke Company. They say the Bill sought to authorize the Company to lower the illuminating power of their gas from 16 to 14 candles, and reduce the standard price from 3s. 4d. to 3s. 3d. per 1000 cubic feet. The Council lodged a petition against the Bill, on the ground that the proposed reduction in price was the result of an arrangement arrived at between the Council and the Company in 1907, and that the Bill did not provide for any further reduction on account of the proposed lowering of the illuminating power. As the result of negotiations, an arrangement was come to with the Company, and the Council's petition was withdrawn.

The terms of the arrangement, the most important part of which was the establishment for the first time of a standard of calorific power, are given in a table at the end of the report. They are as follows:—

Petition presented in House of Commons. Arrangement come to with the Company providing for (1) reduction of standard price by another 1d.—i.e., from 3s. 3d. to 3s. 2d.; (2) a standard of calorific power of 125 calories net; (3) the supply to consumers by the Company, free of charge, of burners suitable for the consumption of gas of 14-candle power; and (4) the price charged by the Company for gas of 14-candle power south of the Thames to be the same as that charged by the South Metropolitan Gas Company for gas of the same illuminating power, in accordance with the Amalgamation Scheme of 1883, and for the price for public lighting in the whole of the Company's area to be the same as the Company's lowest selling price to any consumer. The Company also agreed that their Engineer should notify the Council when he proposed to lay any new mains in streets in which there are tramways. Further petition presented in House of Lords to secure drafting amendments, which were adjusted, and the petition was withdrawn. Bill passed.

## BRENTFORD GAS COMPANY.

### Half-Yearly Report and Accounts.

In the report for the six months ending Dec. 31, which the Directors will present at the ordinary meeting on the 11th inst., they express their pleasure in stating that the recent sale of £30,000 of the Company's new stock (1881) realized £56,160; giving an average price of £187 4s. per £100 of stock—the total amount applied for having been £67,105. A new dock, which will give much greater accommodation to barges than the existing one, and also new coal-handling plant, will shortly be under construction at the Southall station. The Directors inform the shareholders that they have joined several other Gas Companies in the promotion of a Bill for the adoption of the "Metropolitan" No. 2 argand burner as a standard burner for the official testing of the illuminating power of gas.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £184,167; from meter and stove rents, to £20,976; and from the sale of residual products to £34,391—rents and transfer fees making up a total of £239,576, compared with £238,204 in the corresponding period of 1908. On the other hand, the manufacture of gas cost £130,986; distribution, £40,258; and management, £7853—a total expenditure of £196,885, against £208,476. The balance carried to the profit and loss account is £42,691, compared with £29,728 this time last year. The amount available for distribution is £87,806; and the Directors recommend the declaration of the usual dividends at the rates of 5, 12½, and 9½ per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks respectively.

The working statements show that 84,684 tons of coal and 1,446,673 gallons of oil were used in the production of 1,461,885,000 cubic feet of gas (including 517,448,000 cubic feet of carburetted water gas), of which 1,332,775,000 cubic feet were sold and 1,351,775,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 53,042 tons; breeze, 7629 tons; tar, 1,050,445 gallons; and ammoniacal liquor, 27,106 butts.

## TOTTENHAM AND EDMONTON GAS COMPANY.

### Half-Yearly Report and Accounts.

At the Half-Yearly Ordinary General Meeting of the Company on Saturday, the Directors will report an increase of 6·13 per cent. in the sales of gas in the six months ending the 31st of December, compared with the corresponding period of 1908. There was an addition during the twelve months of 3803 consumers, and an increase of 3291 in the number of cooking and heating stoves. The accounts accompanying the report show that £14,528 was expended on capital account in the half year; £8119 being for new mains and service-pipes, including laying and other work connected with distribution, £2101 for meters, and £2439 for new cooking-stoves. The sale of gas produced £92,050; the rental of meters, stoves, and fittings and the maintenance of incandescent mantles, £15,410; residuals brought in £19,134; and the total

revenue was £126,630. The expenditure on the manufacture of gas was £70,794, including £37,166 for coal, £9925 for oil and coke used in making water gas, and £16,079 for the repair and maintenance of works and plant; on distribution, £19,703; on management, £4341; and for the co-partnership scheme, £1200—the total expenses being £104,436, leaving £22,194 to be carried to the profit and loss account. The amount available for distribution, with £18,592 brought forward, is £36,054; and the Directors recommend the payment of the full statutory dividends of 6½ and 5½ per cent. per annum on the "A" and "B" stocks. This will absorb £15,372, and leave £20,681 to be carried forward. The Directors consider that the position of the Company's business justifies a further reduction in the price of gas; and they have accordingly lowered it 1d. per 1000 cubic feet from the reading of the meters last Christmas—making the present price 2s. 4d.

The working statements in the account show that 48,408 tons of coal and 590,112 gallons of enriching oil were used in the production of 834,419,000 cubic feet of gas, of which 758,156,000 cubic feet were sold and 774,127,000 cubic feet accounted for. The residual products were: Coke, 29,044 tons 16 cwt., of which 6611 tons 4 cwt. were used for making coal gas, and 5255 tons 10 cwt. for producing carburetted water gas; breeze, 4598½ chaldrons; tar, 491,393 gallons; and ammoniacal liquor, 13,447 butts. The quantity of sulphate of ammonia made in the half year was 378 tons 14 cwt. 2 qrs. 6 lbs.

## BURTON-UPON-TRENT GAS-WORKS EXTENSIONS.

### Inauguration of a New Gasholder—Presentations to the Mayor and the Chairman of the Gas Committee.

Last Friday afternoon, the Mayor of Burton-upon-Trent (Mr. T. Jenkins) formally inaugurated a new holder which has been erected at the gas-works as part of the scheme of reconstruction to which reference has been made from time to time in the "JOURNAL." His Worship was accompanied by the ex-Mayor (Alderman Tresise), Alderman T. E. Lowe (the Chairman of the Gas Committee), members of the Corporation, Mr. T. N. Whitehead (the Town Clerk), Mr. O. W. Arnold (the Borough Treasurer), Mr. J. Ferguson Bell (the Consulting Engineer to the Gas Committee), Mr. R. W. Thompson (representing Messrs. Clayton, Son, and Co., Limited, builders of the holder).

The party were received by the Manager (Mr. R. S. Ramsden), and assembled in his office, where Alderman Lowe explained, by means of plans, the proposed reconstruction of the retort-houses. In the course of remarks, he said he thought everybody would agree that the Gas Committee had not allowed the grass to grow under their feet, and that their reconstruction scheme was well on its way. In addition to the new holder, No. 5 retort-house had been rebuilt, and was now doing extremely good work. The new retorts had been in use for two months; and though the Committee had not yet realized the full advantage of them, the monthly returns showed that they were getting better and worked more economically. The new holder, which had been erected by Messrs. Clayton, Son, and Co., of Leeds—a very eminent firm who had erected other 200 such structures all over the country—had been built extremely well; and the Committee were well satisfied with the work. It had a capacity of more than the other two holders together; and its cost was about £10,000. Alderman Lowe gave particulars of the rest of the scheme, and said the total contract price was £15,620. He hoped and believed that when they had the retort-houses completed they would have works which would be thoroughly up to date, and which would not only meet the requirements of the town, but prove of great financial assistance to it.

The company then proceeded to the new holder, and the Mayor turned on the gas for the supply of the town.

Returning to the offices, the party witnessed two interesting presentations in connection with the inaugural ceremony. Mr. Bell, on behalf of Messrs. Clayton, presented the Mayor with a handsome silver rose-bowl; and he also asked Alderman Lowe's acceptance of a silver salver, as a gift from himself. He said that the present to the Mayor was offered as a small token to commemorate the occasion. The inscription, which was as follows, was surmounted by the borough arms:—

County Borough of Burton-upon-Trent. Presented to his Worship the Mayor (T. Jenkins, Esq.) to commemorate the completion of the large gasholder and steel tank erected at Burton Gas-Works by Messrs. Clayton and Sons, Limited, of Leeds.—Jan. 28, 1910.

Mr. Bell's present to Alderman Lowe was inscribed as follows:—

Presented to Alderman T. E. Lowe, J.P., Chairman of the Gas and Electricity Committee, to commemorate the completion of the gasholder and steel tank erected at the Burton-on-Trent Gas-Works. Engineer, J. Ferguson Bell, M.Inst.C.E., Jan. 28, 1910.

In making the presentation to the Mayor, Mr. Bell said he did so on behalf of Mr. Clayton, who was prevented by illness from attending. The rose-bowl resembled the gasholder, because it was artistic in design; and he hoped his Worship would accept it as a mark of their appreciation of his kindness in performing the opening ceremony.

The Mayor expressed his thanks, and assured Messrs. Clayton, through Mr. Bell, that he would appreciate their present very highly. His Worship paid a high tribute to the way in which the Committee had discharged their duties. Under the able chairmanship of Alderman Lowe, they had sought to bring the gas-works up to date; and they were to be complimented on the fact that the strides they were making were effecting great improvements. Having briefly sketched the history of gas making in Burton, his Worship concluded by congratulating the Committee, on behalf of the town, on the excellent results of their labour, and wished them continued prosperity.

Before making his presentation to Alderman Lowe, Mr. Bell, in the course of an interesting speech, traced the development of the gas supply to the town, and said it could now be regarded as a much-improved and up-to-date concern. He referred to the recent tour to Germany, and said the visit had proved of great value to the Committee in the discharge of their duties, as they had learnt much that



was very useful in the important matter of managing gas-works. Referring to the new holder, he said the work had been carried out splendidly; and he expressed his obligations to Mr. Ramsden for the great assistance he had given him. By his valuable help, his (Mr. Bell's) duties had been rendered much lighter; and he was much obliged to him. In asking Alderman Lowe's acceptance of the salver, he said they all knew the great interest he took in all matters regarding the town's welfare; and some of his best and most useful work was done in the capacity of Chairman of the Gas Committee.

Alderman Lowe assured Mr. Bell that he very much appreciated his kind present. He thought they could feel confident that the work upon which they were engaged was in the very best interests of the town; and when it was finished it would be a credit to those who were responsible for it. The extension scheme, when completed, would mean that gas could be manufactured at a cheaper rate, and eventually the consumer would reap the benefit. Alderman Lowe mentioned that it was a matter of satisfaction that the Council would not have to obtain a loan in order to carry on the work, as the cost would be defrayed out of the reserve which the Committee had gradually built up.

## ILLUMINATING POWER OF CARDIFF GAS.

### Comparative Tests by the Gas Examiner.

Some time ago, the Gas Examiner to the Cardiff Corporation, acting upon instructions he had received, made a number of tests to determine the difference in the illuminating power of the gas, as shown by the "Metropolitan" No. 2 argand burner, which is the one imposed by the Cardiff Gas Act of 1906, of the "London" argand burner, which was used for testing the gas until the alteration imposed by the Act named, and by a standard flat-flame burner—all consuming the gas at the rate of 5 cubic feet per hour. He has lately presented his report, from which the following particulars are taken.

A test was made with one of the experimental burners, and the result noted. This burner was then removed and immediately replaced by the other, the rate of consumption of the gas readjusted, and a further test made. Of sixteen tests with each of the argand burners, he found the average of the "Metropolitan" tests to be 14.95 candles, and that of the "London" tests 11.93 candles; thus showing that the former burner gives an illuminating power of 3.02 candles in excess of that given by the latter with the same gas. Of ten tests made with the "Metropolitan" argand burner against a standard flat-flame burner, the difference was an average of 4.32 candles in favour of the argand. This burner consequently gives an illuminating power of some 3 candles in excess of the "London" argand burner, and rather more than 4 candles in excess of the standard flat-flame burner, all consuming gas at the rate of 5 cubic feet per hour. The Examiner remarks that this is the average; but individual tests give as much as 4 candles in favour of the "Metropolitan" as against the "London" argand, and as much as 4½ candles against the standard flat-flame burner.

Referring to the contention that the "London" argand burner is not so well adapted for testing the present quality of the gas, and that it develops a relatively smaller amount of light than with gas enriched with cannel coal, the Examiner admits that there is possibly something in the contention as regards the "London" argand burner. But he says it would not apply to the flat-flame burner. Even as regards the "London" argand burner, the difference would not be much; and the comparison would still be fairly correct. He adds: "It will therefore be seen that the illuminating power of the gas is not only liable to be reduced from 16 to 14 candles allowed by the Act of Parliament of 1906, but also the authorized adoption of the 'Metropolitan' No. 2 burner for testing gives a further advantage of some 3 candles in favour of the gas, since it gives so much more light than the 'London' argand burner from the same gas; allowing, in all, a reduction of some 5 candles in the illuminating power as compared with what it was previous to the Act of 1906, when the 'London' argand was used for testing."

The Examiner reports that the average illuminating power of the gas at the City Hall during the 33 months that the "Metropolitan" No. 2 burner has been in use for testing was 15.85 candles, and that the average with the "London" argand burner for a similar period previous to the adoption of the new burner was 16.91 candles; so that as yet the gas has only been nominally reduced 1 candle. Actually, however, there is also the additional advantage obtained for the gas by the change of the test-burner; so that he considers the illuminating power of the gas has been reduced some 4 candles as compared with what it was previous to the changes authorized by the new Act. He explains that the tests were made with the standard flat-flame burner because it is the type ordinarily used for household and street-lighting purposes; and it was found that gas giving an illuminating power of 15.85 candles with the "Metropolitan" No. 2 burner would give a little less than 12 candles when tested by the standard flat-flame burner with 5 cubic feet consumption per hour. The ordinary street burner, however, only consumes 4½ cubic feet, and gives a lower illuminating power in consequence of the smaller consumption of gas. He points out, in conclusion, that since the passing of the Act of 1906 the price of gas has been reduced by 2d. per 1000 cubic feet.

After providing for depreciation, &c., the accounts of the "National" Gas-Engine Company, Limited, for the past year show a net profit of £41,682. The Directors recommend a further dividend of 10 per cent.; making 20 per cent. for the year—the same as for 1908. The sum of £10,000 has been added to reserve (making it £100,000); and £9943 will be carried forward. In order to meet extra expenditure to be incurred in connection with an extension of works, the Company announce the issue of the balance of 50,000 preference and 50,000 ordinary shares at par. These will be offered to existing shareholders in the proportion of one preference and one ordinary share for every three shares held.

## GLASGOW CORPORATION GAS DEPARTMENT.

### The Question of New Show-Rooms.

The Gas Committee of the Glasgow Corporation recommended to the Town Council last Thursday that premises in Sauchiehall Street be leased as a show-room for gas appliances.

Ex-Bailie M. W. Montgomery, the Convener, in moving approval of the minute, said that the rent of the premises they at present occupied in Union Street was £500. The area was 326 square yards; whereas in the Sauchiehall Street shop there was an area of 1100 square yards—about four times the present accommodation—while the rent would be only £100 more. The proposal was to enter into a lease for ten years, with a break on either side at the end of five years. Bailie Paxton, the Sub-Convener, in seconding, referred to the bearing a gas show-room would have upon the subject of air purification. The Corporation had resolved to enter upon a scheme of air purification, and a show of gas appliances would help forward the movement, and would also develop the consumption of gas. Mr. Moir said he was an enthusiastic supporter of the proposed change; and he took no exception to anything in the minute except to the portion which referred to gas appliances. They were all united in the work of air purification; but this work was not confined to gas appliances, and he suggested that all modern heating appliances be included.

Treasurer Graham reminded the Council that a year ago he objected to the proposal, not so much on account of the taking of the property, but because the Gas Committee wanted to go in for a much larger scheme for the improvement of gas stoves and appliances. The Committee then promised that when the accounts came up for consideration they would bring forward a scheme as to their policy. The accounts came up; but there was no statement of policy, and he did not think the Committee had treated the Corporation well in so doing, after having had twelve months for the preparation of a statement. They should have a statement from the Committee as to their policy; and he accordingly moved that the minute be taken back. Mr. P. G. Stewart seconded. He wanted to know what the people in the east-end and the south-side were to do. The Corporation had empty shops at present in Trongate; and if they wanted to reach the industrial classes, they should give an exhibition there. The Committee, however, evidently wanted to have a show in Sauchiehall Street for the wealthy west-end people. The Committee should take the minute back and give the Corporation further information. Bailie Mathieson supported the amendment. The minute simply brought up an old scheme in a new guise. He had not the slightest objection to the Gas Committee exhibiting stoves and heating appliances; but he did object to the Gas Department selling gas fittings, mantles, and burners, against their own ratepayers outside. There was a great deal of apprehension among dealers in these articles, as to whether extended premises would mean extended sales by the Gas Department. There was no mention, moreover, of the initial cost of transferring the premises, which he believed would amount to at least £1000. Bailie Guest thought the matter should be sent back to the Committee. He did not think the proposed premises were suitable for the purpose. Moreover, the Gas Committee had not implemented their promise to produce a tabulated statement showing the conditions under which such a show-room was to be carried on, and the financial results which would be likely to accrue. Mr. W. F. Anderson said they were all interested in air purification. He did not object to the relinquishing of the Union Street shop; but he thought that Argyle Street was a much better place for such a show-room than Sauchiehall Street.

Bailie Alston said he would have been better pleased had the minute been a joint one by the Electricity and Gas Committees; but he supported the recommendation because of the central position of the premises, and because by and by the Gas Committee would see it to be their duty to open show-rooms in the working-class districts of the city. He was in favour of making a start in these central premises. Bailie Russell asked if the question of air purification was any justification for taking these extensive premises. If so, he was quite agreeable to the proposal of the Committee; but he wanted the Convener to make it clear that the business carried on would not in any way interfere with the tradespeople in the city. It was only on such grounds that he could support the proposal. Mr. Montgomery, in closing the discussion, said he desired to assure every member of the Corporation that there was absolutely no change of policy, so far as the Gas Department were concerned, in the proposal to go to new premises. As to sales, the Corporation were aware that recently the Committee entered into an agreement with the Ironmongers' Association with which that body was abundantly satisfied; and there was not the slightest idea of departing from the agreement, which had been amicably entered into and faithfully carried out by all parties. There was absolutely no policy in the matter at all, except the question of whether the Sauchiehall Street or the Union Street premises were the better value and the more suitable for the purposes of the Gas Department. On a division, the minutes were approved by a large majority.

## COST OF GAS AND ELECTRIC LIGHTING.

The Engineering Supplement to "The Times" last Wednesday contained the following answer by their contributor to the letter on the above subject by Mr. Hanbury Thomas, of Sheffield, which was reproduced in the "JOURNAL" last week (p. 247).

Mr. Hanbury Thomas objects to my statement that metal filament lamps, if properly installed, provide a cheaper and healthier light than gas-mantles. He states that I should add that "the comparison was with gas at at least 5s. per 1000 cubic feet—a price which is only charged in villages." I have just as much cause to object to the comparison which he makes in his circular, of electric light at 4d. per unit, with gas at 1s. 4d. per 1000 cubic feet—a price which is only charged in places like Sheffield. If we make theoretical comparisons at all, it is fairer to take the average price charged for gas throughout the



country, which is much nearer 3s. than 1s. 4d. But, as a matter of fact, comparisons based on theory or laboratory tests have no practical value; the most reliable comparisons are those based on actual experience. It has never been denied that the initial light emitted by a gas-mantle costs less than that emitted by a metal filament lamp of equal candle power. But in actual practice we have not to deal with initial light; and it is within the experience of all who use gas-mantles that their light falls off very rapidly, which is not the case with metal filament lamps. Apart from this, it is a well-known fact that light from electric lamps is much more easily reflected and concentrated than that from gas-mantles, owing to the difficulty of adapting suitable shades or reflectors to the latter, on account of the heat which is generated, and also on account of the shadow from the burner. Hence, with electric lamps a larger amount of the hemispherical candle power may be concentrated where it is required than with gas-mantles, which waste much of their light on the walls and ceilings. Experience has shown that those whose houses were previously illuminated by incandescent mantles have, on substituting metal filament lamps with proper reflecting and dispersing shades (such as "Hologhane" glass), been able to effect a considerable saving in their lighting bills, with additional illuminating effects. In my own house, after installing tantalum lamps with "Hologhane" glass, I was able to show, on an installation of about 15 lights, an annual saving of close on £4 in my lighting bill. Incidentally the annual cost of lamp renewals is less than that of mantle renewals; and ceilings remain clean for longer periods. No doubt Mr. Hanbury Thomas will meet the last assertion by a favourite argument of gas advocates, that gas is more healthy because it necessitates more frequent whitewashing and decorating, and thus helps to destroy the bacteria which infest the decorations! Such an argument is on a par with the one which he puts forward in regard to the hygienic aspect of gas. The products of combustion, being heavier than air, cannot be got rid of merely by the use of a ventilator or by keeping the top windows open. A draught has also to be created at a low level, which, perhaps, only Mr. Hanbury Thomas may consider hygienic. Even if carbonic acid gas is not in itself poisonous, it is injurious to health. Besides, the deleterious products of combustion of coal gas are not always confined to this one product. In conclusion, Mr. Hanbury Thomas forgets to mention that the combustion of a coal-gas burner absorbs more oxygen than that absorbed by an adult human being.

Following the foregoing answer was a letter by Mr. H. H. Holmes, formerly Sales Manager in the Electricity Department of the West Ham Corporation, and now filling a similar position with the Marylebone Corporation. In the course of it he said:

There is no doubt that gas can be made to show very efficient results in the laboratory; but laboratory tests are not practical figures. The true comparative costs of electricity and gas are quarters' bills in respect of each, under practical conditions, in similar circumstances; as also the true test of the market value of the light given is the consumer's own judgment of the light he gets, for the consumer is the person who has to be satisfied by both electricity and gas suppliers.

I append herewith six cases, taken quite haphazard, of bills for electricity for lighting purposes, and the bills for gas for the same premises for the corresponding period of the previous year. The prices of electricity and gas respectively are 3d. per unit and 2s. 8d. per 1000 cubic feet. A suggestion will probably be made that the consumers are not getting so much light with electricity as they were with gas, and that the lower cost of electric light is thus explained. But each consumer quoted has stated quite independently, and without any pressure from any source whatever, that the light he obtains from electricity is considerably better than the light he obtained from gas. Under these circumstances, the figures of cost speak for themselves.

In deciding which is the better illuminant and the less costly, the public are the only judges; and the fact that electric lighting is going ahead tremendously, while gas lighting is practically stationary, is an indication as to which the public favours the more.

Regarding the wonderful hygienic "advantages" of gas lighting quoted by Mr. Hanbury Thomas, I have several times pointed out in different publications that, although the ingenious statements of the gas interests may convince human beings, they have up to the present failed to convince plant life, which refuses to live and thrive in gas-lighted premises. I am sure that no more conclusive evidence of the absurdity of the gas interests' claims could be given.

B.—June, 1907, to March, 1908	Gas	£4	7	6
	Electricity	2	15	0
	Saving	£1	12	6
C.—Dec., 1907, to March, 1908	Gas	£4	0	4
	Electricity	1	8	0
	Saving	£2	12	4
D.—June, 1907, to March, 1908	Gas	£1	6	1
	Electricity	1	0	3
	Saving	£0	5	10
E.—June, 1907, to March, 1908	Gas	£7	1	0
	Electricity	3	13	6
	Saving	£3	7	6
F.—June, 1907, to March, 1908	Gas	£6	12	10
	Electricity	2	19	9
	Saving	£3	13	1
G.—June, 1907, to March, 1908	Gas	£1	6	3
	Electricity	0	16	0
	Saving	£0	10	3

METROPOLITAN WATER BOARD.

Financial Position of the Board—The Proposed New Offices.

At the Meeting of the Metropolitan Water Board last Friday, the members had under consideration a motion by Sir Melvill Beachcroft to the effect that the Finance Committee should be instructed to prepare and submit a full report on the financial position of the Board at the present time compared with that of the late Metropolitan Water Companies. Sir Melvill said the Board had had nearly two full years' work under the Charges Act, and they ought to know whether they had strained their full income. Up to March of last year they only just paid their way—there being a margin of about £2000; and in the current year their estimates showed considerable deficiency, which he hoped would not be verified. The Chairman (Mr. E. B. Barnard), while welcoming the resolution, expressed the hope that nobody would hold the notion that any innuendo of an unfavourable description was intended by it. It would be perfectly simple to show that the working under the Board, apart from the questions of additional quality and constant supply of water, compared in their favour as against the Companies. Mr. Tozer accepted the resolution on behalf of the Finance Committee, and it was agreed to.

There was also a lengthy discussion on a proposal brought forward towards the close of last year, to acquire a site for the erection of new central offices. The General Purposes Committee recommended a site in Kingsway, which will cost £100,000. In the course of the debate, however, a number of members favoured the utilization of land already owned by the Board in Rosebery Avenue, and an amendment was moved in favour of the latter site. Mr. E. G. Cole, the Chairman of the General Purposes Committee, said that he was quite satisfied that it was in the best interests of the Board that they should have their own offices, and that it would tend to the better administration of their work if they were in their own home. The only question was where they should be; and he asked the members to decide finally one way or another. On the question being put, it was agreed to accept the amendment that the new offices, if erected, should be on the Board's land in Rosebery Avenue. Upon the amendment being put as a substantive motion, Sir Melvill Beachcroft moved its reference back, on the ground of the present financial position of the Board. He thought the time was not opportune for them to carry out such a scheme. Mr. Karslake seconded the amendment, which was carried by 23 votes to 18.

LIABILITY FOR DEFECTIVE MAINS.

The Metropolitan Water Board and Compensation.

At the Meeting of the Metropolitan Water Board last Friday—the first after the Christmas recess—the agenda contained references to two matters bearing upon the liability of the Board for compensation for damage caused by burst or defective mains. Their nature will be apparent from the following particulars.

It appears that it has been the practice of the Works and Stores Committee of the Board to direct the Engineer to settle, without admitting liability, a large number of compensation claims by *ex gratia* payments, and without any consideration of the Board's negligence. Apart from the question of the policy of making such payments in cases where there is no legal liability upon the Board to pay, and the consequent encouragement of persons to bring claims against the Board on the smallest pretext, it is considered by the Law and Parliamentary Committee that the settlement of all such claims should be referred to them, seeing that, under the Board's order of reference, it is their duty to conduct the legal business. They deal with the matter at some length in their report, and emphasize the importance of uniformity of decision being attained in the settlement of claims; and they say this cannot result if two Committees are to deal with them on different lines. They therefore recommend that it should be referred to the General Purposes Committee to submit to the Board an amended order of reference, which shall include "all claims for damage and compensation to persons or property."

In order that the Board may fully appreciate their views and the scope of their recommendation, the Committee state the Board's legal position with regard to these claims. They point out that the Board, by reason of being a statutory authority, enjoy a protective position—that is to say, they are not liable for any damage which may arise from a burst main unless the person aggrieved can prove that they have been guilty of negligence. In the case, therefore, of a main belonging to the Board bursting, and the water therefrom flooding the premises of a private individual and doing damage, the Board, being authorized by Act of Parliament to lay the main, and not having been guilty of negligence, are not liable for the damage caused to the individual by reason of such flooding. The Board, however, would be liable if the person whose premises were damaged could prove that they had been guilty of negligence in the performance of their statutory obligations. The Committee support this statement by making the following quotation from the judgment of Mr. Justice Mathew in the case of *Green v. Chelsea Water Company*, which was confirmed by the Court of Appeal:—

In this case, the Water-Works Company obtained from Parliament the power to construct reservoirs and carry their mains and pipes under public thoroughfares, with the obligation that, when once the works are constructed, they shall continue to supply the public. It is clear that with no amount of care or skill can they prevent the bursting of one of their pipes, and the consequent damage that may be occasioned to those who may be living near to where the bursting has taken place. It is said that it would be reasonable to suppose that Parliament intended to impose upon them this obligation—namely, the obligation of insurers. But it is manifest that, though the particular injury may not be one of frequent occurrence, it is one that is incidental to the exercise of their statutory powers. In other words, it is impossible to carry on their undertakings without a liability of this sort. That being so, it is not because the damage may be frequent or constant in the case of a railway company, and only occasional in the case of a water-works company, that any sound distinction can be drawn. The principle of



one set of cases appears to me to be distinctly applicable to the other. This Water-Works Company could not carry on its business or exercise its statutory powers without exposing those who are adjoining proprietors to the risk of such damage as has been sustained in this case.

The subject was also dealt with at considerable length by the Works and Stores Committee in their report. The trouble between the Committees arose in respect of a resolution passed by the Board early in November, calling for full reports from each Committee in respect of a claim which had been made for compensation. Conferences took place; but it had not been possible to come to an agreement. To enable the Board to fully appreciate the position taken up by the Works and Stores Committee, they explain the procedure generally adopted by the late Water Companies, and continued by them. On the constitution of the Board, the question was taken up by the Committee, who adopted the following procedure, which, with slight modifications, has been in operation until the present time: (1) Where the Solicitor advises that there is contributory negligence on the part of the Board, the Engineer is authorized, through the medium of the District Engineers, to make immediate settlements in all cases of claims for damages, where the amount of such settlement does not exceed £10, and, with the consent of the Chairman of the Committee, in cases where the amount does not exceed £20; all such cases being subsequently reported to the Committee. (2) In all other cases, the Engineer submits the claims for the consideration of the Committee, who deal with them on their respective merits. (3) The Engineer employs local surveyors to assess the actual amount of damage sustained; and the offers to claimants are made without prejudice, under the Committee's authorizations, upon the basis of the surveyors' reports. An item has always been inserted in the expenditure of the Works and Stores Committee, under the heading "Claims for Compensation." In the estimates for the current year, it is £3000.

Since March 4, 1908, 167 claims for compensation have been placed before the Committee; 40 of them being cases in which there was no contributory negligence, but which were nevertheless settled. The general question of whether it is desirable for the Board to make payments to injured parties for damage sustained by them on account of the bursting of the Board's mains, where there is no contributory negligence on the part of the Board, is a matter of policy which the Committee submit for the Board's determination. They suggest that such determination will entail the following considerations: (1) Whether the Board will refuse to make any payment where there is no contributory negligence. (2) Whether the Board agree to deal with all cases on their respective merits, apart from the question of contributory negligence. (3) If the second consideration is adopted, whether the payments shall be made in all cases, or only in cases of hardship and suffering; and also whether the amount shall be the sum estimated by the surveyors appointed for the Board or a fraction thereof.

On the whole, the Committee are strongly of the opinion that, as the Board are legally entitled to make payments where there is no evidence of contributory negligence, all claims for compensation should be dealt with on their respective merits. They are the more constrained to this view on the ground that the Board, being a public authority, represents the community at large, and that therefore the greater or less liability to damage arising to certain sections of the public by the incidence of the proximity of larger or smaller mains should not be borne by the sufferers, who, from no fault of their own, are made the victims of accidents arising to the Board's works, but by the Board as representing the community.

The Committee point out that the recommendation of the Law and Parliamentary Committee does not settle the question of principle, but merely proposes to transfer to them the functions which have hitherto been carried out by the Works and Stores Committee. The latter Committee, however, see no reason for any such alteration in the practice. They venture to suggest that the matter has been satisfactorily carried out in the past; and that, bearing in mind the duties cast upon them by the Board in their order of reference, and also the important point that no question of law is involved, they should still be empowered to deal with the subject. They are of opinion that, having regard to all the circumstances, the most equitable course for the Board to adopt would be for them to deal with all claims or appeals for compensation in respect of damage caused by the bursting of their mains on the respective merits of each particular case. If the Board adopt this view, the Committee propose that all such claims shall be dealt with by a small Sub-Committee specially appointed for the purpose; and they express the hope that the Chairman of the Law and Parliamentary Committee will serve upon such Sub-Committee should it be formed. They conclude by recommending that all claims or appeals for compensation in respect of damage caused by the bursting of the Board's mains shall continue to be dealt with by them on their respective merits.

#### Trouble from a Gas Explosion.

The other matter on the agenda was the case of *Stacey v. Gaslight and Coke Company, Metropolitan Water Board, and West-End Tailoring Company*, reported in the "JOURNAL" for the 18th ult. (p. 185); and the Law and Parliamentary Committee deal with it in their report. They explain that the action was brought against the defendants jointly by Miss Jessie Stacey (an infant suing by her next friend) for damages for personal injuries sustained by her through an explosion of gas on premises in the Fulham Road; such explosion being alleged to have been primarily due to leakage of water from one of the Board's mains, which caused a subsidence of soil in which the Gas Company's main was laid. No leakage was discovered in the Board's pipes, and liability was accordingly denied. Notice was, however, served upon the occupier of the premises in the Fulham Road, and the defective communication-pipe repaired.

At the commencement of the case, Counsel for the plaintiff expressed his willingness not to proceed with it against the Tailoring Company, who had filed a petition in bankruptcy, if they would agree not to ask for costs. This was agreed to; and judgment was entered for them without costs. After evidence had been called on behalf of the plaintiff, Counsel for the Board submitted that there was no case to go to the jury against the Board, on the ground that, even if the fracture of the gas-main had been brought about by the leakage of water

from the communication-pipe supplying the premises, there was no evidence to show that the Board had been guilty of negligence in regard to it; and it was submitted, as a matter of law, that the owner of the premises was alone responsible for the maintenance and repair of his communication-pipe. Attention was drawn to section 8 of the Board's Charges Act, 1907, which imposed the liability upon the owner or occupier to maintain the communication-pipe; and to section 19 of the same Act, which empowered the owner or occupier to open the ground for the purpose of complying with the obligation to repair imposed by section 8. The learned Judge agreed that there was no evidence to show that the small leakage in the water-pipe caused or contributed to the escape of gas, and he also agreed that there was no evidence given of any negligence by the Board in reference to the broken communication-pipe. Judgment was accordingly entered for the Board. No order for costs against the plaintiff was asked for; but the Board reserved their rights against their co-defendants, the Gas Company. The case was then proceeded with and decided in their favour.

#### PATENT BLOCK TAR COMPANY, LIMITED.

In the "JOURNAL" for the 13th of July last, we referred to the then recently issued prospectus of the Patent Block Tar, Motor Oil, and Asphalte Company, Limited, copies of which had reached us from correspondents in various parts of the kingdom. The following particulars in connection with it, which appeared in the "Financial News" yesterday, will probably be perused with interest by many of our readers, especially the correspondents in question.

The other day we received what purported to be a letter from Sir C. B. Herne-Soame, Bart., whose name has frequently been mentioned in our articles on the Eaton group of gas and water companies. It contained an intimation that he had resigned his position, and was no longer in the group. The letter was written on notepaper with an embossed heading, and dated from Dawley, Salop, where Sir C. B. Herne-Soame resides. Before printing the intimation, however, we sent a reply-paid telegram of inquiry to the supposed writer, and to that message we have had no reply.

Meanwhile, there has come into our hands the prospectus of the Patent Block Tar, Motor Oil, and Asphalte Company, Limited, bearing, at the head of its front page, this statement: "Dividends of 150 per cent. on the entire share capital the Company's Manager and South Wales representative estimates, in his report to the shareholders at the general meeting, Sept. 7 last, held at Newport, can be paid out of the profit on orders, which, in his opinion, can be obtained on erection of the intended works in South Wales." This 150 per cent. concern has a share capital of £10,000, and the Chairman of the Directors is "Sir C. B. H. Soame, Bart., solicitor, Dawley, Salop." Clearly, even if Sir C. B. Herne-Soame has given up his association with the Eaton group, he is still interested in the issue of these small companies. The curious thing is that the Secretary and offices of this new concern are stated to be "E. T. Leaver, 77, High Street, Newport, Mon. (and London)." Now, the London office of the Company is to be found at 5, Dowgate Hill, Cannon Street, E.C., and on another floor of that building are domiciled half-a-dozen of the Eaton Companies. Is Sir C. B. Herne-Soame aware of their proximity to his new venture?

#### PLYMOUTH CORPORATION WATER SUPPLY.

##### Annual Report of the Engineer.

Mr. F. Howarth, the Water Engineer to the Plymouth Corporation, presented his annual report to the Water Committee last Friday. Owing to a decrease of 12.61 per cent. in the average rainfall on the gathering ground, there were 106 days during the year on which the storage reservoir did not overflow and compensation was paid out of the reservoir, compared with only 18 days before. The total quantity of water withdrawn was 143 million gallons, compared with 5 millions. Among the improvements effected was the cutting out of the defective joints in the masonry walls of the Drake's Place service reservoir, and the pointing of them with cement mortar; the result being that the leakage was reduced from 330,000 gallons per day with 9 ft. 9 in. of water in the reservoir to 27,500 gallons a day with 11 feet in the reservoir. A new main had been laid between the reservoir at Roborough and the one at Hartley; thus rendering the town much safer against the occurrence of a water famine in the event of bursts in the old main. The estimated cost of this work was £13,317; and it was carried out for £11,928. The agreement with the Stonehouse District Council with regard to the charge for water in excess of the quantity stipulated in the Stonehouse Water Act, 1893, had expired, and a new agreement had been entered into whereby the price of such excess water was raised from 3d. to 6d. per 1000 gallons for a period of five years. The daily average consumption of water during the year was 5,964,000 gallons—an increase of 280,000 gallons on the previous year, and was equal to 39.10 gallons per head. The income from water-rentals was £31,621, and the total income from all sources £32,524, or £293 more than in the previous year. The cost of maintenance and management was £9627, or £229 less than last year; while interest and other capital charges amounted to £17,386. The gross profit was £22,896, showing an increase of £522; and the net profit in aid of the rates was £5510—an increase of £680 on the previous year. The expenditure on capital account during the twelve months was £9841—making a total expenditure of £381,343; while the amount repaid or provided for in the redemption fund was £111,888.

Messrs. Balcke and Co., Limited, of Clement's Lane, E.C., have just brought out a new catalogue of their horizontal and vertical centrifugal pumps, which are made in a great number of sizes, and for both high and low lifts. The catalogue is well got up; the illustrations of the pumps being very clear and effective.



## NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

I mentioned last week that Lord Provost M'Innes Shaw, of Glasgow, had called a meeting of citizens for Wednesday next, for consideration of the subject of air purification. The meeting, it is expected, will result in the formation of a Glasgow and West of Scotland Branch of the Smoke Abatement League of Great Britain. It is intimated that coalite is now being used in the fires in the Lord Provost's rooms in the City Chambers, and that Mr. A. Wilson, the Gas Engineer, is at present inquiring into the comparative costs of coalite and ordinary household coal-fires. Coalite is also being used in the offices of the "Glasgow Herald," with results which are said to be entirely satisfactory. Is the recommendation of coalite to the public to be a Scotch movement?

The Town Council of Pollokshaws, one of the minor municipalities which have not yet come under the rule of Greater Glasgow, have been considering the Provisional Order which is being promoted by the Corporation of Glasgow for the consolidation of the Gas Acts, and they have prepared a petition for presentation to the Secretary for Scotland, in which they state a number of objections to the proposals contained in the Order. They take exception to clause 21, under which the promoters might acquire lands, not exceeding in the whole 30 acres, in no sense adjacent or contiguous to any existing lands held by them for their gas undertakings, in the midst of a purely residential area, and might thereby destroy the amenity of a locality, and depreciate the value of adjoining property belonging to the constituents of the petitioners. Objection is also taken to clause 26 (2), on the ground that it would be open to the Corporation to charge rates for the supply of gas to public lamps belonging to local authorities of police burghs and other districts outside the area of the city of Glasgow higher than the rates charged within that area. There are also objections to clause 49, under which authority is sought to apply the profits of the gas undertaking to the general purposes of the city. The petitioners submit that any surplus profits ought not to go for the benefit of the inhabitants of Glasgow, of whom a considerable proportion may use no gas, but should be applied in the interests of the gas consumers as a whole. Under clause 49, it would be open to the Corporation, in virtue of their statutory monopoly of supply, to maintain the price of gas at a higher rate than would be absolutely necessary, in order to earn surplus profits which might be applied to reduce the rates within the city area.

We who are understood to have some knowledge of the properties or propensities of coal gas are disposed to castigate people not so enlightened when they attempt to search for an escape of gas with a naked light; but a statement in the "Glasgow Herald" of to-day would seem to point to the objectionable practice being not unknown among those who ought to know better. The statement is that "John M'Knight, a gas-fitter in the employment of the Corporation Gas Department, was badly burned about the face and hands as the result of a gas explosion in a house at No. 45, Abert Drive, Pollokshields, yesterday. M'Knight had been sent to look for an escape of gas in the house; and while he was standing on the steps of a sunk flat endeavouring to locate the escape with a naked light, an explosion occurred. M'Knight was

thrown down; and the tenant of the house, Mr. Alex. M'Laren, was also slightly hurt. One of the steps leading to the front door was dislodged by the force of the explosion. The incident created considerable alarm, and detachments of the Queen's Park and the Southern Fire Brigades were summoned; but their attendance was not required. M'Knight, after receiving temporary treatment, was removed in an ambulance waggon to the Victoria Infirmary."

Mr. Balfour, who is a representative of Portobello in the Town Council of Edinburgh, at a meeting of the Council on Tuesday, when the reports as to the analysis of gas were submitted, referred to the state of the gas at Magdalene Bridge, which, he said, was "like a farthing candle." The Town Clerk explained that the Gas Commissioners had power to supply gas of 14-candle power, as tested at the City Chambers. The matter then dropped. Magdalene Bridge is a long way beyond the City Chambers from the Granton Gas-Works; and it may be that in the severe weather which we have been experiencing, and the heavy consumption, the illuminating power of the gas may not have been so good as in more highly-favoured districts, while all the time the supply may have been in every respect up to statutory requirements. In this free country, everyone is at liberty to grumble; but a town councillor should surely at least grumble with reasonableness, and not as if special provision should be made for his particular locality.

It is intimated in the "Dundee Advertiser" of yesterday that about 1500 lights on the Selas system have been introduced into the Tay Works of Messrs. Gilroy, in Dundee. It has been found, it is stated, that in mills and factories, with incandescent gas lighting, when air is drawn in through the openings at the burner, the burner becomes choked by the dust and fibre floating about the mill. In the Selas apparatus, the air is drawn from the outside of the mill to obviate this objection. The air and gas are mixed and compressed to 10 inches on a water column. In the Tay Works, the compressor is driven off the existing shafting, and requires only about  $\frac{3}{4}$  H.P. Inverted mantles, with anti-vibrators, are used; and it is stated that some of the mantles, after having been in use for three months, are unaffected by the dust and shaking of the mill. The light given is 100-candle power for 2 cubic feet of gas per hour. A great merit of the light is said to be found in its suitability for the distinguishing of colours.

**Gas Purchase Question at Penistone.**—The Penistone Urban District Council have agreed, with only one dissentient, to a proposal that steps be taken to promote a Bill in Parliament for the purchase of the Penistone, Thurstone, and Oxspring gas undertaking, for the sum of £19,800 or thereabouts. It was subsequently decided to call an informal meeting of ratepayers, to be held yesterday (Monday), and to place the whole matter before them.

**Road-Tarring in Hammersmith.**—The Hammersmith Borough Council last Wednesday approved of a suggestion of the Borough Surveyor for tar-spraying the macadam and flint roads in the borough. The tar is to be distributed by means of sprinklers attached to a cauldron; and it is possible to spray about 1500 superficial yards per day. The tar to be used is ordinary gas tar, which it is expected will cost 2½d. per gallon; and a gallon will, in the ordinary way, cover from 15 to 16 yards of road.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 289.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	86-88	+1	5 13 8	£	Stk.	Nov. 11	p.c.	Imperial Continental	175-177	..	4 10 5
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	4,940,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
310,000	Stk.	Oct. 28	6½	Bombay, Ltd.	52-61	..	5 6 1	1,235,000	Stk.	Aug. 26	10	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
200,000	5	"	6½	Do. New, £4 paid	48-44	..	5 6 8	561,000	Stk.	"	7	Liverpool United A.	227-229	..	4 7 4
40,000	5	Aug. 26	15	Bourne- mouth Gas B 7 p.c.	28½-29	..	5 3 5	718,100	"	"	10	Do. B.	16-16½	..	4 2 10
50,000	13	"	7	Do. 4 p.c. Deb.	162-163	..	4 3 7	306,083	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
311,810	13	"	6	Do. 5 p.c. Pref.	152-153	..	3 16 2	75,000	5	Nov. 26	6	Malta & Mediterranean.	4-5	..	6 0 0
75,000	10	"	12½	Do. 4 p.c. Deb.	191-193	+1	4 18 5	560,000	100	Oct. 1	5	Met of 15 p.c. Deb.	59-62	..	4 18 0
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253-256	..	4 17 8	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
300,000	"	"	9½	Do. New	120-122	..	4 2 0	50,000	20	Nov. 11	3½	Monte Video, Ltd.	124-13	..	5 7 8
50,000	"	"	5	Do. 5 p.c. Pref.	99-101	..	3 19 3	511,920	20	"	3½	North Middlesex 7 p.c.	91-93	..	3 15 3
206,250	"	Dec. 29	4	Brighton & Hove Orig.	218-221	+1	4 19 7	1,775,892	Stk.	July 29	4½	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Sep. 10	11	Do. A Ord. Stk.	154-157	..	5 1 1	518,795	Stk.	Dec. 29	3½	Ottoman, Ltd.	68-69	..	6 5 6
246,320	"	"	8	Do. 4 p.c. Deb.	423-433	..	4 11 11	300,000	Stk.	Aug. 26	8	Portsea Island A.	137-139	..	4 19 0
460,000	23	Oct. 14	10	Do. 5 p.c. Deb.	118-120	..	5 0 0	60,000	5	Sep. 10	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	88-90	..	5 0 0	31,800	53	Aug. 26	13	Do. C.	122-124	..	4 16 9
165,700	"	"	5½	Do. B 3½ p.c.	106-108	..	5 1 10	60,000	50	"	12	Do. D & E.	102-104	..	4 16 2
82,278	"	"	4½	Do. C 5 p.c.	87-89	..	3 18 8	100,000	50	"	10	Do. D & E.	78-79	..	4 14 11
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	141-143	..	4 14 11	114,800	50	"	7	Do. 5 p.c. Pref.	58-58½	+½	4 13 0
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	98-100	..	4 0 0	396,480	5	Oct. 28	7	Do. 4 p.c. Deb.	98-100	..	4 11 5
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	3-4	..	—	798,983	100	Jan. 27	5	River Plate Ord.	98-100	..	4 0 0
100,000	10	"	—	Cape Town & Dis., Ltd.	52-54	..	6 2 6	488,000	10	Dec. 1	4	Do. 4 p.c. Deb.	17-17½	..	4 11 5
100,000	10	"	—	Do. 4 p.c. Pref.	48-49	..	5 9 9	1,000,000	10	Oct. 14	8	Do. 4 p.c. Deb.	98-100	..	4 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. Deb. Stk.	80-82	..	4 13 8	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
100,000	Stk.	Dec. 29	4½	Chester 5 p.c. Ord.	103-110	..	4 10 6	250,000	10	Sep. 29	6	San Paulo, Ltd.	143-15	..	5 6 8
157,150	Stk.	Aug. 12	5	Commercial 4 p.c. Stk.	109-111	..	4 14 4	62,500	10	"	5	Do. 6 p.c. Pref.	113-124	..	4 18 0
1,493,280	Stk.	Aug. 26	5½	Do. 3½ p.c. Deb.	104-106	+1	4 14 4	135,000	50	Jan. 3	5	Do. 5 p.c. Deb.	59-51	..	4 18 0
560,000	"	"	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	209,981	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
475,000	"	Dec. 29	3	Continental Union, Ltd.	95-97	..	5 3 1	523,500	"	"	10	Do. B.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Do. 7 p.c. Pref.	137-139	..	4 1 4	79,000	10	Oct. 14	10	Do. C.	233-235	..	4 5 1
200,000	"	"	7	Derby Con. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Aug. 12	53	South African	121-124	..	7 16 11
493,270	Stk.	"	5	Do. Deb. Stk.	98-100	..	5 0 0	1,895,445	"	Jan. 13	3	South Met., 4 p.c. Ord.	81-88	..	4 7 4
55,000	"	Oct. 8	5	Do. 5 p.c. Deb.	24-24½	..	4 18 0	209,823	Stk.	Aug. 26	8	Do. 3 p.c. Deb.	160-162	..	3 12 3
145,995	"	Jan. 27	12	Do. 4 p.c. Deb.	181-183	..	4 16 0	605,000	Stk.	Aug. 12	5½	South Shields Con. Stk.	120-122	..	4 18 9
486,060	10	"	12	Do. 4 p.c. Deb.	105-106	+1	4 8 0	605,000	Stk.	Jan. 12	5	S'th Suburban Ord. 5 p.c.	120-122	..	4 10 2
354,060	10	"	12	Gas 4 p.c. Ord.	88½-89½	+½	3 16 2	117,058	"	Jan. 13	5	Do. 5 p.c. Pref.	123-122	..	4 2 0
15,141,545	Stk.	Aug. 12	4½	light 3½ p.c. max.	103-105	..	3 12 3	502,310	Stk.	Nov. 11	5	Do. 5 p.c. Deb. Stk.	110-112	..	4 2 0
2,600,000	"	"	3½	and 4 p.c. Con. Pref.	81-83	..	3 12 3	120,000	Stk.	Aug. 12	68	Southampton Ord.	134-136	+1	5 0 11
3,799,735	"	"	4	Coke 5 p.c. Con. Deb.	94-96	..	5 4 2	459,940	"	Dec. 29	58	Tottenham A 5 p.c.	113-114	+1	4 14 7
4,793,975	"	Dec. 29	3	Do. do. 5 p.c.	118-120	..	5 4 2	149,920	10	Dec. 29	8	Do. B 3½ p.c.	98-100	..	4 0 0
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	173-18	..	5 2 3	149,900	10	Jan. 3	5	Tuscan, Ltd.	94-96	..	3 4 2
62,500	"	"	5	Do. do. 5 p.c.	144-146	..	4 9 0	230,476	Stk.	Aug. 14	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	108-110	..	4 10 11	255,636	Stk.	Aug. 26	68	Tyne-mouth, 5 p.c. max.	112-114	+1	4 7 9
131,090	Stk.	Sep. 10	6½	Do. A and C	100-102	..	3 18 5	79,416	"	Dec. 29	3	Wands- worth 3 p.c. Deb. Stk.	73-75	..	4 14 0
65,793	"	"	5	Do. B	100-102	..	3 18 5								
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.											

Prices marked \* are "Ex div."



## CURRENT SALES OF GAS PRODUCTS.

## Sulphate of Ammonia.

LIVERPOOL, Jan. 29.

In consequence of the requirements for January shipment being covered, the pace has become slower, and no further advance has taken place, with the exception of Leith, where it is reported that £11 17s. 6d. per ton has been paid for immediate delivery. Demand has, however, been sufficient to sustain the market at last week's level; and the quotations at the close are £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. to £11 15s. per ton f.o.b. Liverpool, and £11 16s. 3d. per ton f.o.b. Leith. Very little interest is being shown in the forward position; consumers evidently preferring to delay making purchases in the hope of values being easier later on.

## Nitrate of Soda.

This article continues rather dull, but holders firmly maintain spot prices at 9s. 1½d. per cwt. for 95 per cent. quality and 9s. 4½d. for 96 per cent.

## Tar Products.

LONDON, Jan. 31.

The markets for tar products have been firm throughout the past week. Pitch maintains its position. If anything, it is still advancing in price, and is very firm all round, especially on the west coast, where it appears to be decidedly scarce. In Belgium, the consumers seem disposed to await the course of events before covering at present; but it is believed that they have a considerable quantity to buy for March-June delivery. In the North of France, the works are well supplied, and in the Bay a fair quantity has been sold at good figures. In South Wales, the manufacturers are evidently covered for their present requirements, and will not buy until they have secured their fuel contracts. Creosote is steady all round, and there appears to be a general impression that prices will improve after March. Benzol is very firm indeed for both prompt and forward delivery; and 50-90 per cent. appears to be rather scarce. Toluol is steady, and there is a good demand for it in the North. Solvent naphtha is scarce, and is fetching good prices. There has been a slight improvement in carbolic acid. Refined naphthalene is unchanged; but there is plenty of inquiry for salts. Tar well maintains its price.

The average values during the week were: Tar, 15s. to 19s. ex works. Pitch, London, 31s.; east coast, 30s. 6d. to 31s.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d.; 50-90 per cent., casks included, London, 7½d. to 7¾d.; North, 7½d. to 7¾d. Toluol, casks included, London, 10d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2½d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 11d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11½d. to 1s. Refined

naphthalene, £4 10s. to £8 10s.; salts, 45s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

## Sulphate of Ammonia.

This article has been steady during the past week. The principal London Gas Companies are quoting £11 12s. 6d. to £11 15s.; while outside makes upon Beckton terms are £11 6s. 3d. to £11 8s. 9d. In Hull, business has been done at £11 12s. 6d. for ordinary makes, while for the best qualities even higher prices have been secured. In Liverpool, business has been done at £11 15s.; and in Middlesbrough, at £11 12s. 6d. to £11 15s. In Leith, makers are asking £11 16s. 3d. to £11 17s. 6d.

## COAL TRADE REPORTS.

## Northern Coal Trade.

Work is now more regular at the northern collieries. There is a decided improvement in the production; and, in a few instances, an ease in the prices has been the result. In steam coals this is the more shown; best Northumbrians being now about 10s. 7½d. to 10s. 9d. per ton f.o.b., second-class steams about 10s., and steam smalls from 5s. 6d. to 6s. 6d. The steam coal supply is now adequate for current needs. As to gas coals, there is still a moderate output only, but it is one that is increased and increasing, so that there is a much better delivery on the long contracts than there was. Prices continue a little uncertain; but Durham gas coals may be put as from about 10s. 9d. to 11s. 9d. per ton f.o.b. for the usual classes, and up to 12s. for "Wear specials." Some delay of steamers has been caused by the storm at the end of the week, and railway traffic was moved with more difficulty; but there is now a better prospect in that respect. In the contract line, that for Helsingfors is reported to have been placed, at about 14s. 6d. per ton, delivered, for best Durham gas coals, the amount being some 17,000 tons. The Magona gas coal contract is also in the market, for a rather less quantity, to be shipped in the next two months or so. Coke is firm; and good gas coke has been in heavier demand—the price being from 13s. 3d. to 13s. 9d. per ton f.o.b. for shipment in the Tyne or Wear.

## Scotch Coal Trade.

There is less activity in the coal market. The shipping demand has fallen off, as it usually does at this season; and stormy weather has also interfered with it. The home trade, though good, has not improved. The prices now quoted are: Ell, 10s. to 11s. per ton f.o.b. Glasgow; splint, 11s. to 11s. 3d.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 300,659 tons—an increase of 37,610 tons upon the previous week, and of 53,029 tons upon the corresponding week of last year. For the year to date, the total shipments have been 712,590 tons—an increase of 132,768 tons upon the corresponding period.

## The Most Popular Radiator For Places where a Radiator With Flue is Desirable!

The "Official" Flue Radiator.



The "Official" is a Radiator  
Without Internal Parts.

The "Official" is constructed  
by Experts in Radiator  
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the results of over 40 years'  
experience in Radiator  
Construction.

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The Radiator Experts,  
Essex Works, BIRMINGHAM.



**Melbourne Metropolitan Gas Company.**—The London agents for this Company (Messrs. John Terry and Co.) have received a cable advice to the effect that the profits for the half year ended the 31st of December last were £85,785. A dividend of 5s. per share has been declared for this period, a sum of £45,670 added to the reserve fund, and a balance of £2210 carried forward.

**Electric Explosion in a Manchester Street.**—Early last Friday morning, an alarming explosion occurred in Piccadilly, Manchester, due to the fusing of an electric cable. The pavement surrounding the fuse-box where the mishap took place was thrown up, and a column of flame shot into the air, followed by dense smoke. The City Fire Brigade turned out; but it was found that the business premises in the vicinity had not been set alight. Had the explosion taken place later on in the day, there must have been several people more or less seriously injured, as this thoroughfare is a very busy one.

**Wicklow Gas Bill.**—Committee reports have been submitted to the Wicklow Urban District Council on the subject of the Gas Company's Bill. These recommended that a report be obtained from the Solicitor and Engineer to enable them to consider the several provisions of the Bill; and they added that they had directed the Town Clerk to ascertain from the Dublin Corporation the name of a gas expert to advise them on the Bill generally. They recommended that a clause be secured in the Bill giving the Council the option of purchase, and that the standard price of gas be fixed at 3s. They also recommended that the clause dealing with electric light powers be deleted, and a new one substituted protecting the urban district against monopoly; and that no mains should be laid without the express sanction of the Council between April 1 and Oct. 1—this not to apply to service-pipes. After a long discussion, it was resolved that the reports be approved as the basis of a conference with the Gas Company, and that the Committee open negotiations forthwith.

**Proposed New Water Supply for Warrenpoint.**—Last Tuesday, Mr. P. C. Cowan, Chief Engineering Inspector of the Local Government Board of Ireland, held an inquiry in the Town Hall, Warrenpoint, respecting the petition of the Urban District Council for a Provisional Order to authorize them to construct water-works for the town, and to raise a loan of £8180 for the purpose. Mr. W. Johnson, Solicitor for the Council, pointed out that as Warrenpoint was a health and tourist resort which was rapidly growing in favour, the Council decided to provide the town with the best possible water supply. The present works were constructed in 1875, and were quite inadequate to meet the growing needs of the place; and the Council decided to get from the Mourne Mountains a new supply which was of the purest character, and was so abundant as to meet all requirements. Mr. B. M'Kerron (Town Clerk), Mr. J. Carroll (Chairman of the Council), Messrs. J. H. Swiney and Mr. W. J. Watson (Engineers), and others, having been examined on behalf of the Council, Mr. M'Murray gave evidence suggesting alterations to the existing scheme instead of having the new scheme. A ratepayer addressed the Inspector in opposition to the application; and the inquiry concluded.

**Swansea and the Burner Bill.**—At a meeting of the Swansea Street Committee last week, the Town Clerk said a number of gas companies were approaching Parliament with a view to altering the present method of testing the illuminating power of their gas. This, he asserted, would have the effect of reducing the illuminating power; and if the illuminating power were reduced, the heating power must also be reduced. The companies met the objection of reduced lighting power by saying it could be overcome by artificial methods; but then arose the question of who was to pay for the artificial methods. He had asked the Town Clerk of Liverpool whether it would not be possible for representatives of all corporations interested to meet and decide on a concerted course of action; and the result was that a meeting had been arranged.

**Opposition to the Cambridge Water Bill.**—At the meeting of the Cambridge Town Council last Thursday, the General Purposes Committee reported that they had had before them the Bill promoted by the Cambridge Water Company for the purpose of obtaining additional powers. The Company were seeking authority to sterilize or otherwise treat the water supply, to acquire land and construct a reservoir in the parish of Cherryhinton, and to sink wells in that parish and at Fulbourn, to increase or alter any of the existing rates, rents, and charges now authorized to be levied by the Company, and to levy additional rates, rents, and charges. The Committee said they had carefully considered the various clauses of the Bill, and were of opinion that steps should be taken to oppose it. They therefore submitted resolutions to enable this to be done. The Mayor (Alderman W. P. Spalding), in moving the adoption of the report, said he hoped there would be unanimity of feeling on this matter. The object of the Council was the same as that of the Water Company in promoting the Bill, and that was to ensure that the water supply of Cambridge should be made as good as it possibly could be. The motion was carried.

**Completion of the Vyrnwy Water Scheme.**—At their meeting this month, the Liverpool City Council will be recommended by the Water Committee to desire the Lord Mayor to send, in the name of the Corporation, an invitation to H.R.H. the Prince of Wales to perform, during March, the inauguration ceremony at the completed reservoir and intake works associated with Lake Vyrnwy. It will mark the completion of the Vyrnwy works according to the threefold ingathering scheme (there being three rivers to impound) originated by the late Mr. George F. Deacon, the Constructing Engineer. In the first stage of the works, the valley of the Vyrnwy was closed by masonry; the village in the valley being demolished before the rising of the water in the reservoir. The valleys of the remaining two rivers—the Conway and the Marchnant—which formerly flowed into the Vyrnwy, have been each curtailed, and the waters diverted. This has been effected by means of tunnels through the hills. Hence all the three rivers now flow into the Vyrnwy reservoir. Nothing of the original scheme remains to be carried out except the construction of a third pipe-line when the demands of the city and district overtake the present abundant supply through the two existing lines.

## SOUND ADVICE.

### REMINDER.

Maintain an ample stock of Richmond's  
"A.B.C." Gas Fires and "MONARCH"  
Gas-Steam Radiators, &c. JANUARY,  
FEBRUARY and MARCH *coldest months.*

Our Sales of "A.B.C." Gas Fires and  
Radiators have far exceeded any previous  
Season. "Merit will Tell."

THE RICHMOND GAS STOVE & METER CO.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.



**Serious Gas Explosion at Wigan.**—Owing, it is thought, to subsidence, a 6-inch gas-main in front of the house occupied by Mr. Jenks, in York Street, Wigan, was fractured last Wednesday evening, and the escaping gas found its way into the house, and was ignited by a lighted gas-jet or the fire. An explosion followed, which not only wrecked the house, but did considerable damage to the property.

**Heywood Corporation and Stand-by Charges.**—It may be remembered that in the article on "Gas Acts for 1909" in the "JOURNAL" for Oct. 12 last it was mentioned that the Heywood Corporation Act contained clauses relating to supplies to consumers who have separate gas installations, and to the minimum charge to be made for gas laid on to premises having a supply of electricity. As these clauses formed precedents, they were quoted *in extenso*. In virtue of the power thereby conferred, the Town Council have adopted a schedule of stand-by charges, ranging from 5s. up to 25s. per quarter, according to the size of the meter, from ten lights upward, when the gas consumption does not amount to the above-named sums. The new scale will come into operation as from the 31st of next month.

**Exmouth Water Bill.**—A poll of the ratepayers of Exmouth last week resulted in an emphatic pronouncement in favour of the promotion of the District Council's Water Bill. Both the supporters and opponents of the Dotton water scheme made use of the ordinary electioneering methods to gain votes; meetings being held on each side, the town placarded, and vehicles employed to bring up voters. As the result of this energy, 1997 persons voted, of whom 1129 were in favour of the scheme and 768 against it—a majority of 361 for the Bill. Last January, when a similar poll was taken, 1341 ratepayers voted; and the result then was a majority of three against the promotion of the Bill. Since then, however, the boring at Dotton has been carried to a point at which its success has been demonstrated.

**Opposition to the Proposed New Standard Burner.**—The Brighton Town Council have decided, on the recommendation of the General Purposes Committee, acting upon a report made by the Town Clerk, to oppose the Bill of the Brighton and Hove Gas Company. One objection is to the proposal to substitute the "Metropolitan" No. 2 burner for the "London" argand for testing the illuminating power of the Company's gas. The Herne Bay Urban District Council will petition against the Gas Companies (Standard Burner) Bill, with the view of securing amendments similar to those required by the Cambridge Town Council, an indication of the scope of which was given in the "JOURNAL" for the 11th ult. (p. 111). At a special meeting of the Radcliffe Urban District Council last Thursday, it was decided to oppose the Standard Burner Bill.

**Suicides by Coal Gas.**—Last Tuesday an inquest was held on Mrs. Matilda Mason, a widow, residing at No. 26, Grenville Place, Brighton, who was discovered dead in bed on the preceding morning under circumstances which clearly pointed to a determination to take her own life. On the house of the deceased being forced open, the place was found to be full of gas; and the medical evidence was to the effect that death was the result of suffocation. As Mrs. Mason had been depressed, the jury returned a verdict of "Suicide while temporarily of unsound mind." Mrs. Annie Buss, the wife of a Hastings carman and contractor, was found dead in her house last Wednesday morning. At the inquest, the husband stated that he was awakened by his son saying that the house was full of gas. Shortly afterwards the deceased was found in a chair in front of the gas-stove in the scullery. All the taps were turned on, and the windows were closed. Mr. A. T. Field, Police Surgeon, who had made a post-mortem examination, said death was due to asphyxia from coal gas. The jury returned a verdict of "Suicide during temporary insanity."

**Darkness in the "City of Light."**—In view of the extent of the terrible floods with which Paris has been visited, it is not surprising to learn that failures of the public lighting have occurred in various parts of the city. The wonder rather is that they have not been more numerous. Although the lamp-posts at the Bercy end of Paris were last week under water almost up to the lantern, the burners were lighted; but at Suresnes the gas supply was cut off, and the streets were illuminated by firemen carrying torches. On some of the bridges the electric light failed; and the magnificent Alexander III. Bridge, which is usually ablaze with electricity, was dimly lighted by oil-lamps. On Friday night, the St. Denis quarter—notorious as a residence of the criminal classes—was plunged in darkness; and a strong force of police had to be sent there in anticipation of disturbances. The fashionable quarter of the Champs Elysées was not more highly favoured, for neither gas nor electric light was available. On Sunday both banks of the Seine were almost without any uniform or efficient light, with the exception of a few favoured quarters in the Bois de Boulogne district. According to the Paris Correspondent of "The Times," the interruption of the electric lighting service is likely to continue for some days, as the underground machinery is completely submerged.

Messrs. John J. Griffin and Son, Limited, of Kingsway, have introduced an adjustable clip (intended to supersede the old cumbersome brass clips in laboratory apparatus) which holds a single watch-glass or a pair of glasses equally securely. It consists of two small rods united by a steel spring wire sufficiently strong to hold firmly a pair of glasses; the ground edges being kept in contact all round. On the other hand, a single glass is as securely fixed, owing to the elasticity of the spring enabling it to resume its original position as soon as the glasses are removed.

Messrs. Falk, Stadelmann, and Co. have sent us a circular of the "Veritas" advertising shield, which they have introduced for Graetzin and similar inverted lamps; having been devised to supersede the existing heavy and expensive forms of transparent screens. It consists of a semi-circular white enamelled iron tablet, which is attached to the reflector by means of adjustable brass grips, and is suspended under the globe. The advantages claimed for the shield (for which a patent has been applied for) are that the inscription upon it is as legible by night as by day; that it absorbs no light and casts no shadow; and that it is cheap.

## What about the Hot Water?

Shall your Consumers still be dependent on the Coal Fire?

### MAUGHAN GEYSERS

will give a Hot Bath in a few minutes at a cost of  $\frac{3d.}{4}$

### THE "HOLBORN" CIRCULATOR

will supply the whole House, with great economy.

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May we send you our suggestions for supplying these to your Consumers on lines successfully adopted by other Gas Undertakings?

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Special apparatus for all Hot Water Requirements.

**THE PARKINSON STOVE CO., LTD.**

(Incorporating Maughan's Patent Geyser Co.)

BIRMINGHAM:

LONDON:

Stour Street, Spring Hill.

129, High Holborn.



The Laddite Incandescent Mantle Company, Limited, have removed from Audrey House, Ely Place, E.C., and on and after to-day their general offices will be at their works, Penrhyn Road, Kingston-on-Thames.

The South Metropolitan Gas Company have ordered four "Bennis" stokers and compressed air furnaces for 8-foot Lancashire boilers from Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton. This is a repeat order for stokers.

The local Gas Company have written to the Bideford Urban District Council explaining that it is hoped, with better supervision, there will not be any complaints against the automatic lighting apparatus on the lamps; but if there still is cause for complaint, the Company will remove them. It was decided to allow the question of having them removed to stand over for another month.

Tenders have lately been received for a covered service reservoir and scheme of mains for the water supply and protection from fire of Beaudesert Hall, Staffordshire, which Messrs. G. & F. W. Hodson, of Loughborough, have designed for the Marquis of Anglesey. The tenders ranged from £3457 down to £2169; and the last-named sum, for which Mr. G. Law, of Kidderminster, was willing to do the work, was accepted.

The Gilbert Little Company, Limited, of Horton Works, Bradford, have issued a new catalogue of their coal screening and washing plant, conveyors, elevators, aerial wire ropeways and cableways, &c. The particulars are preceded by an article, reprinted from the "Indian Engineer," on "The Evolution and Development of Transport Appliances," by Messrs. G. W. White and M. Colquhoun Little, who are joint Managing-Directors of the Company.

The Gas Committee of the Corporation of Stoke-on-Trent and their Engineer (Mr. W. Prince) have for some time had under consideration the question of the improved lighting of their main roads and streets. After an extended trial, an order has been placed with Messrs. D. Anderson and Co., of Farringdon Road, E.C., for a large number of the "Dacolight" regenerative inverted burner lamps of which they are the patentees and manufacturers. The installation will consist of about 100 of the 2-light square type of lamp, a number of 4-light lamps of the hexagon type, and 3-light circular lamps. On completion, this will form one of the most complete and up-to-date lighting schemes in the country.

## APPLICATIONS FOR LETTERS PATENT.

- 1151.—BREEDEN, J., AND CO., LIMITED, and BREEDEN, F., "Incandescent gas-lamps." Jan. 17.  
 1166.—DEUTSCHE GASGLÜHLICHT AKT.-GES. (AUGES.), "Suspended lamps on supports crossing streets." Jan. 17.  
 1286.—MULLER, W., "Discharging machine with jointed ram for horizontal and inclined coke-ovens." Jan. 18.  
 1354.—KOPPEN, O., "Incandescent burners." Jan. 18.  
 1356.—WARDALE, A. E., "Reducing valves." Jan. 19.  
 1364.—WOOD, J. H., "Supporting shades, &c." Jan. 19.  
 1397.—ABADY, J., SIMMANCE, J. F., and YORKE, W., "Water-meters," Jan. 19.  
 1477.—LEATHERBARROW, J., and STAFFORD A., "Reducing-valve." Jan. 20.  
 1488.—SYKES, H., "Gas-check." Jan. 20.  
 1489.—BRAY, A., "Gas-fittings." Jan. 20.  
 1500.—FIELDEN, F., "Gas-producers." Jan. 20.  
 1501.—SPURR, G. R., and TAYLOR, W. H., "Gas-producer." Jan. 21.  
 1523.—STRINGFELLOW, J. H. W., "Improvements in gas-making." Jan. 20.  
 1533.—KLOUMANN'S, and BIRKELAND, R., "Water-pipes." Jan. 20.  
 1534.—WEST, J., "Discharging and charging gas-retorts." Jan. 20.  
 1561.—WOOD, A., and GEORGE BRAY AND CO., LIMITED, "Shades for gas." Jan. 21.  
 1562.—WOOD, A., and GEORGE BRAY AND CO., LIMITED, "Fitting for flexible metallic tubing." Jan. 21.  
 1563.—STURGE, W. H., "Suspension of gas-fittings." Jan. 21.  
 1565-6.—STINCHCOMBE, H., "Suction producers." Jan. 21.  
 1594.—HANDS, G., and BREEDEN, F., "Incandescent burner fittings." Jan. 21.  
 1599.—QUEMBY, B. J., "Operating taps and cocks." Jan. 21.  
 1653.—MIDDLETON, S. H., "Gas-taps." Jan. 22.  
 1671.—WILLIAMS, B. G., "Prepayment meter mechanism." Jan. 22.  
 1699.—JÄHDE, E., "Glass globes for lights." Jan. 22.

The largest consumption of gas in Manchester during any 24-hour period this winter was reached last Wednesday, when 27,904,000 cubic feet were used. The department's record for a day's supply is held by Dec. 12, 1905, when the consumption totalled 28,810,000 cubic feet.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

WORKING FOREMAN. Newport (Salop) Gas Works.

### Situations Wanted.

SECRETARY, MANAGER, OR ACCOUNTANT. No. 5175.  
 SULPHATE PLUMBING. Leadburner, 117, Galloway Road, Shepherd's Bush.

### Plant, &c. (Second Hand), for Sale.

COMPLETE GAS WORKS PLANT (EXCEPT BUILDINGS). Particulars from the Eastbourne Gas Company.  
 GAS HOLDERS, SCRUBBER, CONDENSER, STATION METER, EXHAUSTER, HYDRAULIC MAIN, PIPES, &c., &c. J. Harper and Co., Willenhall.  
 PURIFIERS, SCRUBBERS, AND CONDENSERS. Edinburgh and Leith Gas Commissioners.

### Patent Rights.

GAS STOVE UTENSILS. No. 5175.

### Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. Feb. 15.  
 NORTH MIDDLESEX GAS COMPANY. Feb. 15.  
 SOUTHGATE GAS COMPANY. Feb. 15.

### Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel, Feb. 11, 2.30 o'clock.  
 SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel, Feb. 18, Three o'clock.  
 SOUTHGATE AND DISTRICT GAS COMPANY. London Offices, Feb. 17, 3.45 o'clock.  
 UXBRIDGE GAS COMPANY. Offices, Feb. 17, 2.30 o'clock.

### Coal.

MILFORD HAVEN URBAN DISTRICT COUNCIL. Tenders by Feb. 12.  
 NELSON GAS DEPARTMENT. Tenders by Feb. 14.

### Cookers.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Fire-Clay Goods.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Gas Oil.

DEVONPORT GAS DEPARTMENT. Tenders by Feb. 5.

## TENDERS FOR

### General Stores (Ironmongery, Brass Fittings, Cocks, Oil, Lime, &c., &c.).

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
 NELSON GAS DEPARTMENT. Tenders by Feb. 14.  
 SALFORD GAS DEPARTMENT. Tenders by Feb. 10.

### Meters.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Pipes, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Sulphuric Acid.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
 NELSON GAS DEPARTMENT. Tenders by Feb. 14.

### Tar.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

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### O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

### SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
 PALMERSTON HOUSE,  
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### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 183, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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GAS LIGHTING ENGINEERS AND CONTRACTORS,

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 REPAIRS RECEIVE PROMPT ATTENTION.  
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ANY QUANTITY. ANY PORT. ANY STATION.

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PAINT FOR GAS-WORKS.

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## SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

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Offices: City Chambers, LEEDS.  
Correspondence invited.

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See Advertisement on p. 269.  
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**AMMONIACAL Liquor wanted.**  
BROTHERTON AND CO., LTD., Ammonia Distillers.  
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**"GAZINE" (Registered in England and Abroad).** A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.  
It is also used for the enrichment of Gas.  
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.  
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**PREPARED from Pure Iron.**  
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Gives no back Pressure.  
The Cheapest in the Market.  
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DIGGERS AND SUPPLIERS OF THE  
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Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—  
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Combine Brilliancy and Strength. British Made. Send for List.  
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**MEADE-KING, ROBINSON, & CO.**  
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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**SIMULTANEOUS Discharging-Charger.**  
The one Machine which Discharges and Charges at One Stroke.  
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**MR. W. B. MIMMACK, for many years**  
Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.  
Address No. 5115, care of Mr. King, 11, Bolt Court, FLEET STREET E.C.

**SULPHATE Plumbing by a First-Class**  
Journeyman Workman of over 30 Years' Experience. Own Plant. Saturators, Tanks, &c., Made and Repaired on Reasonable Terms (Distance no object).  
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**WANTED, a Working Foreman at the**  
Newport, Salop, Gas-Works (Average Annual Gas Consumption 12,000,000 Cubic Feet). House, Gas, and Firing found. Must be Experienced in Fitting work.  
Applications, stating Age, Experience, and Wages required, accompanied by recent Testimonials, to be sent to me, ROWLAND P. LIDDLE, Secretary, Newport, SALOP.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.  
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**GAS PLANT FOR SALE.**  
**FOUR Cast-Iron Purifiers 8 ft. by 4 ft.**  
by 3 ft. 6 in. deep, with Covers and Two Layers of Wood Grids. Centre-Valve, 6-inch Connections. Newly erected Three Years ago.  
SCRUBBER, Vertical, 16 ft. to 18 ft. high by 2 ft. 6 in. to 2 ft. 9 in. diameter complete, fitted with new Elm Grids.  
CONDENSER with Vertical Pipes.  
Round STATION METER, with 6 Dial Index. Capacity 3600 Cubic Feet per hour. New Drum. In First-Class Order. Complete with Bye-Pass and all necessary Valves coupled to 6-inch Main. Also Two 6-inch Bye-Pass PLUG COCKS (new Three Years ago) for Two extra Purifiers.  
EXHAUSTER for same, Belt Driven.  
HYDRAULIC MAIN, ASCENSION PIPES, and Six Tangye's Patent MOUTHPIECES, all complete with Connecting Pipes, with all details.  
Two GASHOLDERS—One with Standards, 15 ft. diameter by 12 ft. high approx.; one with Ashmore and Pease Chain balanced 18 ft. by 15 ft. approx.  
Only just ceased work.  
Address JOHN HARPER AND CO., LIMITED, Albion Works, Willenhall, STAFFS.



## SECOND-HAND GAS PLANT FOR SALE.

HAILSHAM, SUSSEX.

**THE Eastbourne Gas Company, having** acquired the Hailsham Gas Undertaking, invite TENDERS for TAKING DOWN and PURCHASING the Whole of the PLANT at the Hailsham Works (excepting buildings). Two small HOLDERS, Two BENCHES OF RETORTS, Nearly New Braddock's 6-inch GOVERNOR, STATION-METER ENGINE and EXHAUSTER (Waller), STEAM BOILER, PHOTO-METER, WORKS MAINS and SUNDRY SCRAP.

Further Particulars of Mr. JOHN HAMMOND, Gas-Works, EASTBOURNE.

## EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

FIRST-CLASS SECOND-HAND PLANT.

**THE Commissioners have for Sale the** following PLANT, together with all Accessories, &c., for which they are prepared to receive OFFERS.

Two Sets of WATER-LUTE PURIFIERS, 24 feet by 19 feet.

One Set of WATER-LUTE PURIFIERS, 27 ft. 6 in. by 24 ft.

Two TOWER SCRUBBERS, each 60 feet High by 13 feet Diameter.

One Battery of WROUGHT-IRON ANNULAR CONDENSERS, 31 ft. 6 in. high. Inner Tube, 22 inches Diameter.

Detailed Specifications and Drawings can be supplied to Persons contemplating the Purchase of this Plant, and references given to other Works where similar Plant has been transferred.

For further Particulars and full Information, Apply to the undersigned.

W. R. HERRING,  
General Manager.Calton Hill, Edinburgh,  
Jan. 21, 1910.

## DEVONPORT CORPORATION.

(GAS DEPARTMENT.)

**TENDERS** are invited for the Supply of from 150,000 to 200,000 Gallons of GAS OIL for the Year ending the 31st of March, 1911.

The Oil to be delivered in bulk to the Corporation Wharf, Devonport, as required.

A Sample of the Oil to be submitted, and Tenders to be delivered on or before Feb. 5, 1910.

W. P. TERVET,  
Engineer and Manager.

Gas-Works, Devonport.

## COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

**THE Gas Department invite Tenders** for the Supply of about 700 Tons of LIME required for the Purification of Gas at their respective Stations during the Twelve Months commencing the 1st of April, 1910.

Full Particulars may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Lime," to be delivered to me not later than Three p.m., on Thursday, the 10th of February, 1910.

L. C. EVANS,  
Town Clerk.

Salford, Jan. 28, 1910.

## BOROUGH OF NELSON.

(GAS DEPARTMENT.)

**SUPPLY OF GENERAL REQUIREMENTS, AND SALE OF SURPLUS TAR.**

**THE Gas Committee invite Tenders** for the Supply of the following requirements during the Twelve Months ending the 31st of March, 1911.

- GAS COAL.
- GENERAL IRONMONGERY.
- BRASS FITTINGS.
- SULPHURIC ACID.

The Committee also invite TENDERS for the Purchase of the Surplus TAR, produced at their Nelson and Brierfield Works during Twelve Months ending the 31st of March, 1911.

Form of Tender for each item, together with full Particulars, may be obtained on Application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.

Sealed Tenders, duly endorsed, must be sent to the undersigned not later than Monday, Feb. 14, 1910.

J. H. BALDWIN,  
Town Clerk.

Town Hall, Nelson,  
January, 1910.

## URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS AND STEAM COAL.

**THE Milford Haven Urban District** Council are prepared to receive TENDERS for about 1400 Tons of Large GAS COAL and about 50 Tons of BITUMINOUS STEAM COAL, to be delivered between the 1st of April, 1910, and the 31st of March, 1911, the whole of the Coal to be Fresh Hewn, Clean, and free from all Impurities.

Further Particulars and Forms of Tender can be obtained on Application to the undersigned.

Sealed Tenders, endorsed as follows:—

First:—"Tender for Gas Coal," addressed to the Chairman of the Gas and Water Works Committee.

Second:—"Tender for Steam Coal," addressed to the Chairman of the Highways, Lighting, and Public Improvements Committee.

Tenders to be delivered not later than Saturday, the 12th of February, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

By order,  
THOMAS H. LEWIS,  
Clerk.Milford Haven,  
Jan. 29, 1910.

## BOROUGH OF BARROW-IN-FURNESS.

**THE Corporation are prepared to receive** TENDERS for the Purchase of Surplus GAS TAR and OIL-GAS TAR, produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1911, delivered into the Purchaser's Tank-Waggons at the Gas-Works Siding.

Any further Information may be had on Application to the Manager of the Gas-Works.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office on or before Tuesday, the 22nd day of February, 1910.

The highest or any Tender not necessarily accepted.

By order,

L. HEWLETT,  
Town Clerk.

Town Hall, Barrow-in-Furness.

**THE Corporation are prepared to receive** TENDERS for the Supply of FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRON-MONGERY, and SULPHURIC ACID, as may be required from the 1st day of April next to the 31st day of March, 1911.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 22nd of February, 1910.

The lowest or any Tender not necessarily accepted.

By order,  
L. HEWLETT,  
Town Clerk.

Town Hall, Barrow-in-Furness.

## BRENTFORD GAS COMPANY.

**NOTICE is Hereby Given, that a** HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 11th of February next, at Half-past Two o'clock precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office in compliance with the Company's Acts of Parliament.

By order,

WILLIAM MANN,  
Secretary.  
Office, Brentford,  
Jan. 25, 1910.

## SOUTH SUBURBAN GAS COMPANY.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 18th day of February, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect Two Directors and One Auditor in the place of those retiring by rotation; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 4th day of February, until after the Meeting.

By order of the Board,

CHARLES M. OHREN,  
Secretary.  
Offices and Works:  
Lower Sydenham, S.E.,  
Feb. 1, 1910.

## SOUTHGATE AND DISTRICT GAS COMPANY.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 17th day of February inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1909; to declare Dividends; to elect Two Directors and an Auditor; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 4th to the 17th of February, both days inclusive.

ERNEST L. BURTON,  
Secretary.Secretary's Office: 5, Great Winchester Street,  
Old Broad Street, London, E.C.,  
Feb. 1, 1910.

## UXBRIDGE GAS COMPANY.

**NOTICE is Hereby Given, that the** FORTY-NINTH ORDINARY GENERAL MEETING of the Company will be held at the Office, 162, High Street, Uxbridge, on Thursday, the 17th day of February, 1910, at 2.30 o'clock in the Afternoon when the following Business will be transacted—viz.: the presentation of the Directors' Report, and the Balance-Sheet and the Declaration of Dividend; the Election of Directors and an Auditor; and the Remuneration of the Secretary.

AND NOTICE is FURTHER GIVEN, that the STOCK TRANSFER BOOKS of this Company WILL BE CLOSED from the 3rd to the 17th days of February, 1910, both inclusive.

NOTICE is ALSO HEREBY GIVEN, that, immediately after the Transaction of the Business of the Ordinary General Meeting, an EXTRAORDINARY GENERAL MEETING of the Company will be held at the Company's Offices: To authorize the Directors to raise £20,000 by the creation and issue of Preference Shares or Stock, being a further portion of the Additional Capital authorized by the Uxbridge Gas Act, 1906, and to exercise any powers of borrowing by Mortgage or by the creation of Debenture Stock which attaches to the creation and issue of such Preference Shares or Stock in pursuance of the Acts of Incorporation, in such manner and at such times as they may determine.

By order of the Board,  
GEORGE J. BRISTOW,  
Secretary.

Uxbridge, Jan. 27, 1910.

## SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
NORTH MIDDLESEX GAS COMPANY.NEW ISSUE OF £7500 FIVE PER CENT.  
PREFERENCE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
SOUTHGATE AND DISTRICT GAS COMPANY.NEW ISSUE OF £5000 FIVE PER CENT.  
PREFERENCE STOCK,AND  
£2500 SEVEN PER CENT. MAXIMUM DIVIDEND  
ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
ALDRSHOT GAS, WATER, AND DISTRICT  
LIGHTING COMPANY.NEW ISSUE OF £4000 FIVE PER CENT. "C"  
CONSOLIDATED STOCK.AND  
£4000 FOUR PER CENT. CONSOLIDATED  
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**ANALYSIS OF THE ACCOUNTS**  
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Principal Water Undertakings  
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The Undertakings of the Metropolitan Water  
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FOR THE YEAR 1908-1909.

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**CANDLE SAFETY LAMPS.**

Are a great improvement on Oil, giving a good Light,  
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**MIRFIELD GAS COAL.**  
**UNEQUALLED.**

Sperm Value 878·85 lbs. per Ton.

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Refills (5000 sparks) 9d. and 1/- each retail.

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**HEATHCOTE GAS COAL**  
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Rich in Illuminating Power and Yield of Gas.  
Above the Average in Weight and Quality  
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PIPES and CONNECTIONS, 1½ to 48 inches  
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These are cast in one piece, without Chap-  
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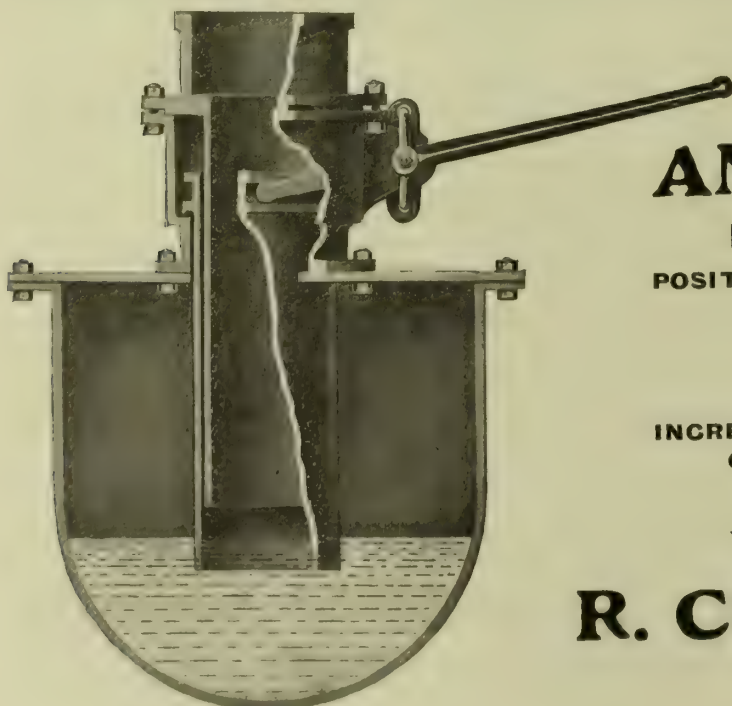
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POSITIVE IN ACTION,  
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From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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## SPLENDID CARBONIZING RESULTS.

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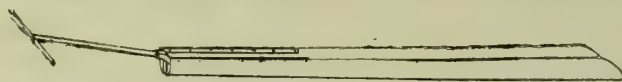
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Apparatus serving to Find out the Leakage in Gas-Mains.

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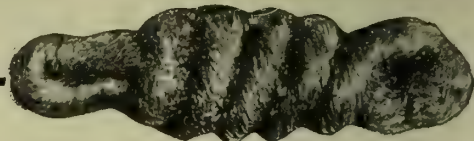
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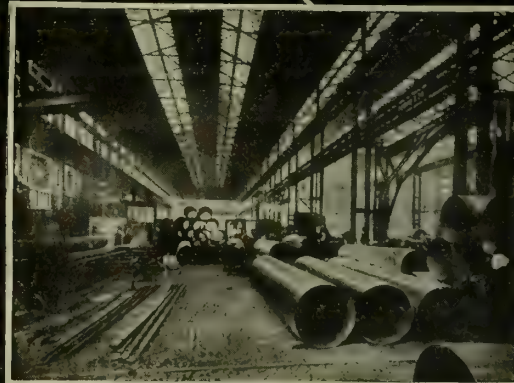
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The Lead Wool Joint is built up evenly all the way through.  
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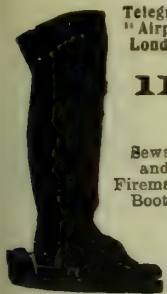
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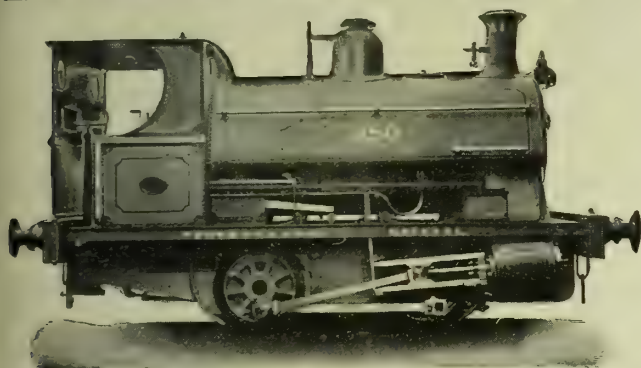
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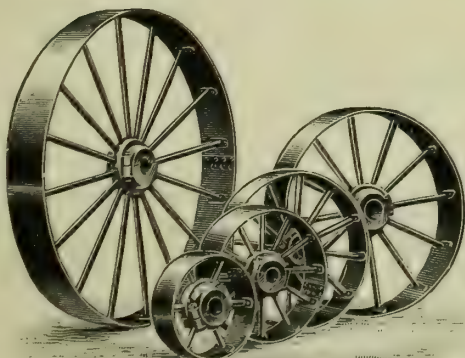
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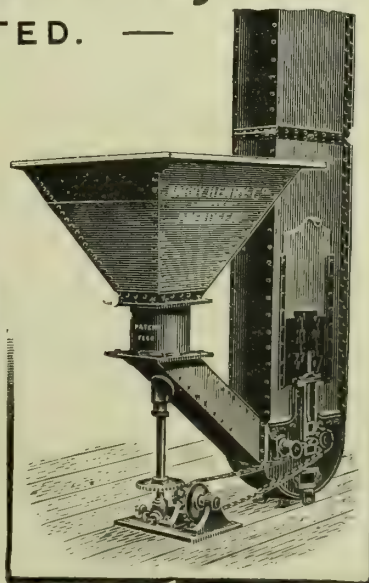
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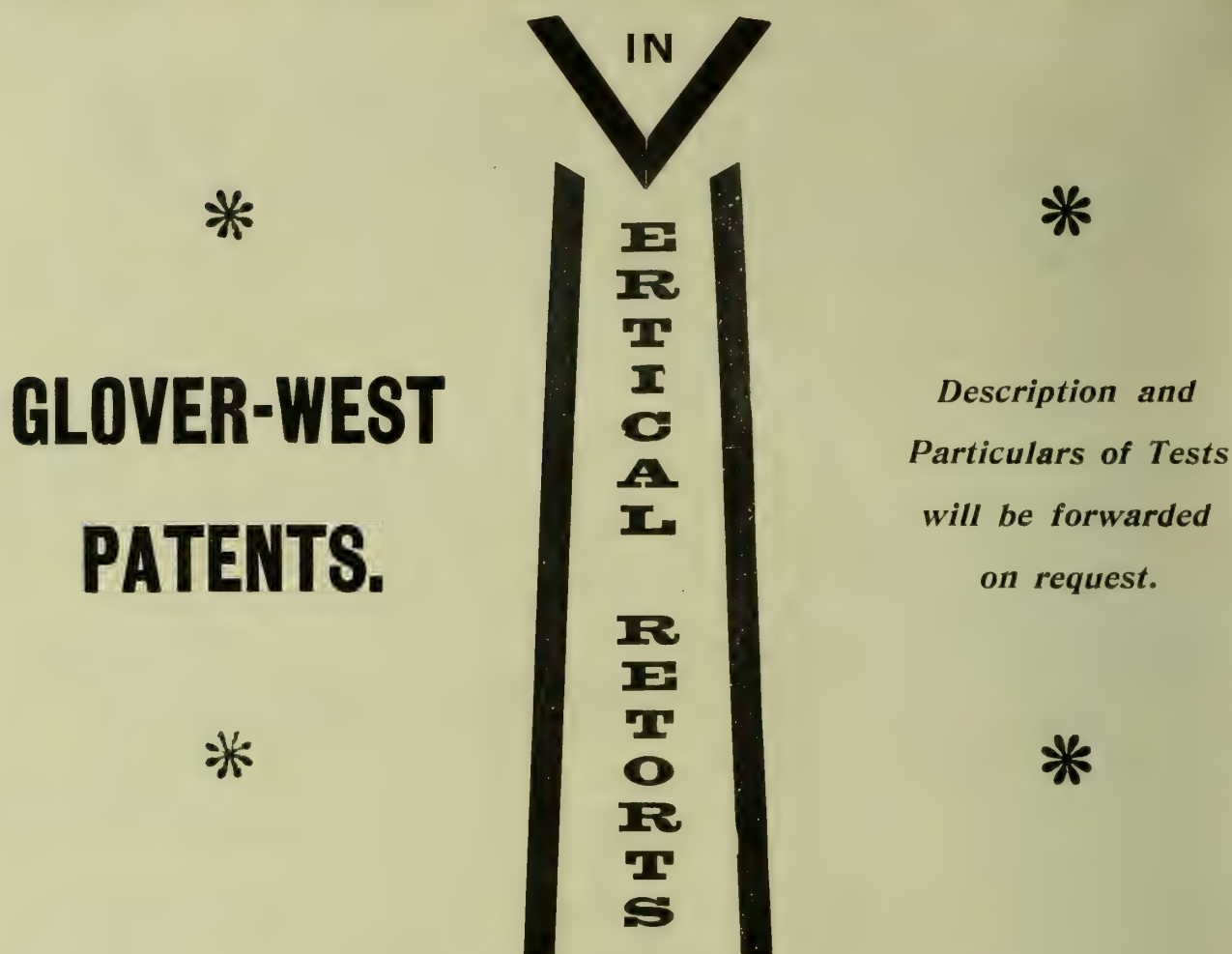


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## LIGHT

### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

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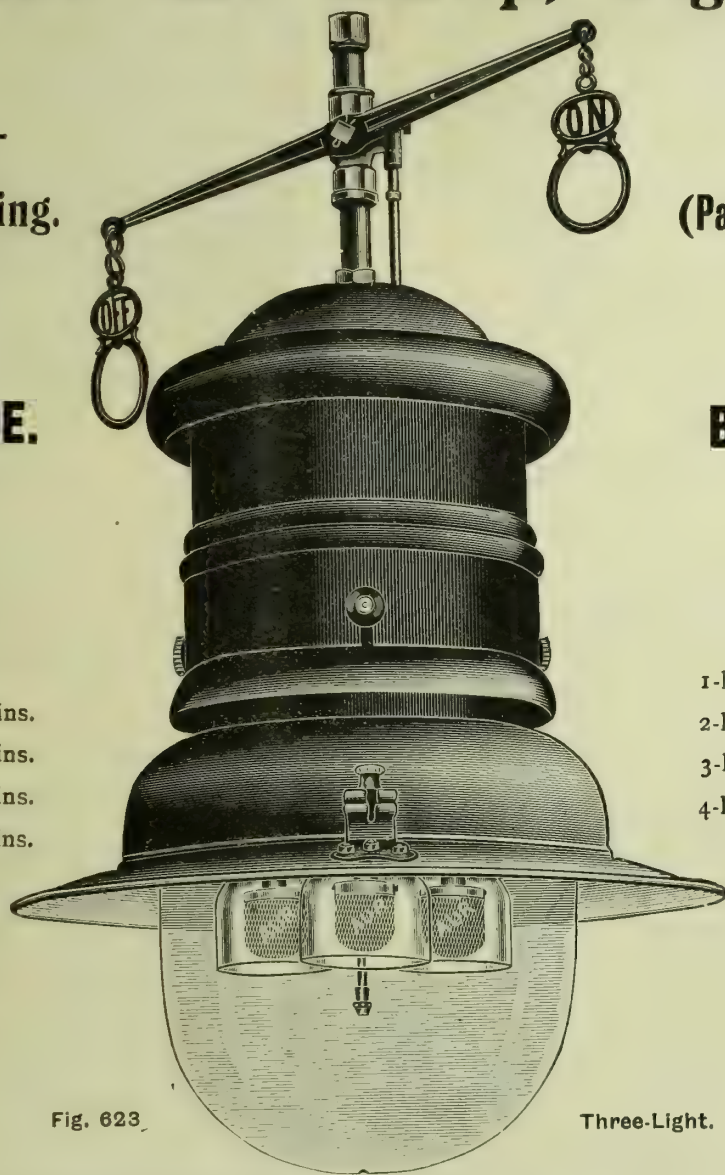


Fig. 623.

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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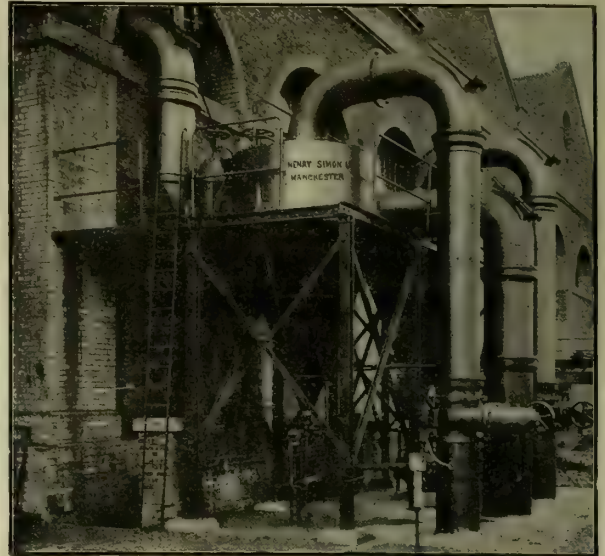
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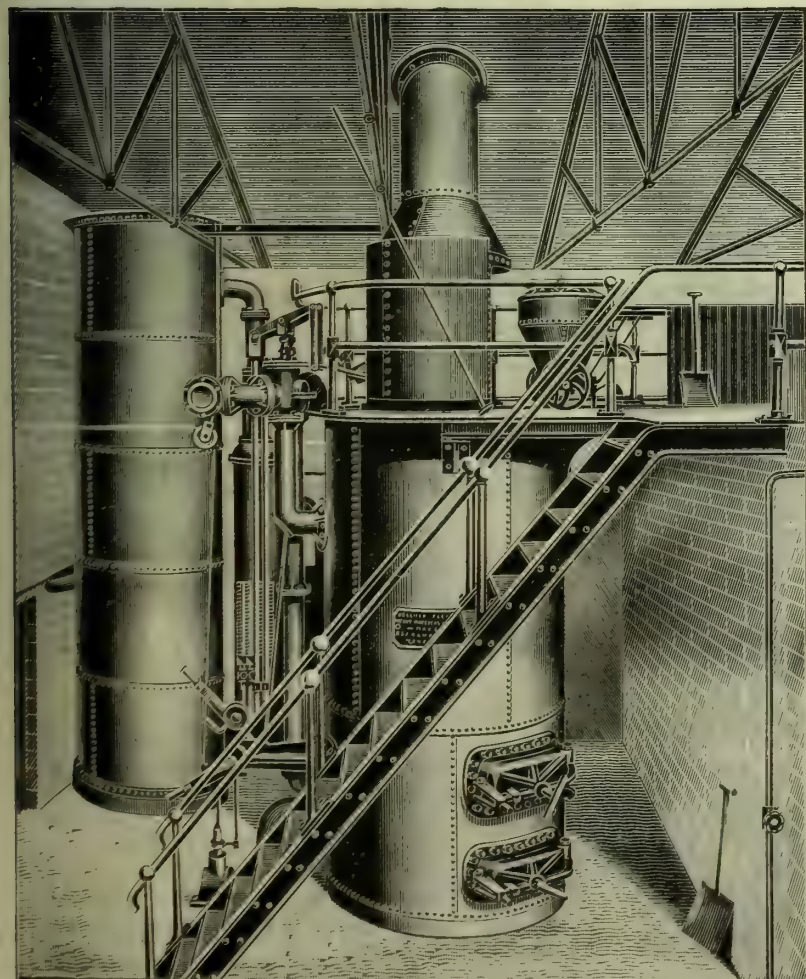


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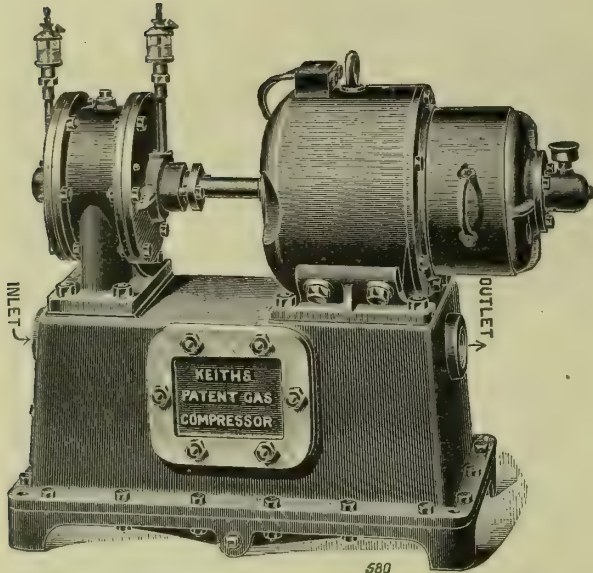
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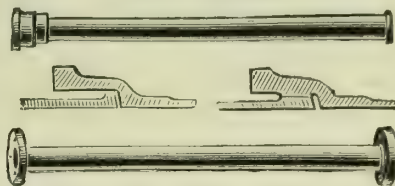
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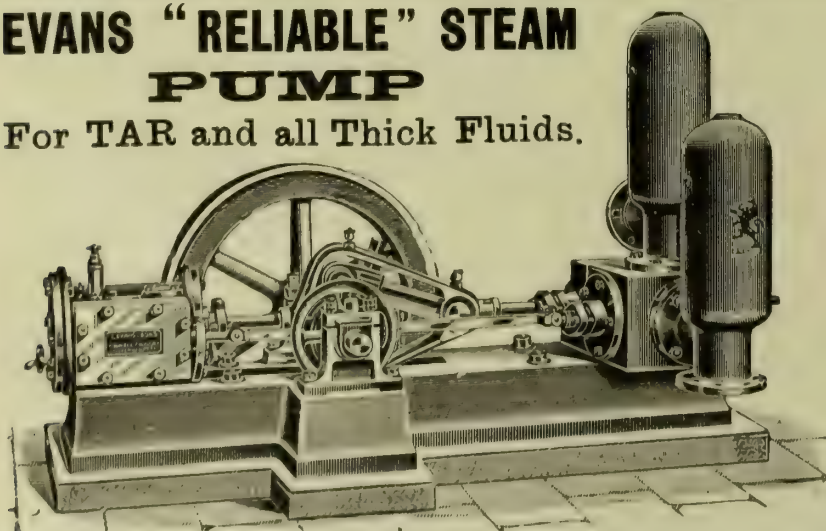
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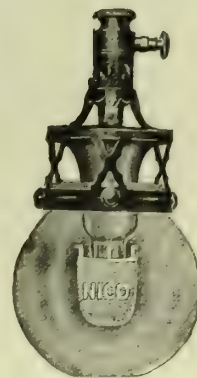
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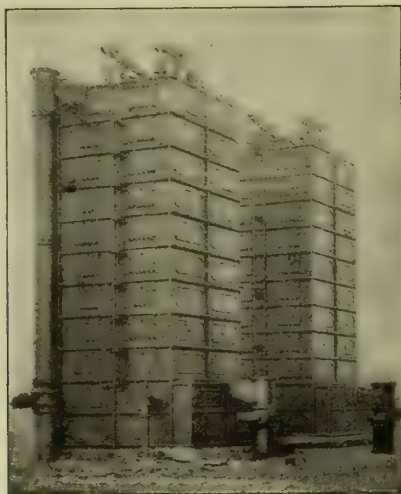
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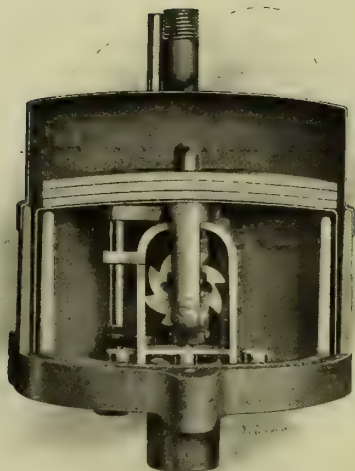
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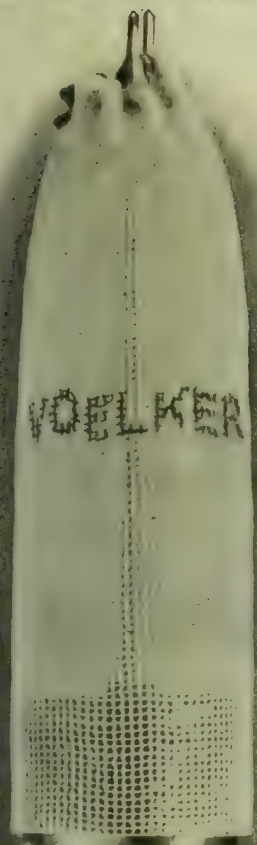
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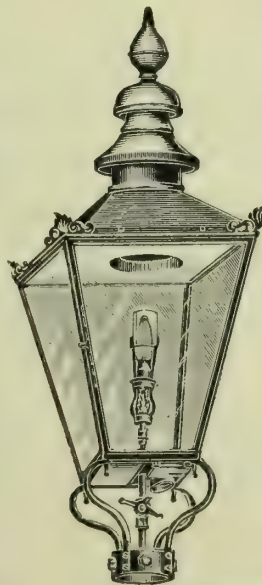


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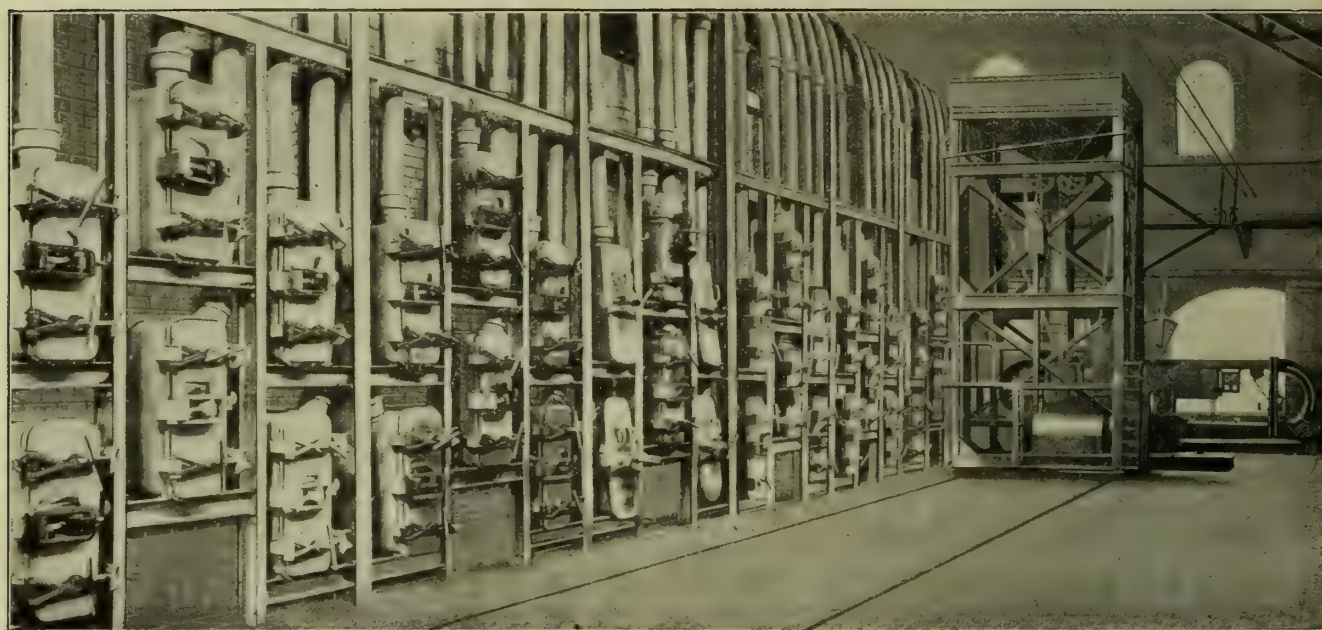
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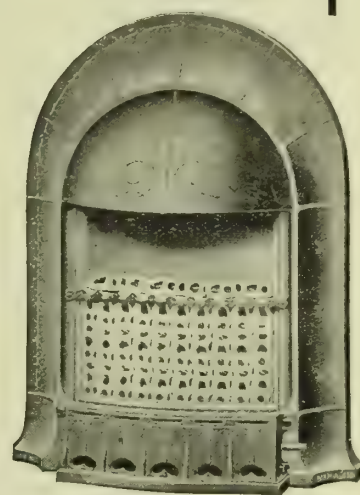
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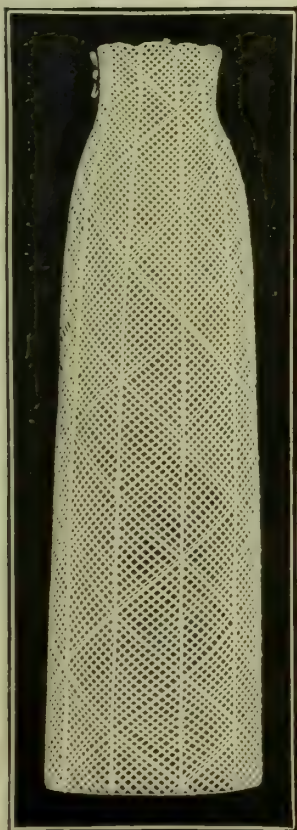
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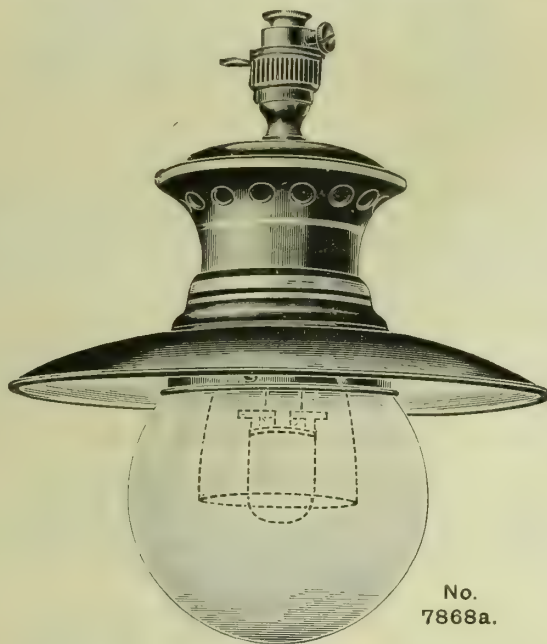
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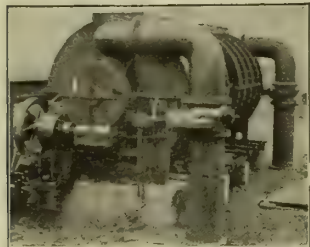
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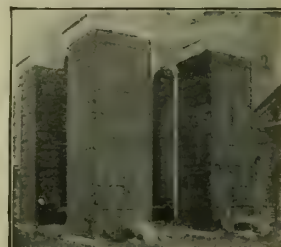
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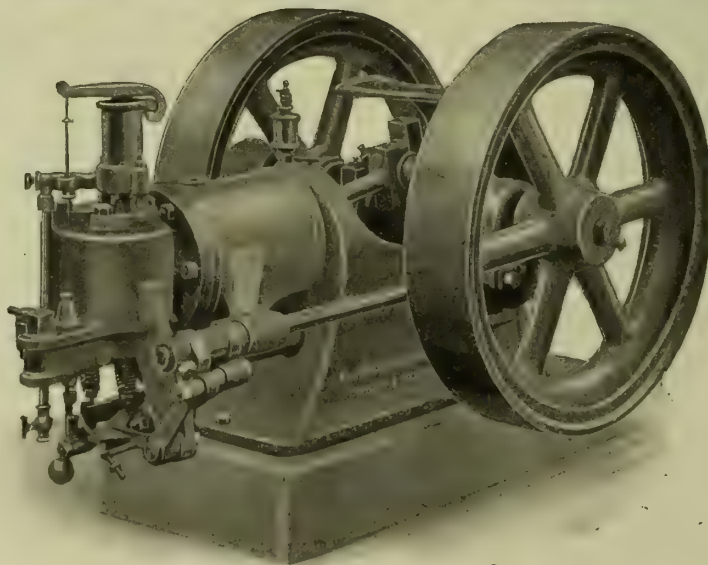
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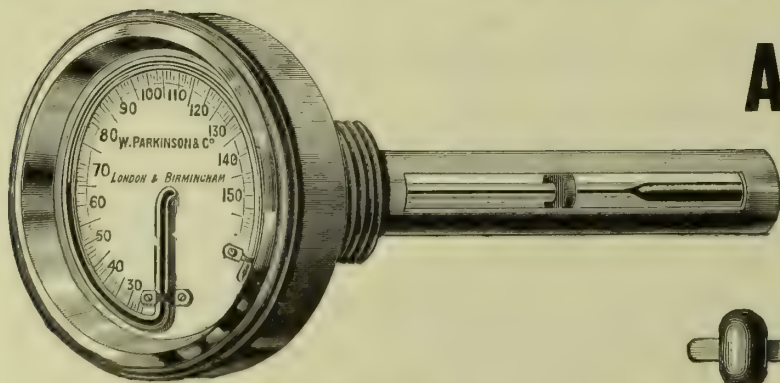
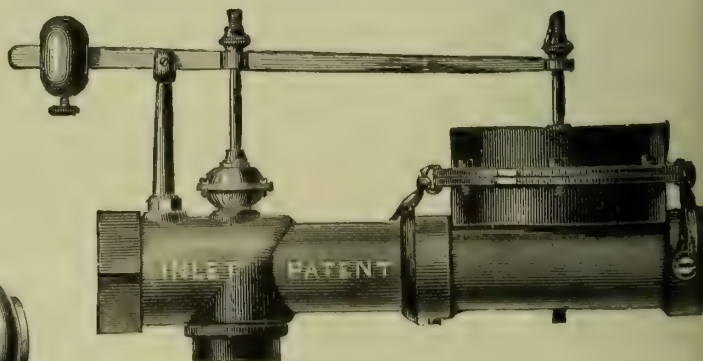
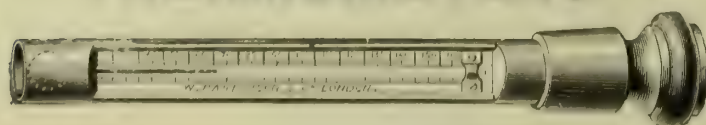
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VOL. CIX., No. 2439.—TUESDAY, FEBRUARY 8, 1910.

## EDITORIAL NOTES—GAS, &c.

### Economy and Municipal Discouragement. An Inquiry Proposed.

IF there were present at Friday's meeting of the Gaslight and Coke Company any of the stockholders of the now defunct West Ham Gas Company who had at one time any misgivings as to the wisdom of the amalgamation, from the West Ham proprietary point of view, with the Gaslight and Coke Company, those misgivings must have been completely dispelled by the accounts presented, and the explanatory and instructive statement made by the Governor (Mr. Corbet Woodall), who seemed to have nothing to do, so far as the finances and working were concerned, but to revel in good features, and to treat lightly (being anticipated) the only set-back in the matter of residuals. As our review of the accounts last week indicated, the Company's financial position has been strengthened in a remarkable manner; and this is due more to internal working than to external influences. There has been prudent capital administration during recent years; and the interesting story of the capital account told by the Governor shows the progressive lowering of new expenditure per million feet of gas, and, partly in consequence of this, a diminishing dividend charge per unit of sale. Yet we have never known the works of the Company to be in better case than at the present time. The very fact of accomplishment indicates the scope for this economy in connection with the Company. Then in relation to manufacture, since 1904 there has been an increase of no less than 10 per cent. in the production of gas per ton of coal carbonized, which represents a saving of 180,000 tons of coal a year—in other words, had the production per ton remained as in 1904, last year 180,000 tons more coal would have been required. Again, the fact of accomplishment indicates the scope for the economy in connection with the concern. On every side, there is the justification, and the proof of the necessity, for the release of the undertaking from the old absolutism in administration that crippled progress.

The enormous saving of 180,000 tons of coal a year is in itself a monument to the wisdom of the new policy. The saving, as the Governor says, is a matter not only for congratulation to the Company and consumers, but it is one of national importance. Any improvement that will increase the product and service of our natural and national heritage must be of importance to the country at large; and we know of no direction in which the economical use of coal is being fostered with such good effect as in the gas industry—not only through enhanced gas production, but through the encouragement offered to the use of gas and coke for heating, displacing, wherever change is made, the wasteful and barbarous modes of coal consumption. But the gratitude of the country to the gas industry does not find expression through either legislative or municipal channels; the main object—we regret there is occasion for saying it—appearing to be to trammel the industry as much as possible, either by enactment or by unfair competition. Improved working has also brought about economy in the manufacture of carburetted water gas, notably in the consumption of oil per 1000 cubic feet. These changes, which have so effectually altered the material fortunes of the concern, the Governor generously ascribes to the zealous labours of both the technical staff and the rank-and-file of the workers; and there is no doubt in his mind that the advances in the past year's working are partly due to the better relations established between employees and employers through the medium of co-partnership. Incidentally, it is recorded that the employee co-partners of the Company number 8700, and already there are 1500 of them on the list of proprietors. This augurs well for the future.

The increase of  $4\frac{1}{2}$  per cent. in the consumption of gas in the past half year was regarded by the proprietors as satisfactory in itself, and as a sign of the return to a normal scale of increases. What are called "normal" increases are more difficult to obtain in these days than they were; the ruling conditions are to-day more favourable to wide fluctuations. Saturation level may have been practically reached by electricity; the worst of the declining consumption influence of the incandescent burner may have now been passed. But the fact remains that both causes have had effect in drawing closer the limits of the lighting business. The quantity of gas consumed for heating, cooking, and industrial purposes is on the increase. Use in these directions, however, is subject to uncontrollable circumstances. The degree of consumption for heating is under the dominion of the prevailing climatic conditions; and the industrial business is governed by trade prosperity and adversity. As the consumption of gas extends for these purposes, in many gas-supply territories "normal increase" will grow more and more a term applicable to a past day, and oscillations in consumption will become more and more pronounced. In the course of our comments last week, we asked, out of curiosity, in view of the great extension of the gas-stove connection in the Company's district, whether information could be given as to the proportion, approximately, of the day to the night consumption. For various reasons, at present, there is difficulty in quoting figures that would be instructive. The great activity in promoting connections of gas cooking stoves and fires is only a matter of some four or five years; and the period is really too short for comparative purposes. Moreover, the character and habits of the residents in the Metropolitan district cause considerable long-hour use of cookers and fires during the lighting hours; and this removes from the day hours much of the consumption that obtains in other than the lighting period in districts where the circumstances of life are of a different order. Again, the very magnitude of the Company's business produces big divergencies in the consumption from day to day according to atmospherical condition. Under the circumstances, it does not appear possible to give at present any reliable figures that would have particular instructive value as to the proportion of gas in the daytime contrasted with the lighting hours.

The Company have suffered considerably in the matter of the loss of public lamps at the hands of municipal owners of electricity supply undertakings; and the Governor made a vigorous and condemnatory attack on the preferential conditions that this ownership sets up to the detriment of the ratepayers, of which the Company is an exceptionally large one in many of the Metropolitan boroughs. He had an example upon which to work, the equal of which perhaps is not to be found in the length and breadth of the land—an example in which all commercial and economic considerations have been set at naught, an example in which every act on the part of the Borough Council (unnamed by the Governor, but known to be the Marylebone) has been an injustice to the Company as competitors of the municipally owned electricity undertaking. The Governor hit out freely, in dignified and unimpassioned language, at the municipal arbitrariness and the sole motive of electrical favour. The occasion demanded it. In no one respect can justification be shown by this particular Borough Council for what they have done; and what they have done will, unless some power steps in to prevent the miscarriage and abuse not only of justice but of local administration, be copied elsewhere. Indeed, though the most prominent case, Marylebone is not by any means the only instance in the country of this preferential treatment of the electricity undertaking at the expense of the ratepayers. It is, as Mr. Woodall says, in his concluding remarks, a matter that calls for searching investigation and prompt action; and we would emphasize, and earnestly urge



upon the notice of the administrators and executive officers of all Gas Companies, his concluding words.

Neither the Local Government Board nor the Board of Trade appears to possess powers adequate to deal with the emergency which has arisen; and I venture to suggest that one or the other or the Treasury should procure the appointment of a Commission, or a Committee of Inquiry, having the necessary competence.

The Gas Companies' Protection Association some time ago had this question under their consideration; and perhaps the Governor's remarks and suggestion will do something to accelerate movement in the matter. The situation imperatively demands prompt action. The tale and the protest as given in the report of the proceedings at the meeting of the Gaslight Company should be read by all who have at heart the interests of the gas industry, and by all who are the lovers and defenders of fair play.

### More Glare.

THE February number of the "Illuminating Engineer" contains the text of the paper on "Glare," which was read by Dr. J. Herbert Parsons, F.R.C.S., on the 11th ult., together with a report of the discussion which followed the reading of the paper, and a number of communications on the subject from scientists and technical men abroad. Extracts from the paper and a summary of the discussion have already been given in the "JOURNAL" (*ante*, p. 167). A few of the communications from abroad—notably a pithy one from Professor H. Strache, of Vienna—treat the question of glare much as we suggested it should be treated in our editorial comments upon the paper and the discussion in the "JOURNAL" for the 18th ult. (p. 147). Nevertheless some of our words are quoted by our contemporary as meriting reproof, which it proceeds to administer in very ponderous phrases, through which however runs an undercurrent of excuse for the mistake which was made of devoting one whole meeting to the views of physiologists on the subject. Discussion of a question from one standpoint only is apt to vex the man of broader views; and we are glad to believe that the Illuminating Engineering Society will not repeat its initial blunder of inviting gas and electrical engineers to listen for an hour and a half to physiologists in debate one with the other. Had the communications from abroad been made available for publication in our columns along with the extracts from the paper itself, readers might have been saved from gaining the impression that the new Society was, despite its title, in reality a physiological debating society.

### Provisional Orders—More Stand-by Clauses.

THE changes in gas legislation of recent sessions have made their mark on Gas Provisional Orders. There was a time when the drafts of the proposals submitted to the Board of Trade and the Local Government Board had the characteristics of being stereotyped and as dry-as-dust. There are for the coming session no less than thirteen applications to the Board of Trade, and one to the Local Government Board; and most of them are the promotions of moderate sized Limited Companies, desirous of expansion, and at the same time applying to their operations modern legislative developments. Particularly is it noticed that there is not a single instance in which anything more than a standard illuminating power of 14 candles is asked for, with the use in testing of the "Metropolitan" No. 2 burner. The Sheffield Company are seeking sanction, *via* the Board of Trade, for bringing themselves under present-day prescription in both respects. Throughout, where money powers are sought by the Orders, provision is made for the application of the revised auction clause as introduced in 1908, and which clause has not such an amount of irksome conditions about it as its immediate predecessor had. The model provision as to prepayment meter supply also consistently appears; and in several cases the special purposes fund clause is inserted. We may hazard the opinion that the two or three companies who have included the old renewals fund clause in their draft Orders will, before the session is through, find the special purposes fund clause substituted; the creation of the latter having been the outcome of the distaste of the parliamentary authorities for the renewals fund clause, and in its operation it is intended to displace both the old renewals and insurance funds clauses.

Last week, reference was made to the fact that three Bill

promoting Gas Companies and two Local Authorities were seeking the protection of stand-by clauses—in the cases of the Local Authorities in respect of both private gas and electricity plants. In four of the Provisional Orders under review this week, like protection is sought, but equally in different manner. In two cases—the Orders of the Burnham and Highbridge Gas Companies—a no-penalty clause appears. In other words, it is proposed that the Companies shall not be liable to penalty for neglect or refusal to give a supply of gas where suction gas is used, if, and so long as, in their opinion, it would interfere with, or jeopardize, the supply of gas for public or private lighting, and to consumers not using private gas-producing plants. This is all right in its way; but it does not make provision, where the consumption is not of profitable quantity, for the compensation of the gas suppliers in the matter of expenses they incur in providing the stand-by. Such provision is made by clauses on the lines of the Heywood and Mountain Ash precedents of last year, as were cited in the "JOURNAL" for Nov. 23 last (p. 525). In the present group of Orders, the Mountain Ash precedent is found in those promoted by the Dinnington and District and the Sudbury (Suffolk) Gas Companies. There are, therefore, three forms of protective stand-by clause in the Bills and Orders for the coming session—the Heywood, the Mountain Ash, and the no-penalty clauses. If the clauses are successful, as were the Heywood and Mountain Ash ones of last year, we should imagine that no gas company or supplying local authority will in future approach Parliament without asking for the simple but useful permissive power.

### Light and Inundation.

THOUGH the newspaper accounts have been copious, from them the real seriousness and terrible character of the inundations in Paris cannot be fully grasped a distance away, however well one may be acquainted with the affected areas. Now that the floods have subsided, though it will be some time yet before the mischief is completely repaired, and Paris assumes its normal aspect, the question is already being considered as to how such a disaster can be averted in future, and incidentally how the provision of artificial light can be assured. The electricity supply to the city failed at an early stage of the catastrophe, owing to the flooding of the power stations and the cable conduits; but it was only in comparatively small districts that the supply of gas was throttled by the water invading the distribution system where the pipes became broken. Unlike the electric power stations, too, certain of the gas-works were fortunately safely above the highest flood-level or outside the area affected by the inundation. Where there was deprivation of artificial light, there the difficulties and sufferings during the hours of darkness were greatest. The Minister of Public Works has already been considering how such deprivation can be averted for the future. Gas and electricity mains, drains, and so forth, are all huddled together underground; and M. Millerand, the Minister in question, says that an accident to one must affect the rest, and so they must be separated. The matter is not one to be dealt with by hasty project before there has been an opportunity of calmly surveying the position. To separate all the underground services of the kind would be an enormous and costly task. It would seem that what has to be legislated for and guarded against, in relation to floodings, are the causes rather than the effects. For instance, there would be little good transplanting the electrical conduits, while the power stations remain subject to flooding; and if provision can be made for preventing the floodings, the power stations would be safe, and still economically placed so far as transport and water supply are concerned. It was expected that one of the electric power stations—that at Rue Bergère—would be at work by Saturday last; and, in view of this, cables were being carried over and along houses as temporary means for giving a supply of current. But the big power station at Issy-les-Moulineaux has received such considerable damage, that it will take many weeks to straighten affairs out there. Workmen have also been busy on the broken gas-mains, and have promptly restored the supply in the small areas deprived of gas. Here, again, gas has scored. Not only was it less affected by the floods than the electric supply, but where it was so affected, it was more quickly re-established. At the time of writing, petroleum lamps are lighting such fine thoroughfares as the Champs Elysées and the Quai de l'Archevêché. Such illumination must look strange. But



Parisians have long since learned that the primitive candle and the oil-lamp, with or without inundations, are indispensable concomitants of electricity supply.

### The Cost Controversy Continued.

THE erratic statements and flights of imagination in which electricians indulge when making comparisons between gas and electricity require no exemplification in these columns. In their own localities, most gas engineers have become intimate with them. But it is found that when—we may repeat the word “when”—electricians can be drawn from insinuation to categorical declaration, it is an easy matter to put them completely to rout. By no means would we impugn the seriousness with which electricians hold their beliefs regarding gas; but we do impugn the knowledge serving as the foundation of those beliefs. They fling their assertions about in the most reckless manner; and these assertions find as easy entry into the columns of “The Times” as did the famous Pigott letters. Allusion was made last week to the controversy that has been provoked by one of “The Times” contributors through his partisan advocacy of electric lighting and his traducement of gas lighting. The controversy a week since had reached the point where the “Contributor” and Mr. H. H. Holmes, Sales Manager to the Marylebone Borough Council, essayed to undermine the denial by Mr. Hanbury Thomas of the original statements in our morning contemporary. Mr. Hanbury Thomas’s maxim in controversy is “Facts not Fancies;” and he has now, in his retort, come down with such a sheaf of solid representatives of the former that “Contributor” will find some difficulty in beating a dignified retreat. This electrical advocate, as well as others, have attempted to minimize the renewal expense of metallic filament lamps by pointing to the renewal costs of gas mantles, which latter costs it has become an electrical habit to place at almost fabulous figures. All gas companies can just as easily dispose, by their own experiences, of the fictitious assertions as Mr. Hanbury Thomas does by the concrete experience of the Sheffield Gas Company, who maintain about 27,000 burners, with an average use of mantles during the twelve months of 3·16 per burner, many of which mantles are fixed in public houses and shops, and come in for somewhat rough treatment. This is only one out of several points treated upon in Mr. Hanbury Thomas’s communication; but perhaps Mr. Holmes, with his unquenchable affection for his little stock of accounts that show a “saving”—whether illuminating power and duration of use are the same is a matter of pure conjecture—by the substitution of gas by electricity for lighting (probably after Mr. Holmes has made an estimate of the gas consumed for cooking), will find most interest in the quotation of substantial accounts by Mr. Hanbury Thomas that exhibit a saving by the conversion from electricity to gas. The figures (reproduced in our news columns) are only examples of what every gas undertaking in the country can produce where there is a competing electricity supply undertaking. A second letter, written by Mr. J. S. Owens (and also reproduced elsewhere) forms another contribution to the dispersal of the errors of our electrical competitors regarding carbon dioxide and other products of the combustion of gas. Independent testimony of this character is valuable.

### National Memorial to the Late Sir George Livesey.

In our “Correspondence” columns to-day, there appears a letter from Mr. C. E. Jones, suggesting a national memorial to the late Sir George Livesey, and inviting discussion with the view to bringing the proposal to a successful issue. Our columns are freely open for such a purpose; but we do feel, in giving publicity to Mr. Jones’s letter, that it is our duty to say that we fear the project can only end in failure. We quite agree that the work of Sir George—diversified and far-reaching in character as it was—is deserving of greater public recognition than it has yet received. The very fact of his knighthood points to work of public importance beyond the bounds of the gas industry, though the work in the industry itself—producing as it did cheaper gas for the country at large, and binding together to so great an extent the interests of gas consumers and the industry—was of such extraordinary public value as to merit proper recognition outside the industry. What should externally appeal with stronger force are his magnificent and successful labours in the social amelioration of the lot of industrial

workers, and in producing a durable pacification between capital and labour. In short, Sir George did more good in his life than many men who have had public memorials set up to perpetuate their names. But what he did in this direction was done without ostentation; and the complete measure of it, or the extent of the ramifications of its effect, will never be fully known. So much of what we of the gas industry know—and it is great—of Sir George and his work, is not common knowledge outside; and we are afraid an external appeal for funds for the purpose suggested would not bear fruit, while in the industry itself it will be felt that the commemorative object of the Leeds University Endowment Fund has been attained. In an attempt to create national interest in, and to collect funds for, the project, Mr. Jones should have issued his appeal through the public organs. There were, however, appeals made through them in connection with the Endowment Fund; but with what result? We know the difficulties of raising funds, and did our utmost in connection with the one just named; and with the experience so fresh in our memory, it may as well be frankly said at once that we cannot encourage hope of success for the idea put forward by our correspondent.

### Gas Companies and the Northern Coal Trouble.

THE trouble among the miners in Northumberland and Durham, through the Coal Mines Regulation (Eight Hours) Act, appears to have had a variety of effects in connection with gas-works supplies. The Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) says they have had ample supplies of coal during the winter, and have now a large stock at the stations; and there is no cause for anxiety in this regard. While this is so, news has been received of boats for London gas-works being held up in the North. As to the settlement of the matters in dispute, Mr. Woodall is decidedly optimistic, notwithstanding the disquieting reports of the last week or so. He says that “the disputes at the collieries appear to be practically settled; and there is good reason to hope that full work will soon be resumed, and the supply abundant.” On the other hand, the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) and his fellow-Directors still regard the position as one for some anxiety; and they have insured against an interruption of supplies of coal by laying down an increased stock. They hope, however, matters will have settled down before the time comes for making fresh contracts. One particularly large Gas Company have advanced the time for making their contracts by entering into new ones before the close of last year for coal required from the end of next June. At the Tottenham meeting on Saturday, it was also reported that the Directors had bought a substantial portion of their coal requirements from June forward, at the prices paid for the current contracts, and the supply of oil to July, 1911, at very much reduced figures. These engagements on the part of coal owners do not suggest that they are apprehensive of any disturbance that would justify them in asking for higher prices, and in delaying entering into contracts. Herein perhaps is one reason for the optimism felt and expressed by the Governor of the Gaslight Company.

### Coalite Gas and Electricity Generation.

THE British Coalite Company, Limited, have received another check in the matter of getting rid of their gas from the Barking plant. Their various unsuccessful plans for doing so were referred to in the “JOURNAL” for Jan. 11 (p. 85); and a new project was also mentioned. It was that the gas yielded in the carbonization of the coal for the production of coalite should be employed for the generation of electricity, and that the latter should be supplied in bulk to the Barking District Council for distribution by them through their electricity supply undertaking. Terms were submitted by the Company to the Council; but we now learn that the Electricity and Tramways Committee have decided that the offer cannot be accepted on the suggested terms. Once more the hopes of the Company are dashed to the ground, unless they are prepared to make the terms such that they are acceptable to the Barking Council. Acceptable terms to the Council may mean unprofitable ones to the Company; for electrical generating plant is not a particularly cheap line. Meanwhile, the Barking Council have received sanction to a further loan for their own electricity undertaking, which does not look as though they seriously contemplate having recourse to the aid of any outside source in providing the electricity required in their district.



### A Question of Principle.

We are in this country accustomed to pride ourselves, and with most ample justice, upon the purity of our public life. It is, indeed, a comforting reflection to be able to make; but it would seem that in one town at least there are certain councillors who are unduly fearful lest any reproach should fall upon them as a body. At any rate, this is apparently the explanation of the attitude adopted by the mover and seconder of an amendment, at the last monthly meeting of the Wigan County Borough Council, with regard to the appointment of a professional Auditor of the Council's accounts. This was in opposition to the proposal of the Finance Committee to appoint a gentleman who happens to be the nephew of an Alderman and the stepson of a Councillor who have devoted their services to the borough. One can agree with the assertion of the mover of the amendment that the appointment of Auditor was so important that "it should be above suspicion and criticism as to impartiality," and at the same time maintain that in the present instance this may fairly be considered to be the case. In the discussion which followed, it was clearly shown that the appointment was made upon merits; and as was pointed out by one speaker, adopting the principle of which the amendment was the outcome, "would debar hundreds of young men who might happen to be related in some way with members of the Council from applying for any position connected with the Corporation." On a division, the amendment was defeated by about four to one. It nevertheless threatens to have a disastrous result which it is sincerely to be hoped may be obviated. That is to say, during the meeting the Alderman in question, who has given very many years to public work in the town, and is Chairman of the Finance Committee, declared that, so as not to jeopardize the future of the young man who had been chosen as Auditor, he would resign his position in the Council. If this decision should prove irrevocable, Wigan will have lost an honoured and steadfast worker through what (though the principle for which these members contended might be justifiable in the abstract) certainly seems an unnecessary display of anxiety that the Council should be "above suspicion."

### The Difficulties in South Wales.

There seems to have been but little change for the better during the past week or two in the position of the South Wales coal difficulty. In fact, in some quarters the possibility of a stoppage at the end of March, as a result of the action of the miners in deciding to terminate the existing agreement, was regarded more seriously; and this consideration has had a somewhat unsettling influence on the market. In spite of several meetings between the representatives of owners and miners on the Conciliation Board, it is hard to see that any progress has been made towards overcoming the obstacles that exist to an agreement being arrived at. The two questions already dealt with in discussion between the parties—the rate of pay for working in abnormal places, and the fixing of the minimum wage rate generally—have proved thorny ones; and suggested modifications on the one side, have failed to meet the views of the other. There has been in the past so much talk of strikes in this field, which have ultimately been obviated by eleventh-hour agreements, that the general public might be pardoned if they had come to regard such threats without any very great amount of alarm; but, of course, markets are always more or less sensitive to possibilities, as well as to probabilities. An argument against strikes in any particular coalfield (which may be commended to the attention of the men) is adduced by a Newcastle paper, which remarks that the lessened dependence which now exists on any one area reduces the likelihood of successful pressure being brought to bear by a stoppage of work. It is pointed out that, when Wales was first feeling the difficulty of the Eight-Hours Act, there were diversions of steamers to Northern ports for a short time; while it is now seen that, with the restricted output of coal in Durham and Northumberland, there has been a transfer of the demand in some degree to Scotland and Yorkshire. In other words, the production of coal has been so developed over long years, that there is not only now a vast output, but it is drawn from a much wider area than it was; and the means of transit by land and sea have been increased, until the temporary shortage of coal in any one district is soon met by supplies from another field. This is all very well so far as it goes; but there is something more—for the miners should also bear in mind the readiness of other countries

to take advantage of any opportunities which labour disputes here may put in their way, especially with regard to the requirements of our foreign customers. German and American agents, says the Cardiff correspondent of the "Financial Times," are known to be actively engaged in seeking business in markets that have hitherto almost exclusively drawn their supplies from South Wales; and it is not improbable that they will succeed in securing business, if the representatives of the masters and men prolong negotiations after the end of this month. Glancing over the disturbed condition of the coal industry generally in this country, one would find difficulty in saying, with any degree of confidence, in which of the fields the Eight-Hours Act has proved to be most unpopular.

### Labour Exchanges.

Last Tuesday, the Labour Exchanges Act was brought into operation; and many have been the hopes inspired in the breasts of the supplicants for employment by the fact that their needs have at length been taken in hand by a Government Department. It is questionable whether the exchanges by themselves will do much to afford relief. Experience does not give encouragement. Certain Provincial Municipalities long since tried experiments in this way on a small scale; but with only a moderate success. Provision, too, was made by the Unemployed Workmen Act, 1905, for the establishment of labour exchanges; but the powers then granted were not put into operation to any large extent. A wider foundation has been given to the new scheme; and it is under the direct control of the Board of Trade. Still, there are doubts as to its efficiency for the purpose. Where it will fail, though it may bring unemployed and would-be employers together in the smaller industrial operations, it will not create work, and work is the essential to greater employment. We do not hear of employers being idle from any lack of hands. The great fundamental problem, therefore, is to raise the level of direct production in this country; and until that is done, there will always be an army of unemployed among us. The gas industry will find little use in the exchanges. The labour constantly clamouring at its gates for work is greater than the need; and it is an easy thing to place hands on men—artisan and labourers—when occasion requires. Though the industry employs to-day more labour than ever, there are seasons when particular work slackens; and it is one of the most distressing of a gas manager's duties when he has to send a man adrift through an insufficiency of suitable work. To such men the labour exchanges may be—we do not say will be—of use as a registry office. But will that very fact inure to the undermining of his self-reliance, and cause him to be less energetic in personally seeking that which he requires? The answer, of course, depends upon the man. There are, however, men who will, as every employer knows, grasp the slightest excuse for loafing.

### "Transactions" of the American Gas Institute.

We have received the volume of proceedings of the American Gas Institute for the past year. It contains the papers submitted at the fourth annual meeting, held at Detroit (Mich.) on Oct. 20, 21, and 22, under the presidency of Mr. Charles F. Prichard, of Lynn (Mass.), with reports of the discussions thereon and of the general business; the reports of the various Special Committees; and the lecture by Dr. Edward P. Hyde, on "The Relation of Natural Science to the Development of Lighting." Most of the papers and reports have been noticed in the "JOURNAL"—the one on "Calorimetry" last week. The technical matter is preceded by the accounts, which are signed by Mr. Albert B. Beadle, the Secretary and Treasurer, and is followed by an appendix containing notices of deceased members, questions submitted to, and answered by, the Bureau of Information, an addition to Mr. A. E. Forstall's paper on "The Sliding-Scale," a collection of "Wrinkles," the constitution and bye-laws of the Institute, and lists of the officers, committees, and members. As usual, a portrait of the President for the year forms a frontispiece to the volume, the contents of which, occupying nearly 1000 pages, have been edited by the Publication Committee.

At a recent meeting of the Council of the Institution of Municipal Engineers, the Committee appointed to draw up regulations for District Committees presented their report; and the draft regulations accompanying it were unanimously approved and ordered to be circulated. One of the regulations is to the effect that the Honorary District Secretaries are to report immediately to the Institution "all cases of alleged hardship or unfair treatment inflicted upon municipal engineering officials in their respective districts, whether members of the Institution or not," and furnish as much information on the matter as they can obtain.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 382.)

AGAIN the Stock Exchange has had a business week, with a great many more dark lines than bright ones in its spectrum. There were several sombre influences dominant during the week—Græco-Turkish friction, French floods, American Markets, &c.—and not much that was cheering. The opening day was pretty fair, thanks to the better feeling with which the previous week had closed. Consols managed a little rise, and Rails were quite happy. Tuesday was not so sunny. Gilt-edged drooped, and Consols fell  $\frac{1}{16}$ ; others were irregular, and the Foreign Market, where touched by Near-Eastern affairs, was weaker. Wednesday was not at all cheerful, and most of the leading departments were lower. Consols fell, Rails were dull, Foreign were anxious, and American flat. Thursday was very dull and inanimate. All the old disturbing factors were at work, and markets continued weak. Friday was much the same, though the last part of the day was not the worst of it. Consols touched the very low figure of  $81\frac{1}{2}$ , and closed with a fall of  $\frac{3}{16}$ . Anxiety regarding coals oppressed Rails; but the Foreign Market was relieved. On Saturday came a change; and a fair step towards recovery was effected. Consols picked up  $\frac{3}{16}$ ; and other things were brighter. In the Money Market, the supply was very abundant. Discount rates hardened in the middle of the week, but relaxed before the close. Business in the Gas Market was scarcely as plentiful as the previous week; but the tone was strong, and many quotations advanced. A batch of them were put up one apiece by a sort of rule-of-thumb without discrimination; and of them some at least were worthy of higher promotion. In Gaslight and Coke issues, there was nice steady business in the ordinary, which crept up another half-point, and changed hands at the close figures of  $105\frac{1}{2}$ – $106$ . In the secured issues, the maximum marked  $88\frac{3}{4}$  and  $89\frac{1}{2}$ , the preference  $104\frac{1}{2}$  free and  $105$  (a rise of  $\frac{1}{4}$ ), and the debenture from  $81\frac{1}{4}$  to  $82\frac{1}{4}$ . South Metropolitan advanced  $\frac{1}{2}$ , with business at from  $121\frac{1}{2}$  to  $122\frac{1}{2}$ . In Commercial, the 4 per cent. made  $110$  and  $111$ , and the 3½ per cent.  $105\frac{1}{2}$  and  $106$ —a rise of 1. Among the Suburban and Provincial group, Alliance and Dublin was done at  $87\frac{1}{2}$ , Brighton ordinary at  $155\frac{1}{2}$ , South Suburban at  $120\frac{1}{2}$ , Southampton at  $110\frac{1}{2}$  and  $110\frac{3}{4}$ , Wandsworth debenture at  $74\frac{1}{2}$  and  $74\frac{3}{4}$  (a rise of 1), Chester at  $110$ , and Liverpool "B" at  $167$  and  $168$ . Many issues were quoted higher without business being marked in them. In the Continental companies, Imperial was unchanged at from  $175$  to  $176\frac{1}{2}$ , ditto debentures realized  $95\frac{1}{2}$ , European fully-paid  $24\frac{3}{4}$ , and ditto part-paid  $18\frac{5}{8}$ . Among the undertakings of the remoter world, Buenos Ayres changed hands at from  $14\frac{1}{2}$  to  $14\frac{5}{8}$ , Melbourne 5 per cent. at  $101\frac{1}{4}$ , Monte Video at  $12\frac{3}{4}$  and  $13\frac{3}{16}$ , Primitiva at  $7\frac{1}{8}$  and  $7\frac{1}{4}$ , ditto preference at from  $5\frac{1}{4}$  to  $5\frac{1}{16}$  (a rise of  $\frac{1}{16}$ ), ditto debenture at  $99\frac{3}{4}$ , River Plate at  $17$  and  $17\frac{1}{4}$ , ditto debenture at  $99\frac{3}{4}$  and  $100\frac{1}{4}$  (a rise of 1), San Paulo at  $14\frac{1}{8}$ , and ditto debenture at  $51$ .

## ELECTRICITY SUPPLY MEMORANDA.

The Fixed-Price Proposal—Nursing Consumers to Maintain Contentment—Undue Influences—Cost and Sanitary Considerations—From Above—Electricians and Gas at Fires.

THE revivalists in the matter of the old fixed-price-per-lamp-per-annum idea, to which attention was turned in the "Memoranda" last week, have beaten anything that has been done before in the way of getting the right side of the Daily Press to take up an electrical subject, and give it circulation, as something that is actually new under the sun. The conductors of the Daily Press cannot be expected to know everything—though some of them may think they do; and so it is not surprising that occasionally (sometimes frequently in the case of the sensation mongers at one-halfpenny a time) they get "taken in," and are induced to applaud with warmth something that most men really conversant with the matter condemn as impracticable. Ordinary newspapers and financial papers have gone out of their ordinary course in the past week to bestow unmeasured praise on the genius that hit upon the plan of charging a fixed price per lamp, quite unconscious of the fact that the original genius and his works were decently buried by the gas industry many decades ago; and for the very reason that Mr. R. Borlase Matthews has found in his journeyings in Switzerland. In "Electrical Industries," he writes: The contention is that since the metallic filament lamps are so expensive, people will not burn them longer than they need the light. "If managers are going to base any systems of charge on this weak foundation, they are likely to be doomed to disappointment, for it is 'agin human natur.'" The writer has just returned from Switzerland where a flat-rate per lamp is the normal method of charging. During the past twelve months, an enormous number of tungsten lamps have been introduced; but notwithstanding their cost of about 3s. 4d. per 125-volt lamp, it is interesting to note that users have them burning almost day and night, as they had been previously accustomed to do in the case of their carbon lamps." That is the resurrection of the gas industry's experiences in pre-metering days. But apart from this particular aspect of the question of fixed prices, there is the point to be noted by the gas industry as to the increased ability developed by electricity competitors in getting daily-read papers to disseminate

more or less truthful information respecting electricity and its capabilities.

There are a few excellent precepts to be found in an article in the "Electrical Times" by Mr. L. L. Robinson, the Borough Electrical Engineer of Hackney. The heading to the article is "The Selling of Electricity," which is a very praiseworthy ambition on the part of any electrical engineer in these times. With Mr. Robinson's precepts, we are in hearty agreement. Here are a couple of specimens: "The best way for a supply manager to attain his object is to make sure that the consumer attains *his*." "There is no advertisement so good as a thoroughly satisfied consumer." These sayings are not new, but that does not detract from their excellence. "Meteor" in another part of our contemporary comments on the article. And from what he says, there appears to be some difficulty about keeping an electricity consumer thoroughly contented, and of preventing him being proselytized by the gas suppliers' canvassers. The electricity consumer, our journalistic friend writes, "must be nursed from the day of his birth, or he will never develop his full appetite for electricity, to say nothing of the risk of his being kidnapped by the gas man." We cannot avoid acknowledging the open spirit in which this confession is made. Mr. Robinson's idea of the principal way of maintaining contented consumers, brings him into conflict with wiring contractors. The latter think they have rights and privileges that are sacred to themselves; in Mr. Robinson's opinion, the electricity supply authorities must usurp those rights and privileges, if such they are. The interests of the contractors and the supply authorities are antagonistic. The latter want the consumers to have cheap but not nasty installation; while the contractors (Mr. Robinson does not put it so bluntly as this) want as much money as possible spent on an installation, and to derive as much profit from it as competition will allow. In short, it is necessary for the lasting good of the consumer and the electricity supply undertaking that the central station engineer should have supreme control of the consumer's installation. Even then, as "Meteor" says, the electricity consumer "must be nursed from the day of his birth." And why?

Always amiably inclined towards the Gas Company, the Electricity Committee of the Hastings Corporation are ever on the prowl for fresh prey; and, truth to tell, they do not seem very particular as to how they get it. But an incident at a recent meeting of the Hastings Education Committee, over which the Mayor (Alderman R. W. Mitchell) presided, gives scope for fair complaint as to how a municipal electricity committee have, very unjustly, opportunity for vigorous wire-pulling to the detriment of its competitors, and at the cost of the ratepayers, of which useful element in a town the local gas company is not an unimportant unit. There is in local government an intercommunication, through the several committee memberships of individual councillors, that brings about an undue influence in favour of the electricity committee, where the electricity concern is owned by the municipal body. At Hastings, the Mayor is a strong champion of the electricity undertaking, and is *ex officio* a member of the Education Committee. Counting him, there are no less than six members of the Education Committee who are also members of the Electricity Committee. On the Education Committee's Sites and Buildings Sub-Committee (of which only three members are required to form a quorum), no less than five are members of the Electricity Committee. It really amounts to a scandal how, by such means as these, favour is obtained for the Electricity Committee, and fair and open competition is knocked on the head. With fair and square competition, the Hastings or any other Gas Company have no fear of not holding their own, as, for example, in the lighting by the Hastings Company of the St. Leonard's Pier. But when unfair influences are at work in the public governing body such as are found at Hastings, they must be galling in the extreme to the company against whom they are directed. Fortunately, the little scheme providing the incident giving rise to this protest against these undue and unfair influences, missed fire; but it was a narrow shave. It is palpable that, when the matter was before the Education Committee, there was a feeling permeating the proceedings that the project had a very defective base of justification. For the proposal, the Sites and Buildings Sub-Committee were responsible. They reported that the St. Mary-in-the-Castle Boys' and Girls' Schools are used by the Education Committee for evening classes; and it was thought it would be a great advantage to the students if arrangements could be made to substitute electric light for gas.

It was considered that 47 osram lamps of 32 befler units would efficiently light the schools, displacing Welsbach "C" gas-burners. The cost of wiring, inclusive of the first lamps (not the renewals), was put down at approximately 15s. per point, or in all £35 5s.; but no mention was made of the cost of running the cable connecting up to the nearest distributing main. Nor was any estimate given of the annual cost, nearer than that a couple of units of electricity or thereabouts would be used per hour. Anything, however remote from the positive, was near enough for those interested in the Electricity Committee. The gas lighting of the schools cost £18 8s. 6d. for the year ending Sept. 30 last. The independent members of the Committee have but a poor notion as to the economic promises of the Electricity Committee. They have had substantial experience in street lighting by electricity. Councillor Cox asserts that the public buildings of the borough that have been lighted electrically are costing the ratepayers at least 30 per cent. more than when incandescent gas-burners were employed. Alderman Hutchings puts the cost at 50 per cent.



more. No one ventured into the open to say that the annual cost of lighting the schools would be below that of gas lighting. But some gems of knowledge were brought out in the course of the discussion. It was on sanitary grounds that some of the members voted for electricity. That sounds highly attractive. Certain of them had been to the schools in the evening time, after the rooms had been in use during the day, and after a number of students had congregated there in the evening, and with no discretion practised in the heating of the rooms. The ventilation of the rooms is admittedly bad. No wonder the members found the atmospheric conditions not altogether as they should be. Had the electric light been in use, they would have heard of stuffiness and headache. But if anyone wants to know anything about this matter let him apply to Councillor Stace, the Chairman of the Hastings Electricity Committee. His knowledge of the subject is remarkably profound; so much so that, we venture to think (assuming we have not been misled by a report in a local paper), a little time spent at an evening school where elementary science is taught would do him no harm. To him this piece of ungrammatically expressed nonsense is attributed by the local paper in question: "With regard to gas, there was seven times as much carbon thrown off than there was with a man breathing." It is unnecessary to go beyond this to show the depth of scientific knowledge upon which some local councillors found their arguments when attempting to build up a case. It is a pity there is not more care exercised, instead of allowing one's ignorance to make one look foolish in public. The letter by Mr. J. S. Owens appearing in our "Miscellaneous News" to-day, and an editorial article in the "JOURNAL" for Feb. 9 last year, p. 360, may be enlightening to Mr. Stace. We conclude from the report of the discussion that it is also a pity the Education Committee do not take the Gas Company into their confidence to a greater extent than they appear to do at the present time. The upshot of the discussion on the electric lighting of the schools was rejection of the proposal, but by only one vote. From what has been stated, we do not think that our complaint is at all unreasonable as to the composition of municipal Committees bringing about undue influence of a nature that is an obstacle to open and free trading in connection with local administration.

From time to time there is a revival of the proposal, in the quest for cheaper means of electricity distribution, of running overhead wires for the conveyance of electricity. The powers that be at Westminster will not countenance the idea; and, in respect of public thoroughfares and places, they are quite right. The occurrences on the 28th ult. in Dublin give support to the attitude of the authorities. There had been a heavy fall of snow; and the result was that telephone wires all over the city and in the suburbs were broken. There is a particularly heavy stretch of these wires in front of the Kingsbridge Station; and, at this spot, these fell and dropped across the tramway lines, which were carrying current at 500 volts, with the result that the telephone wires dangling into the thoroughfare were charged with electricity at this pressure. Three or four horses were electrocuted, a pony was instantly killed, a man leading the pony received such a nasty shock that he was thrown unconscious to the ground; while a youth, curious or careless, tried to lift the wires, and, in doing so, received a shock that rendered him unconscious, and burnt him so severely that he had to be removed to the hospital. Dublin has had, electrically provided, a fair amount of excitement lately. There have been failures of the electric current, and streets, shops, and private houses have been put into darkness; and now horses have been killed, people have received bad shocks, and the police have had their nerves put seriously to the test in trying to protect people from handling wires of the dangerous condition of which they were unconscious.

The severe fire shocks that our electrical friends have received lately have induced them to clutch at any paltry excuse for having a fling at gas. That sage publication, the "Electrical Times," excels among its contemporaries at this sort of thing. It was the publication that a short time since tried to involve gas lighting in the origin of the Clapham fire; it was also the publication that recently, after the Gaslight and Coke Company's workmen had, by the aid of pick and shovel, opened up the roadway near Blackfriars Bridge to discover a leak of gas that had contributed to an explosion in the Post Office telephone system and the neighbouring electric wire conduits, photographed the spoil, and published the picture as showing the effect of the explosion. A recent issue of our contemporary contains another example. There was a fire the other day at the premises of Messrs. Smith, Crotch, and Co., at Croydon; and the "Electrical Times," in its exuberant love for gas, says that the fire illustrates "the great increase in the difficulties which the fire brigade meets in the cases of fires in premises where gas is used." Assuming that gas has ever caused the fire brigade difficulties, it would be interesting to know what our well-wishers really mean by the difficulties having "greatly increased." We could have understood what was meant if they had said that, since the advent of electricity, the difficulties of the brigade have greatly increased, as the present Chief of the London Fire Brigade has on various occasions testified, and a number of big fires have demonstrated. According to the "Electrical Times," the gas-main to Messrs. Smith, Crotch, and Co.'s establishment contributed fountains of flames to the spectacle. That is quite a picturesque statement; but it may not be near the truth. It so happens that the firm named are the proprietors of the "Croydon Chronicle;" and in the account of the fire that they publish (no one ought to know the facts better than the tenants of the

premises), there is not a single word about gas, nor is there in the official report issued by the Fire Brigade. No complaint is made by the latter of gas having in any way contributed to their difficulties. But the "Electrical Times" knows better than the Fire Brigade, and so complains for them. The "Croydon Chronicle" remarks that, filled as the premises were with "a great quantity of highly inflammable materials—oils, printing ink, paper, and the like—the flames spread with amazing rapidity; and in a few moments the basement and the ground floor were a raging furnace." And a little further in this same account, it is observed "there were loud explosions due to the fire catching the chemicals stored in the block-making department." The lighting and power supply of the building was electrical; and gas was used for the "Lino" machines and for a number of radiators employed for heating the premises. The official report of the Fire Brigade states that "the cause of the outbreak has not yet been ascertained." Perhaps it never will be now; and the occurrence will add one more to the long roll of those mysterious fires that have broken out in premises electrically lighted. The statements of the "Electrical Times" are instructive as to the state of the feelings at the present time of some of our electrical friends.

## PERSONAL.

The Warrington Town Council have adopted a recommendation of the Water Committee that Mr. JAMES GRAY, the Assistant Water Engineer, be appointed Water Engineer, at a salary of £300 per annum.

At the monthly ballot for membership of the Institution of Civil Engineers last Tuesday, Mr. THOMAS GLOVER, Engineer and Manager of the Norwich station of the British Gas Company, and Past-President of the Institution of Gas Engineers, was elected a member.

At the meeting of the Paris Academy of Sciences on the 24th ult., Lord RAYLEIGH, the Chief Gas Examiner for the Metropolis, was elected a foreign associate member in succession to the late Professor Simon Newcomb. His Lordship was elected a correspondent of the Academy in 1890.

From among 138 applicants, the Colwyn Bay Urban District Council have appointed as Engineer and Manager of their gas-works Mr. JAMES SMITH, who at present occupies the position of Gas Manager at Congleton. Mr. Smith, who is 38 years of age, has been at Congleton for six years.

Mr. FRANCIS H. WOOD, the Manager of the Wokingham Corporation Gas Department, underwent a serious operation at the beginning of December in St. Bartholomew's Hospital; but his friends will be pleased to learn that he has now so far recovered as to be able to resume his duties at the works over which he has charge.

Mr. JOSEPH TYSOE, the Engineer of the East Greenwich works of the South Metropolitan Gas Company, has been granted by the Board three months' absence, and left England last Friday by the P. and O. steamer "Himalaya" for Cairo. Mr. Tysoe contracted an obstinate cough; and his medical adviser considered that complete change and a temporary holiday in a warm climate would be desirable to enable him to thoroughly shake off the troublesome symptoms. Mr. Tysoe's many friends will join in wishing him a pleasant time and a successful cure.

A few days ago, Mr. WALTER PARKER, an Assistant at the Carlisle Gas-Works, was the recipient of a suit-case, kit bag, and set of books, subscribed for by the staff and workmen, on the occasion of his leaving Carlisle to take up an appointment at the Bolton Gas-Works. Mr. T. Birkett, the Works Foreman, presided; and the presentation was made by Mr. Harold Bloor, the Engineer and Manager, who said that in the short time he had been acquainted with Mr. Parker he had formed a good opinion both of his abilities and character. He expressed the hope that Mr. Parker would be prosperous in his new position. Mr. J. Birkett, the Chief Clerk, spoke of the high esteem in which Mr. Parker was held by the office staff, who one and all hoped he would succeed in his profession. Mr. Parker, in acknowledging the gifts, said they would always remind him that he had good and true friends in Carlisle.

## Obituary.

The "Journal für Gasbeleuchtung" reports the sudden death recently of Herr ERNST KUNATH, who was for many years Manager of the gas and water works at Dantzig, but from which position he had retired and gone to live in the neighbourhood of Berlin. Deceased had nearly completed his 68th year. He was one of the best known and respected of Continental gas managers.

**Society of British Gas Industries.**—We learn from the Secretary, Mr. Arthur L. Griffith, that the annual general meeting of the Society will take place at the Waldorf Hotel on Thursday, the 24th inst. At the commencement of the proceedings, the chair will be taken by the retiring President, Mr. Thomas Newbigging, M.Inst.C.E., after which the new President, Mr. J. H. Balfour Browne, K.C., will be inducted, and will deliver his Presidential Address.



## THE CASE FOR THE STANDARD BURNER BILL.

[COMMUNICATED ARTICLE—CONTINUED FROM PAGE 289.]

THE second point on which opposition to the Bill may be based—viz., that, through the proposed change in the prescribed burner, the promoting Companies will be able to effect a reduction in the quality of the gas supplied, though the prescribed illuminating power remains unaltered—is dependent on the first point, and leads up to the third point, which is that the reduction (if any) thus effected, will have a more than proportionate deteriorating effect on the lighting duty of flat-flame burners. [The effect of a reduction in the illuminating power of gas on its value for heating purposes will be discussed more appropriately when the fourth point is dealt with.]

The second and third points inevitably raise the question whether the users of flat-flame burners still deserve any protection or consideration by Parliament, since flat-flame burners are now only retained in positions where the intensity of the light or illumination afforded is an extremely minor consideration. If through reduction in the quality of the gas a 14-candle-power flat-flame becomes reduced to 12-candle power, no consumer is really injured; for if the 12-candle flame is inadequate in power for his needs, he would be foolish to refrain from substituting for his flat-flame burner a small incandescent burner (inverted for choice), by which he would obtain double the light of his former 14-candle power flame, while his consumption of gas would be reduced to one-fourth. In the few positions where a flat-flame has some advantages over an incandescent mantle, it is perfectly immaterial whether the light is reduced by 1 or 2 candles. We no longer think of gains of 1 or 2 candles in the intensity of a gas-light as of any moment—the incandescent mantle has enlarged our views as to the scale by which increment and decrement of lighting power should be measured. Now that 10 and 20 candles can be gained through a scarcely perceptible increase in the gas consumption, or by the adoption of an improved type of incandescent burner or mantle, it seems puerile to continue to discuss a loss of 1 or 2 candles in the light afforded by a flame. Since, however, the *raison d'être* of statutory testings of the illuminating power of gas must now be almost solely the protection of that quaint survival of a bye-gone era—viz., the consumer who continues to use flat-flame burners—a few more words must be devoted to the question of the effect of a reduction in the illuminating power of gas on the light afforded by flat flames. As the Companies promoting the Standard Burner Bill are not asking for the abolition of statutory testings of illuminating power, but only for a change in the standard burner used in those testings, it must be admitted that they are extending to the user of flat-flame burners far more consideration than his relative importance in the cosmos of gas consumers warrants.

A flat-flame gas-burner of any but the most primitive type is designed to produce from gas consumed in it at a certain rate a flame of relatively high luminosity and free from smokiness. The maximum degree of luminosity from a flame is obtained, *ceteris paribus*, when it is on the verge of smoking—that is to say, the air supply to the flame must be restricted to as great a degree as is possible, compatible with the carbon in the flame being completely burnt. With flat-flames, the air supply is determined mainly by the velocity of issue of the jet of gas, although the form of the burner-head and the shape of the flame also affect the flow of air to the flame. If the jet of gas issues at a great velocity, it draws to the flame more air than is needed for the combustion of the gas. The strong indraught of air distorts and over-aerates the flame, with the result that the latter begins to approximate in character to the non-luminous bunsen flame. Hence the orifice (holes or slit) of the burner is made of such cross sectional area that gas will pass through it at the designed rate of consumption when the pressure at which the gas enters the orifice is comparatively low. If the pressure immediately anterior to the orifice is raised, more gas passes through the latter, and the velocity of efflux is increased.

The volume of air drawn to the flame increases with the velocity of efflux of the gas in a higher ratio than the volume of gas passed by the burner; and, consequently, if the air supply to the flame is correct at the lower rate of flow of the gas, it becomes too great at the higher rate of flow. The flame therefore falls off in illuminating duty at the high rate of passage of the gas—i.e., the ratio of the candle power of the flame to the number of cubic feet of gas passed by the burner per hour, is reduced. That is to say, when a burner is taking more gas than it has been designed to consume, each cubic foot of gas consumed yields less light than it should. On the other hand, the efficiency is not appreciably diminished when the rate of consumption is reduced below the normal rate for the particular burner; but the flame becomes flabby, highly susceptible to draught, and inclined to smoke.

This explanation of the functioning of flat-flame burners has been introduced here in order to show how, by misuse of such burners, gas may be made to appear to afford a lower illuminating duty in a particular type of flat-flame burner than it ought to afford. Entirely fallacious and misleading conclusions and arguments in regard to the effect of a reduction in the illuminating power of gas on its lighting duty in flat-flame burners have been based on results obtained through such misuse of the burners. Since conclusions and arguments of this nature are being used in an attempt to justify opposition to the present Bill, it is important that they should be refuted at once. The Gas Examiner

for the Borough of Reading (Dr. Ashby) reported that it had been clearly shown by Mr. Dibdin that, "when gas of lower illuminating power is burned in a flat-flame burner, a greater quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas. That is to say, if the illuminating power of a gas is reduced by one-eighth, an extra quantity (considerably more than one-eighth of the poorer gas) must be consumed to obtain the same amount of light as was given by the higher quality gas. In other words, the illuminating value of the poorer gas is much less than its illuminating power."

The foregoing paraphrase by Dr. Ashby of Mr. Dibdin's conclusions does not one whit exaggerate them, as expressed in a paper which Mr. Dibdin read in 1900 before the London Section of the Society of Chemical Industry ["JOURNAL," Vol. LXXVI., pp. 1395, 1452]. But these conclusions are based on the results of testings of which a large proportion involved gross misuse of the burners employed. For instance, Bray's fishtail No. 4 burner according to Mr. Dibdin's tests, consuming 4.3 cubic feet of gas of 16.2-candle power per hour, yields a light of 8.6 candles. On the other hand, the same light may be obtained with the same burner by forcing through it 9 cubic feet per hour of gas of 14.2-candle power. Hence Mr. Dibdin argues that if gas costs 2s. 6d. per 1000 cubic feet, the expenditure on 14.2-candle power gas must be 4s. 6d. in order to obtain from it the same light as is obtained for 2s. 6d. from 16.2-candle power gas.

This is, of course, an outrageous proposition which can only be substantiated by forcing through a burner which is designed to consume about 4 cubic feet of gas per hour, as much as 9 cubic feet per hour. The high velocity of the jet of gas, issuing at the rate of 9 cubic feet per hour through orifices designed to pass only about 4 cubic feet, draws in too much air to the flame, which becomes distorted and over-aerated, and the lighting value of the gas is in large measure wasted. If a flame of 8.6-candle power is desired from 14.2-candle power gas, a No. 4 Bray fishtail burner should not be used, but a larger size of the same type, or a burner of some other type better adapted for the consumption of gas of 14.2-candle power. If the No. 5 Bray fishtail were used with the latter, a light of 8.2-candle power could be obtained with a trifling, if any, increase in the rate of consumption of the gas. The development of the full lighting duty from gas depends on the use of a suitable burner for the quality of the gas, and on that burner being used at about the rate of consumption for which it is designed. Mr. Dibdin selected burners well adapted for the consumption of gas of about 16-candle power, and ascertained, by trial, the rate of consumption of each of these burners when it was affording "a fair and even-burning flame" with gas of that quality. He then tried the same burners with gas of lower quality; forcing them to burn at a much higher rate of consumption, and entirely ignoring the condition on which the tests with the richer gas had been based—viz., that the burners should afford "a fair and even-burning flame." The only thing indubitably proved in Mr. Dibdin's paper on the "Effect of Quality on Consumption" is the inequitable and reprehensible character of the method of research employed.

It is, however, possible to extract, even from the results recorded in that paper, some figures which indicate the sort of relation that really subsists between the light afforded by gas of high and gas of low illuminating power when the gas is burnt in flat-flame burners at about the normal rate of consumption for the particular burner—i.e., so as to yield a "fair and even-burning flame." For instance, with 16.2-candle gas, Mr. Dibdin obtained a light of 11.8 candles from a consumption of 5.05 cubic feet per hour in a No. 5 Bray's fishtail burner, and with 14.2-candle gas he obtained a light of 14 candles with a consumption of 6 cubic feet per hour in a No. 7 Bray's fishtail burner. The illuminating duty is practically the same—viz., 11.6 or 11.7 candles per 5 cubic feet of gas consumed—though the gas in one case is of 16.2-candle power and in the other of 14.2-candle power. That is to say, a falling-off of 2 candles in the nominal or standard illuminating power of the gas in this case has involved no falling-off in the yield of light obtainable from the gas in burners of precisely similar type, provided the size of the burner is varied according to the quality of the gas.

Even if the same sized burner is used, no great advantage is proved for the high candle power gas by Mr. Dibdin's figures, wherever the normal rate of consumption for the particular burner is not exceeded. Thus, with the No. 7 Bray's fishtail, he obtained an illuminating duty of 11.7 candles per 5 cubic feet of 14.2-candle power gas, and of 13.7 candles per 5 cubic feet of 16.2-candle power gas. Here there is the same difference of 2 candles in the duty obtainable from the flat-flame burner as in the illuminating power of the gases used. If we pass to a burner which is better able to develop a good duty from gases of varying illuminating powers—viz., a Bray's union with Codac economizer—Mr. Dibdin records that a light of 14.6 candles may be obtained with it by the consumption of either 4.95 cubic feet of 16.2-candle power gas, or 5.4 cubic feet of 14.2-candle power gas. The duty here is 14.7 candles per 5 cubic feet for the higher and 13.5 candles for the lower quality gas, or a difference of only 1.2 candles

\* See "JOURNAL," Vol. CVIII., p. 688.



in the flat-flame burner corresponds with a difference of 2 candles in the standard "London" argand No. 1 burner. The latter burner was the standard used by Mr. Dibdin for assessing the quality of the gas employed in his testings, and is also the standard burner prescribed in the Private Acts or Orders of many of the Companies promoting the present Bill. The last quoted figures, and certain other figures given by Mr. Dibdin, show that *when a flat-flame burner is used at about its proper rate of consumption, its light is less affected by a change in the quality of the gas than is the light of the "London" argand No. 1 burner.*

It follows from this proposition that the "London" argand No. 1 burner is unsuitable as a standard burner, because it exaggerates the differences between the lighting values of various samples of gas. If the standard burner makes one sample of gas appear as of 2 candles higher illuminating power than another sample, while there is a difference of only (say) 1 candle in the light afforded by the two samples in flat-flame burners of similar type, it is obvious that the standard burner does not properly reflect the relative values of the two gases to consumers who use flat-flames. The "London" argand burner No. 1 and, broadly speaking, all other argand burners which have been dignified as standards prior to the year 1905, fail in this respect. It has been shown that this is the case so far as the "London" argand No. 1 is concerned by results quoted from Mr. Dibdin; but the author now proposes to give some results of independent testings which lead to the same conclusion.

The unsatisfactory character of the most widely adopted standard burner of the past having thus been demonstrated, he will next give the results of testings of the relative illuminating value obtainable in a good flat-flame burner at a normal rate of consumption from gases of varying illuminating power, when the illuminating power is determined by means of the "Metropolitan" argand burner No. 2. These results will demonstrate that the latter burner gives to gas tested by it a value for the illuminating power which runs almost exactly parallel to the illuminating value obtainable from the gas in flat-flame burners. That is to say, there is a practically constant difference between the illuminating power of the gas as tested by the "Metropolitan" argand No. 2 and the illuminating value of the gas in a flat-flame burner over a wide range of quality of the gas. *No earlier standard gas-burner gave results similarly corresponding with the light obtainable by the consumer who uses flat-flame burners.*

(To be continued.)

## MONUMENT TO SIR GEORGE AND LADY LIVESEY

In Nunhead Cemetery.

THE number of the "Co-Partnership Journal" of the South Metropolitan Gas Company for the current month has for a frontispiece a well-executed reproduction of the monument which has been placed over the grave of Sir George and Lady Livesey in Nunhead Cemetery. It is an obelisk of Aberdeen granite, bearing simple inscriptions recording the dates of the birth and death of those in whose memory it has been erected, and two Scripture texts (Ps. xxvii. 1 and the first part of Mal. iii. 17.) Referring to the simplicity of the inscription, the Editor, in the opening article, entitled "The Resting Place," which contains a small picture showing the position of the monument in the Cemetery, says: "There is no mention of the eminent engineer, the philanthropist, the industrial reformer, the man to whom the whole nation is indebted for so many unselfish efforts to remove evils and adjust burdens. How much might have been said! And yet we feel that the Executors have rightly understood the spirit and wishes of those at rest. . . . In years to come, when the principles of co-partnership are universally applied, it may happen that the names of the pioneers will be almost forgotten, and that only a few will know anything of the great work of George Livesey. It matters not. The triumph of the work we can imagine him caring about; but we cannot imagine him feeling very deeply as to his own part in it being recognized. . . . His memory will long remain with those who came into contact with him or have benefited by his influence, teaching, or administration. The spot where his body is resting, with that of the gentle, invalid wife who helped and inspired him, will long be visited by those who cherish the recollection of a man who was great because he was good, and fearless because he knew the secret of true strength."

**Analysis of the Accounts of Water Undertakings.**—In another part of the "JOURNAL" will be found the announcement that the "Analyses of the Accounts of some of the Principal Water Undertakings of the United Kingdom" for the year 1908-9, compiled by Messrs. Wood, Drew, and Co., Chartered Accountants, is now ready. This is the twenty-ninth year of publication; and the nature of the work is well known to those of our readers who are connected with the management of water-works. It is to them what "Field" is to their gas colleagues. The accounts dealt with are those of the Metropolitan Water Board for the two years ending March 31, 1908 and 1909, and of 24 Provincial water undertakings for the latter year. The "Analysis" is presented in the same form as its immediate predecessor, with the addition of particulars relating to the Middle Ward District of the County of Lanark.

## PROVISIONAL ORDERS FOR 1910.

THERE are thirteen Provisional Order entries relating to gas for consideration by the Board of Trade, while the Local Government Board will only be called upon to consider a single Gas Order. Under the Private Legislation Procedure (Scotland) Act, 1899, there are four Orders dealing wholly with gas supply, and one incidentally. It may be remarked that in all the Orders where additional capital is sought, the new auction clauses are to apply. These will be found in the "JOURNAL" for Sept. 22, 1908, p. 773.

Dealing with the applications to the Board of Trade, the Brownhills and District Gas Order is the first to come under notice. It is introduced by the Ogley Hay and Brownhills Gas Company, Limited; and they are proposing that their limits of supply shall be Walsall Wood, Norton-under-Cannock, Ogley Hay, and Shire Oak—all within and comprising the urban district of Brownhills—and the parish of Ogley Hay rural. But a proviso is to the effect that the supply of gas to Shire Oak shall be subject to such terms and conditions as may be mutually agreed between the undertakers and the Lichfield Gas Company, and further that the promoters shall not under the Order supply gas to the part of the parish of Norton-under-Cannock at present supplied by the Cannock Gas Company. The share capital, it is contemplated, shall not exceed £30,000, consisting of the original ordinary and preference share capital of £12,000, and of £18,000 additional share capital. The dividend on the original ordinary capital is to be limited to 10 per cent., to 5 per cent. on the original preference capital, 7 per cent. on the additional ordinary capital, and 5 per cent. on the additional preference capital. The proposal as to borrowing powers is limited to one-third of the issued capital. Most of the powers sought are of quite common character. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. The maximum price proposed for the gas is 4s. 9d. per 1000 cubic feet. [Parliamentary Agents: Messrs. W. & W. M. Bell.]

The Builth Gas and Coke Company, Limited, submit a draft Order in which they define the limits of supply as the urban district of Builth Wells, the parishes of Llanddewir Cwm and Rhosferig, in the county of Brecknock, and the parish of Llanllwedd, in the county of Radnor. The contemplated capital is not to exceed £7500, whereof £2535 will represent original capital, and £4965 additional capital. The dividends proposed are 10 per cent. on the original ordinary capital, 7 per cent. on the additional ordinary capital, and 5 per cent. on the preference capital. To place the undertaking on the ordinary lines, it is proposed that the amount of money borrowed shall not be increased until it is less than one-third of the capital; and thereafter it is not at any time to exceed in the whole one-third of the amount of capital actually raised. A scarce provision in these days since the special purposes fund clause was framed, is the renewal fund clause. It reappears here, and proposes that such a fund shall be built up by appropriations from revenue equal to 1 per cent. on the paid-up capital. Land powers are also sought. The maximum price of gas is proposed at 5s. 6d. per 1000 cubic feet of a prescribed 14-candle power, as tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Lees and Co.]

The Burnham (Somerset) Gas Order defines the area of supply of the Limited Company as the parish and urban district of Burnham, and parts (as specified) of the parishes of Berrow, Brent Knoll, and Burnham Without. It is proposed that the capital shall not exceed £16,825, consisting of the ordinary share "A" capital already raised of £6025, £4300 of "B" capital, and £6500 of additional capital. It is intended that the shares in the "B" capital shall be issued to the holders of shares in the "A" capital rateably according to their respective holdings. The dividends proposed are 10 per cent. on the "A" capital, and 7 per cent. on the additional and "B" capital. Borrowing powers on the one-third scale are desired. Special purposes and reserve funds are contemplated by the provisions. Land and works authorization is included. The standard proposed for illuminating power is 14 candles, tested by the "Metropolitan" No. 2 burner. A standard price of 3s. 9d. is named, with the sliding-scale operating on the ordinary terms. The prepayment meter clause appears among a number of other ordinary ones. A protective clause referring to suction gas is proposed in these terms:

No penalty shall be incurred by the undertakers for neglect or refusal to give a supply of gas in accordance with the provisions of this Order to any company, body, or person who uses, or is in the habit of using, machinery or apparatus for making and utilizing suction gas, if, and so long as, in the opinion of the undertakers, the giving of a supply by them to such company, body, or person, would interfere with, or jeopardize, the supply of gas by the undertakers for public and private lighting, and to consumers not using such machinery or apparatus as aforesaid.

[Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.]

The next Order is principally for the purpose of empowering the Chertsey Gas Consumers' Company, Limited, to raise additional capital. It is intended that there shall be an extension of the share capital powers to an amount not exceeding in the whole £30,000. On the new ordinary capital, the dividend is not to exceed 7 per cent., and on new preference capital 5 per cent. One-third borrowing powers and special purpose fund clauses are



found among others of ordinary type. The Company seek to adopt the "Metropolitan" No. 2 burner in the testing of their gas. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Cranleigh Gas and Coke Company desire authorization in respect of the construction and maintenance of further works and of the raising of additional capital. The latter it is proposed shall not exceed £12,000, provided that the share capital does not extend beyond £20,000. On such part as is raised as ordinary capital, the authorized dividend is to be 7 per cent., and on the preference capital 5 per cent. Confirmation is asked to the borrowing of £4,000; and subject thereto, borrowing is not to exceed one-third of the issued capital. The purchase is provided for of lands on which to erect additional works. It is desired to apply the "Metropolitan" No. 2 burner to the testing of gas. The Company ask for a maximum price of 6s. 6d. In the prepayment clause, the terms are the usual; except that there is a variation in the maximum charge for the hire of a prepayment meter without fittings, which it is suggested shall be 8d. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Dinington and District Gas Company, Limited, are forward with proposals for powers in respect of the supply of Dinington and a number of neighbouring parishes in the West Riding of the County of York. The share capital, it is suggested, shall not exceed £48,000, comprising the ordinary share capital already raised of £12,000, and of additional share capital not exceeding £36,000. The dividend limit proposed on the original ordinary capital is 10 per cent., 7 per cent. on the additional ordinary capital, and 6 per cent. on the preference capital. Borrowing powers are limited to the usual one-third. Land and works powers are sought. It is proposed that the standard price shall be 4s. per 1000 cubic feet, with the sliding-scale operating on the ordinary lines. Special purposes fund, reserve fund, and prepayment clauses appear among others. It is suggested that "the price to be charged by the undertakers for gas supplied for public lighting within the limits of supply shall be such a price as may be determined, in accordance with the provisions of the Gas-Works Clauses Act, 1871, not exceeding 3s. 6d. per 1000 cubic feet." It is proposed that the standard illuminating power shall be 14 candles, tested by the "Metropolitan" No. 2 burner. The Mountain Ash stand-by clause (as published in the "JOURNAL" for Nov. 23 last, p. 525), for application to cases where a consumer has a separate supply, is inserted. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Highbridge Gas Company, Limited, are seeking authorization in various respects. The area of supply is specified as the north and south parishes and urban district of Highbridge and a defined part of the parishes of Burnham Without and Huntspill in the county of Somerset. It is proposed that the share capital of the concern shall not exceed £13,500, constituted of the share capital ("A") already raised, of £3500; ordinary share capital ("B") of £2500, to be issued to the holders of the "A" shares rateably, according to their respective holdings; and additional capital not exceeding £7500. Maximum dividends of 10 per cent. on the "A" capital, and 7 per cent. on the additional and "B" capital are proposed. The formation of special purposes and reserve funds is provided for. The customary one-third borrowing power is requested. Provision is made for the necessary lands and works authorization. The prescribed illuminating power of the gas is placed at 14 candles, tested by the "Metropolitan" No. 2 burner. A standard price of 3s. 9d. is suggested, with the sliding-scale operating upon the usual terms. The prepayment meter clause is included; as is also a stand-by clause in the terms of that quoted in connection with the Burnham Order. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

In the Order introduced by the Llanidloes Gas, Coal, and Coke Company, Limited, the limits of supply are defined as the borough of Llanidloes and the parish of Llanidloes Without, in the county of Montgomery. The share capital, it is suggested, shall not exceed £10,000, consisting of the share capital of £2500 already raised, and of additional capital not to exceed £7500, to be issued under modern conditions. The original capital is to be entitled to a maximum dividend of 10 per cent., the additional ordinary to 7 per cent., and preference shares to 6 per cent. Borrowing powers are proposed on the one-third scale. A renewal fund is contemplated, despite the existence of the special purposes fund set up partly in substitution by the parliamentary authorities. The promoters are taking lands and works powers. Gas of a standard illuminating power of 14 candles, as tested by the "Metropolitan" No. 2 burner, is proposed; with a maximum price of 5s. 5d. per 1000 cubic feet. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Ripley Water-Works and Gaslight and Coke Company, Limited, require certain authorization in respect of the gas supply to specified parts of the townships of Pentrich and Ripley in the county of Derby. In regard to Ripley, the limits are so much of the township and urban district as are not included in the area of the Riddings District Gas Company. The share capital, it is proposed, shall not exceed £19,000, consisting of £14,000 already raised and £5000 additional capital. The maximum dividends suggested are 10 per cent. on the original capital, 5 per cent. on the preference capital already issued, 7 per cent. on the additional ordinary capital, and 6 per cent. on the additional preference capital. Borrowing powers are proposed at the ordinary one-third rate. Special purposes and reserve funds, and land and works powers, are all provided for. The prescribed illuminating power is 14 candles, tested by the "Metropolitan" No. 2 burner. On a proposed standard price of 4s. 6d., the

sliding-scale will operate on the usual terms. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Rowley Regis and Blackheath Gas Company are forward with an Order to empower them to supply gas in the township of Cakemore in the county of Worcester, to raise additional capital, and for other purposes. The proposal as to Cakemore is an extension of existing limits. In addition to the capital authorized by the Company's Act of 1886, the promoters ask for sanction to raise additional capital not exceeding in the whole £12,500, carrying a maximum dividend of 7 per cent. on the ordinary shares, and not exceeding 5 per cent. in respect of capital issued as preference. One-third borrowing powers on the original and additional capital are requested. Provision is made for the creation of a special purposes fund. Power is sought to enable the Oldbury District Council to give, and the promoting Company to take, a supply of gas in bulk at such point in the urban district of Oldbury or the parish of Cakemore as may be agreed. The prepayment meter clause in the usual terms is inserted. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Sheffield United Gas Company are up with a short Order to alter their prescribed standard of illuminating power to 14 candles, and to adopt the "Metropolitan" No. 2 burner in testing it. Consequent amendments are to be made in various of the Company's Acts and Order. It is proposed to modify enactment in respect to the holding of meetings in this wise: Section 52 of the Act of 1855 it is intended shall be read and have effect as if the words, "and the future ordinary meetings shall be held in the month of March in every year, or at such other time as shall be appointed for that purpose by an order of a general meeting," were inserted in that section in lieu of the words "and the future general meetings shall be held in the months of April and October in every year." One result of this change is that an amendment has also to be made in relation to the retirement-rotation and election of Directors. Provision is arranged for the declaration of interim dividends without calling a meeting of the proprietors. Sections in the Company's Order of 1893 referring to the issue of debenture stock are to be repealed; and new conditions are proposed. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Sudbury Gas and Coke Company, Limited, are applicants for additional powers. The limits of supply are to be the borough of Sudbury and the parishes of Great Cornard and Chilton, in Suffolk. Concerning capital, it is intended that it shall not exceed £24,616, consisting of £14,616 share capital already invested in the undertaking, and known as original capital, and additional capital not exceeding £10,000. The maximum dividend is placed at 7 per cent. The borrowing powers are not to exceed one-third of the issued capital. A renewal fund is contemplated. Land and works powers are sought; and it is proposed that the standard illuminating power be prescribed at 14 candles, tested by the "Metropolitan" No. 2 burner. The maximum price of gas is placed at 4s. 9d. per 1000 feet. The Mountain Ash stand-by clause appears. A purchase clause is inserted, excluding the Corporation from the right to purchase compulsorily the undertaking within ten years after the commencement of the Order; but subsequently, and within 25 years of the commencement of the Order, if the Corporation introduce a Bill, there is to be no opposition on the part of the Company, except in respect of the protection of interests. The lines of the terms on which an agreement or arbitration shall take place are included in the Order. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The last of the Board of Trade applications to be noticed is one from the Swansea Gas Company, by which they are seeking to extend their limits to such portion of the parish of Llansamlet as is not included in the undertakers' existing limits of supply, or within the authorized limits of supply of any statutory gas company, to a defined part of the parish of Clase rural, and to the parishes of Penderry and Cockett. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

To the Local Government Board, the Warsop Urban District Council are applying for gas-supply powers; and the scheme comes into conflict with the plans of the Shirebrook Gas Company, as outlined in the Bill noticed on Jan. 25 (p. 226). The Council submit that they are, by the Public Health Act, 1875, empowered to supply gas within the part of their district not included in the limits of the Shirebrook Company; and they are, therefore, by this Order, applying for authority to establish and maintain a gas undertaking, and to supply gas. Subject to the consent of the Local Government Board, the Council have agreed to acquire, from the Mansfield Corporation, the rights, powers, and privileges in relation to the supply of gas exercisable by the Corporation in the district. Lands are scheduled for works purposes. The standard illuminating power of the gas is to be prescribed at 14 candles, tested by the "Metropolitan" No. 2 burner; and the maximum price for the gas is put at 5s. 6d. The price charged for gas for public lighting is not to be less than that charged to private consumers by more than 10 per cent. Authorization to borrow with the sanction of the Local Government Board is sought; and the moneys so borrowed are to be repaid within a period of fifty years as may be determined by the Board. [*Parliamentary Agents: Messrs. Torr and Co.*]

\*\*\* The Scotch Orders will be noticed next week.

The European Gas Company, Limited, have contributed £105 to the Mansion House fund for the relief of the sufferers from the Paris floods; and Sir John Aird, Bart., has given £100.



## CENTRAL STATION GAS ENGINEERING.\*

THE volume bearing the above title is called a Catechism; but, as its description indicates, it is in no sense a "shorter catechism." It may, however, be accepted as a confession of faith of the orthodox American gas engineer, and is well described by one of their journals as "the only comprehensive work on American gas engineering practice which deals with things as they are."

As its title page shows, it has been compiled from the answers sent out to the Practical Class of the Trustees Gas Educational Fund. This class, whose education is imparted by correspondence, has received mention from time to time in our pages, and is not entirely unknown to our readers. It will be worth while, however, before discussing the Catechism, to say a little about the inception of the class and the students who have profited from the information now made available for the general public.

The class owes its origin entirely to Mr. Walton Clark, who, in his Presidential Address in 1895 to the American Gaslight Association, said: "What effort is the Association making towards giving systematic aid to the many boys and men, who, without the advantage of an advanced education, are struggling to fit themselves for positions of responsibility, while filling subordinate positions in our gas-works? The answer must be 'Nothing.'" Mr. Clark's recommendation for a Committee on Education was adopted, and he served as its Chairman until, in 1899, it was dissolved and the work continued on a broader basis under the Trustees of the Gas Educational Fund. Mr. Clark is Chairman of the Board of Trustees, five in number—three of whom are permanent, the fourth and fifth being *ex-officio* members as President and Junior Past-President of the American Gas Institute.

The cost of the work is about \$4000 yearly, supported by voluntary subscriptions usually made on a five-year basis; the present series extending to 1913. Over \$11,000 has been accumulated as a surplus fund. Approximately 1000 students have entered the class, and about 150 completed the three-year course. When it is considered that of the 1000 entrants, 260 belong to classes not yet graduated, and that anyone is allowed to enter without undergoing examination, it may fairly be said that the proportion of graduates is high. Each year the names of the graduating class are published in the "Proceedings" of the American Gas Institute.

From the beginning, the best engineering talent has been available for the conduct of this work; and though, since the formation of the Trustees, the responsibility for questions and answers has devolved upon the Secretary, he has always been able to obtain, *gratis*, criticism and advice, which, if valued at consulting engineers' prices, would have been very costly. Year by year, these answers have appeared in the "Proceedings" of the American Gaslight Association, and then of its successor, the American Gas Institute. Their value not only to the students, but to the gas profession at large, was early recognized, and the present book is issued in response to the demand that the information be placed in convenient form. So well was the course planned from the beginning, that few of the questions and answers needed to be omitted because of duplication; and while the entire field of the gas business has not yet been covered, the gaps are comparatively trivial. The book is divided into eight sections.

Section I.—General Definitions—treats of the classes and compositions of illuminating gases, and of the names of apparatus used in manufacture and distribution. It is very short, with only ten questions, occupying seven pages.

Section II.—Manufacturing Materials—is divided into three parts, treating of bituminous coal, anthracite coal, and gas oils respectively. The properties of a good gas coal, the location of the principal fields, the effect of size and of storage on carbonization results, the causes of spontaneous combustion, the comparison of various fuels for use in a water-gas generator, and the grades of gas oils in common use, are described in seventeen pages, with twelve questions.

Section III.—Manufacturing Plant: Construction and Operation—is the largest in the book, with 179 questions, answered in 346 pages. It is divided into three parts—viz., distinctively coal gas, distinctively carburetted water gas, and common to both coal and carburetted water gas. Under the first part come charging, drawing, and coke-conveying machinery, retort-benches, impurities, tar-extractors, exhausters, washers and scrubbers, and residuals. To retort-benches are devoted 33 questions with 76 pages, where, with many illustrations, are described the construction and operation of various types of benches. Thirteen pages are occupied with washers and scrubbers, and sixteen are devoted to residuals, where especial attention is devoted to ammonia. In the second part carburetted water-gas generating apparatus and manufacturing practice is fully described in 29 pages, representing the views of the largest manufacturers and users of such apparatus. Scrubbing, relief holders, oil-tanks and oil tar, complete the part. The third part deals in much detail with coal-handling machinery, boilers, engines and exhausters, condensers, purifiers, station meters, gas-holders, street-main governors, measurement of pressures and photometry. It contains 162 pages, with many illustrations, and

with problems designed to make the student do some valuable thinking.

Section IV.—Distribution System and Consumers' Appliances—tells, in 84 questions and 167 pages, of street-mains, services, consumers' meters, house-piping, burners and fittings, appliances and complaints.

Section V.—Chemical—comprises eight questions relating to acetylene, oxidation, combustion, atomic and molecular weights, and tests for carbon dioxide and sulphuretted hydrogen.

Section VI.—Physical—devotes 56 questions on 74 pages to many physical truths, a knowledge of which is necessary to the gas engineer. The calculation of weights from specific gravity, the variation of gauge pressure due to elevation, and the determination of maximum flame temperature of a gas of known composition are some of the problems set for solution. Two questions are devoted to showing how an absurd claim for the efficiency of any gas-making process can be disproved.

Section VII.—Masonry Construction—describes in 34 pages, brick, stone, concrete, lime, and cement, and their preparation for, and use in, building.

Section VIII.—Miscellaneous—is devoted entirely to a very detailed description of the treatment to be given persons overcome by gas. This occupies twelve pages, with thirteen illustrations, and is the most comprehensive and valuable presentation of this subject that has ever been printed. It was prepared by the largest Syndicate Gas Company in the States; and the employees of the Company are given regular drill in this treatment.

It appears from the above indication of the book's contents that Sections V., VI., and VII. would hardly find place (certainly not in their entirety) in the manual of a gas engineer, as the latter would go to proper text-books on these subjects for their fuller treatment. They are needed in the Catechism, however, to give the men and youths for whose benefit the class is conducted, the chemical, physical, and construction knowledge of most value in their work.

No pains have been spared to make the information readily accessible; for, in addition to the splendid topical arrangement, there is a good subject-index. Illustrations numbering 120 aid the clear wording of the text in conveying its lessons, and fittingly round out a volume which should form the beginning of the gas library of every "junior" in America.

## GAS-ENGINE THEORY AND DESIGN.\*

As its name designates, this work is chiefly confined to the theory and design of the gas-engine; and for this reason it is more suitable for the student and those mainly interested in the mechanical details of the engine than for the practical user. The author is Instructor in Mechanical Engineering at the Michigan Agricultural College; and his remarks, as might be expected, are chiefly concerned with American practice.

After a brief *résumé* of the history of the gas-engine (with the making of whose history America, it may be remarked, had very little to do), the author passes on to describe a few of the principal applications of the gas-engine in the United States. The work is to a great extent spoilt by the entire absence of style, and the repeated examples of grammatical and constructive errors in composition. Here is an instance: "More work has been done on large gas-engines in Europe than here, since fuel economy is of greater importance there." And sentences such as the following frequently appear: "These gases and the ash weigh just as much as the coal and air consumed did," and "the car can be started and stopped quicker than an electric-car." Or is this to be regarded as an Americanism?

In his preface, the author states that it has been his aim "to make the treatment clear and concise; and for this reason every paragraph should be studied—not merely read over." This injunction is very necessary, for who, at the first reading, can grasp: "The ports are larger than is usual in such small engines; the gas-passages are as direct as possible; the exhaust port is uncovered while the piston travels the last five-eighths of its down-stroke; the cylinder inlet port is uncovered a little later; the crank-case inlet port is uncovered the same length of time as the exhaust port"?

In a chapter on "Fuels," the author makes but the briefest mention of coal gas—the entire information on this subject throughout the book being compressed into a paragraph of six lines; and even this information is incorrect, for we are told that "the coal is placed in closed iron retorts, which are heated from the outside." Again, in describing carburetted water gas, the author states that "the gas is 'fixed,' the same as coal gas, by passing it through a superheater"!! This will be news indeed to readers of the "JOURNAL." Later, in a table giving particulars of the various fuel gases, it is stated that the heating value of "water gas" is 630 B.Th.U. per cubic foot. This is quite incorrect, for the figure should be nearer half of that quoted. It can hardly be intended for "carburetted water gas" as "oil water gas" immediately follows it, with a heating value given of 1000 B.Th.U. per cubic foot.

\* "Catechism of Central Station Gas Engineering in the United States." Published by the Trustees Gas Educational Fund, and compiled by A. E. Forstall, Secretary. New York, 1910. [Price, cloth, \$5; flexible leather, \$7.]

\* "Gas-Engine Theory and Design." By A. C. Mehrrens. New York: John Wiley and Sons; 1909.



The author gives only very cursory attention to the subjects of "Governing," "Ignition," "Cooling," and "Exhaust," contained in four consecutive chapters. The best feature of the work are the chapters on the "Determination of the Principal Dimensions," "Forces Acting in the Gas-Engine," "Design and Dimensions of Parts," and the last on "Designs." These are well illustrated in an instructive manner; many of the drawings and diagrams being novel, and not to be found in any of the best-known books on the gas-engine. This part of the volume cannot fail to be of interest to those desirous of studying the theory and mechanical details of gas-engine design. But this said, there remain no opportunities for praise, though, on the contrary, many for criticism.

In short, we do not see the necessity for going beyond the work of our own writers on this important subject. At the same time, the works published, both British and Foreign, do not give nearly sufficient attention to the working of gas-engines on coal gas, or town gas as it is sometimes termed.

Comparatively few users of engines under 100 H.P.—and these are far in excess of those employing the higher power engines—are interested in suction or producer plants and all their attendant disadvantages. This being so, gas-engine literature should be rather of a nature to interest and assist the user of the 10 or 20 H.P. engine, as it is he who is chiefly in need of assistance, and he on whom the future prosperity of the gas-engine industry largely depends.

KRAMERS AND AARTS WATER-GAS PLANT.

Tests of a Unit at the Hunslet Works.

Some time ago, arrangements were made for the carrying out, by Professor W. A. Bone, Ph.D., F.R.S., &c., Chief of the Department of Fuel and Gas Engineering in the Leeds University, of a series of tests of a unit of the Kramers and Aarts water-gas plant, of a capacity of 500,000 cubic feet per day, erected at the works of Messrs. Clayton, Son, and Co., at Hunslet, Leeds. Professor Bone has submitted his report, and we give it herewith.

Duration of Trial Six Hours—10 A.M. to 4 P.M. of Dec. 1, 1909.

[All data referring to both volume and calorific value of the gas refer to "dry gas" at 0° C. and 760 mm.]

- 1.—Dry coke charged per hour = 5'91 cwt.
- 2.—Fuel charged was ordinary gas coke and contained 2'9 per cent. of moisture. The dry coke contained—  
Carbon, 87'2 p. ct. Hydrogen, 1'2 p. ct. Ash, 7'3 p. ct.
- 3.—The calorific value of the dry coke = 13,300 B.Th.U. per pound.
- 4.—Average make of gas = 21,833 cubic feet per hour, at 0° C. and 760 mm.
- 5.—Mean percentage composition of two continuous samples :  
Carbon dioxide . . . . . 3'75  
Carbon monoxide. . . . . 43'70  
Hydrogen . . . . . 45'10  
Methane . . . . . 0'50  
Nitrogen . . . . . 6'95
- 6.—Mean calorific value of the gas at 0° C. and 760 mm.—  
Gross, 308'9 B.Th.U. Net, 284 B.Th.U.
- 7.—Yield of dry gas per pound of carbon = 37'84 cubic feet at 0° C. and 760 mm.
- 8.—Percentage of carbon in coke appearing in the gas = 60'65 per cent.
- 9.—Ratios of the calorific values of the gas and coke—  
Gross, 0'766. Net, 0'705.

- 10.—Clinker. Although the ash of the coke was ferruginous, the formation of large clinker was very small. The largest clinker formed during the trial weighed 10 lbs. only; and there were three others weighing 8, 7, and 6 lbs. respectively. All the rest were quite small, weighing less than 5 lbs. each. This was a most satisfactory feature of the trial.
- 11.—Unfortunately the weather was very cold and wet during the whole period of the trial; and although the plant was in a fairly sheltered position, the conditions were unfavourable. The plant worked very smoothly throughout the trial; the gas was of a uniform and good quality, and the make quite regular.

NEW INVERTED INCANDESCENT GAS-LAMP COMPANY.

Manufacturing Premises in Birmingham.



MANY of our readers are doubtless aware that the business of the above-named Company has hitherto been confined to the design and sale of gas burners and fittings, and that its growth necessitated some time ago considerable enlargement of their premises in Farringdon Avenue, E.C., in which their London offices and show-rooms are situated. In view of the success which has attended the Company, it has been deemed advisable to make arrangements for extending their operations. They have accordingly decided to become their own manufacturers; and with this object have acquired the works and business of the Sunlight and Safety Lamp Company, Limited, who have for some considerable time been the makers of their specialities. Consequently the Company are now in possession of a large and well-equipped

factory—the Roscar Works—situated in a prominent position in the centre of Birmingham. It consists of a block of buildings, three storeys high, in Summer Hill Road. The various departments are furnished with plant of the most approved kind for the production of inverted burners and gas-fittings of all qualities. An interior of the premises is shown in the above illustration. The buildings are lighted throughout by means of incandescent gas-burners; and the power for driving the machinery is furnished by gas-engines. By this acquisition, the Company become possessors not only of a large well-equipped factory, but also of a technical and operative staff thoroughly skilled in the production of their specialities. They are therefore now fully prepared to cope with the increased business which the records of the past few years justify them in looking for in the near future.



## THE STRIKE AT THE STOCKHOLM GAS-WORKS.

AUG. 6 TO SEPT. 5, 1909.

[COMMUNICATED.]

OF late years the Swedish labour market has been the scene of numerous conflicts of varying duration and import, which last summer led to a comprehensive struggle, extending throughout the entire kingdom, between the Employers' Associations and the Workmen's Unions, when about 280,000 men in all found themselves out of work owing to a proclamation made by the leaders of the workers concerning the great strike of Aug. 4. In this proclamation, however, it was expressly stated that the hands employed at the municipal works for the lighting up of towns, &c., were exceptions.

Furthermore, some years ago the town of Stockholm entered upon a collective agreement with all the workmen, in which the stipulation was inserted that on no account was work to be discontinued or abandoned; and by a special notice issued the attention of the workpeople was called to this stipulation. The Stockholm Gas-Works were, therefore, apparently protected from all danger in this respect; but the situation rendering caution necessary, those in authority chose—from among the employees of various grades who volunteered—a reserve band of workers, who, in case work was abandoned by others, would take their places. This reserve brigade consisted of 21 engineers and technicians; 21 counting-house clerks; 9 collectors; 20 meter-controllers; 16 workmasters and gasmasters; 19 foremen; and 19 watchmen and workers paid monthly.

The consumption of gas during the first few days of the strike was calculated not to exceed about 55,000 cubic metres per diem; and with the reserve brigade, it was deemed possible to produce about 45,000 cubic metres a day. Aided by the gasholders, which at this critical period were almost full—containing 120,000 cubic metres—the possibility was considered of being able to manage for the time it was supposed the strike might last—i.e., a week or at most a fortnight. As a matter of fact, the strike was not over for a month. So as to keep the consumption within the limitations calculated, plans were made that, should necessity call for such steps, certain parts of the town should be cut off from delivery; and, if called for, the delivery pressure was also to be decreased.

The gas-works belonging to the town of Stockholm, the Värtan Gas-Works, are outside the town itself,\* and here lodgings were put in complete readiness for the reception of the reserve brigade. A dining-hall was arranged; and a contract was entered into with a provision merchant, who undertook that two hours after due notice he would provide full board for the volunteers, so that the brigade could be entirely catered for at the works. The reserve brigade received mobilizing billets, containing a statement as to where the assembly order at stated times should be inquired for at a given telephone number; a list of the clothes which each person should take with him; and a statement of the kind of service, time of work, superior command, and quarters and time of meals, &c.

In order to ensure the uninterrupted continuation of the delivery, the due lighting of the lamps and their being extinguished, &c., a volunteer delivery brigade was also organized. It was formed by 3 engineers and technicians; 2 workmasters; 8 foremen; 35 clerks; and those gas-meter controllers and collectors who had not entered the gas-making contingent, together with some forty delivery workmen who were deemed reliable—most of them being lamplighters. For members of this brigade, printed directions were held in readiness; special maps being issued concerning the various districts which were to be lit.

Owing to the gravity of the situation, from the very first day of the strike the authorities placed the military at the more important points of the town; and at the request of the head of the gas-works, a troop of fifty men were stationed within the precincts of the works at Värtan, though completely shut off from the ordinary places where work was carried on, and not in sight of them.

In spite of the workmen being informed that the presence of the military was due to the desire to protect the valuable property belonging to the town from damage from outsiders, there were a certain number of agitators who succeeded in awakening an opinion against this precaution; the result being that an ultimatum was sent to the gas-works authorities that, unless the troops were withdrawn, work would be discontinued. Since the gas-works could not comply with this demand, after attempts had been made to prevent a strike, without any success attending the negotiations, work was discontinued on Aug. 6 at 6 a.m. The strike, it must be remembered, occurred against the wishes of the organized and more sensible hands.

At the Värtan works, there were 325 workmen; and of these, 275 went out on strike. Of the delivery workmen, numbering 327, there were 111 that struck work. All the lamp-lighters continued work; so that the volunteer delivery brigade was not called upon to light up.

The volunteer gas-making brigade, the members of which had received definite orders on the evening preceding the day on which work was abandoned, marched in when the men left the works. These volunteers, together with the workmen remaining

\* In the town itself there are older gas-works, the Klara works; but these works are not used in summer, so were closed when the strike broke out.

## Working Statement.

Date.	Gas Made.			Number of Workmen, (a) Old, (b) Voluntary, (c) Newly Engaged, and (d) Total.																Per 1000 Cubic Metres of Gas Made.												
	Coal Gas.		Total.	Working of Retort- Furnaces.				Working of Water- Gas Apparatus.				Working of Steam Boilers, Exhausters, and Pumps.				Coal-Conveyors					Coke-Handling.				Drugging and Repairs.				Total.			
	Horizontal Retorts Worked by Hand.	Inclined Retorts with Conveyors for Coal and Coke.		Water Gas.	Cubic Metres.				(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)		(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)			
July 31.	38,180	29,050		77	..	..	77	..	..	..	..	12	..	..	12 <sup>+</sup>	14	..	..	14	33	..	..	33	189	..	..	325	4'83				
Aug. 7.	2,040	35,920	13,880	184	36	..	54	..	5	..	5	4	17	..	21 <sup>1/2</sup>	9	8	..	9	6	4	..	10	21	46	..	50	166	3'20			
" 14.	1,480	45,570	13,360	18	36	1	55	..	5	..	5	4	17	..	21	14	10	..	14	6	6	..	12	24	32	..	56	54	163	2'70		
" 21.	..	60,780	60,780	20	33	1	54	..	3	..	3	5	13	..	18	4	12	..	14	9	6	..	15	23	34	5	62	61	166	2'73		
" 28.	..	59,250	4,820	22	26	2	50	..	4	..	4	5	14	..	19	4	10	..	14	10	6	..	16	22	50	37	109	63	110	39	212	3'31
Sept. 4.	..	78,470	11,390	26	27	6	59	..	6	1	7	5	10	1	16	4	10	..	14	8	5	13	26	31	38	43	112	74	96	64	234	2'97
" 30.	29,460	80,820	..	89	..	4	93	..	..	..	..	11	..	1	12	8	..	10	18	27	..	14	41	125	..	44	169	260	..	73	333	3'02
Oct. 15.	40,960	71,150	112,050	97	..	5	102	..	..	..	..	11	..	1	12	12	..	7	19	29	..	19	48	122	..	48	170	271	..	80	351	3'13

\* Exclusive of those who served by order.

† Of these, 15 were stokers and coke quenchers.

‡ One boiler-room at work.

§ Two boiler-rooms at work.

## REMARKS.

Gas made Aug. 6 to Sept. 5—  
Coal gas. . . . . 1,689,670 cubic metres.  
Water gas. . . . . 278,120 " "

Total.

Contents of the gasholders—  
On Aug. 5, at 11 p.m. . . . . 119,900 cubic metres.  
On Sept. 5, " " " " " 84,300 " "

Coal-gas works—

Output of gas per ton of coal

. . . . . 299 '9 cubic metres.

Water-gas works—

Output of gas per kiln. of coke in the generators

. . . . . 1 '98 cubic metres.

Oil per cubic metre of gas

. . . . . 0 '43 litres.

Illuminating power in Hefner candles (Carpenter burner at 15° C., 760 mm.)

. . . . . 18 '3

Calorific power (15° C., 760 mm.)

. . . . . 4690 calories.

Total illuminating power in Hefner candles (Sugg's "London" argand burner No. 1, at 15° C., 760 mm.)

. . . . . 11 '1

Total calorific power (15° C., 760 mm.)

. . . . . 5160 calories.



at their posts, at once continued the gas-making, which during the entire month that the strike lasted was kept up to the amount necessary without any stoppage, dislocation of work, or damage to the material. Once or twice the gas-making had to be reduced, since more gas was being made than the gasholders could contain. When the strike began, not only the benches with horizontal retorts for hand-power, but also the benches with inclined retorts with conveyors for coal and coke, were working. In order to save labour during the first period of the strike, the alteration was made that the horizontal retorts were not used after the water-gas works had commenced working, and further firing was undertaken in the inclined retorts. The volunteer brigade (unaccustomed as the members were to physical labour) stood the test with due credit, and without any accident occurring.

The result of the work carried on under these exceptional conditions will best be judged from the accompanying statement.

When the leaders of the workmen subsequently declared the great strike to be at an end, they had imagined there would be a general return to work on the morning of Sept. 6. The gates of the gas-works were, however, closed against the strikers; they being obliged to apply for work at the head office in the ordinary way. Some of those who were engaged were given different work from that which they previously performed; their places having been filled by new-comers during the strike.

It is but natural that the Stockholm Gas-Works suffered great losses, both direct and indirect, in consequence of the strike. It may be counted as gain, however, that a much-needed elimination took place among the workmen. Moreover, there is the very valuable experience that large gas-works can be kept going with a volunteer staff, mostly recruited from among its own employees. This knowledge, together with the more stringent stipulations enforced on the workmen subsequent to the strike, should offer a guarantee that for some long period the Stockholm Gas-Works will enjoy immunity from strikes, and carry on work in peace.

## THE CAUSES AND RANGES OF VARIATION IN CALORIMETRIC TESTS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

WHEN making tests of gas with the Boys calorimeter, a correction should be made for any difference in temperature between the air of the room and that of the gases leaving the instrument. This correction is included in the one stipulated in the Instructions issued by the Gas Referees as 1.6th of a Calorie for each degree centigrade. Mr. J. H. Coste refers to this,\* and further names two sets of extreme conditions, and calculates what are the limits of error possible therein. In the first of the examples, he shows that the gross calorific value and the difference figure would both be appreciated 1.5 Calories per cubic foot of gas; while in the second he shows each would be depreciated 1.6 Calories.

If the Referees' correction be applied to these two examples, we have firstly (where air enters the instrument at 21° C. saturated with water vapour, and leaves at 10° C. saturated)  $\frac{1}{2}$  Cal.  $\times$  11 = 1.83 Cal. or 0.3 Calorie in excess of that computed to be required; secondly (where the air again enters at 21° C. and the gases leave at 25° C., with air at one-third saturation), the Referees' correction would be  $\frac{1}{2}$  Cal.  $\times$  4 = 0.6 against 1.6 computed, or a difference of 1 Calorie. These examples are here dissected to direct attention to the fact that the Referees' correction is one that includes temperature specifically, and other variables to an uncertain extent. In other words, there is no mention of its applicability to correct for variations of humidity or rate of flow of air in proportion to gas. The application of that rule in practice is confined to the gross calorific value of the gas tested. General considerations as well as Mr. Coste's examples show that the Referees' rule is an approximation only; and it is therefore necessary to further inquire what are the magnitudes of the several deviations mentioned and others that may occur under working conditions.

These disturbing factors may be classified as follows: (1) Changes of temperature at the calorimeter between ingoing and outgoing gases. (2) Changes of atmospheric relative humidity. (3) Changes of volume of air supply per cubic foot of gas burnt. The influence of these factors will be discussed in this order; but before doing so it will be necessary to state the data about to be employed. A sample of gas from the St. Helens vertical retorts, of 594 and 542.9 B.Th.U., gross and net, and having an illuminating power in the "Metropolitan" No. 2 burner of 3.372 candles per cubic foot, will be employed. It is given [*vide* "JOURNAL" for June 8, 1909, p. 636], as of the following percentage composition:

Marsh gas	32.4
Hydrogen	49.7
Carbon monoxide	9.9
Unsaturated hydrocarbons	2.7
Carbon dioxide	2.1
Nitrogen	3.0
Total accounted for	99.8

It was pointed out by Dr. H. G. Colman, in the discussion of Mr. Coste's paper, that the analysis of a gas mixture is usually

stated as though it were dry; whilst the actual gas burnt in the calorimetric test is moist, and that this shifting of the basis introduces an error in the comparison of the calorific values calculated and those observed. The remark is a just and timely one; but the error can only be obviated by the analyst giving in his return how much moisture the gas contained at the time of the experiment. As this may amount to 1.44 per cent. at 55° Fahr., 1.72 per cent. at 60° Fahr., or 2.05 per cent. at 65° Fahr., it is obviously erroneous to give figures which purport to be for a gas free from moisture, when the sample taken was in all probability measured moist, and might continue so throughout the series of absorptions. The substances removed by direct absorption—viz., CO<sub>2</sub>, O<sub>2</sub>, CO, and the unsaturated hydrocarbons, and nitrogen if determined directly or by difference—may be easily corrected by the usual simple rule; but marsh gas and hydrogen, which are usually determined by explosion, must be corrected after allowing for the air introduced, the subsequent shrinkage due to the condensation of water vapour, and the absorption of the CO<sub>2</sub> generated at the time of explosion. These attentions to detail are desirable for the accurate declaration of each of the simple combustibles, but emphatically so when it is wished to ascertain the calorific value to be assigned to the unsaturated hydrocarbons. In the absence of a statement of the carbon and hydrogen densities of the latter, no calculation of the calorific values that is reliable can be made; and then a computation by difference is all that can be attempted. Under these circumstances, all the errors due to incompleteness of the analysis are accumulated in the figures assigned to the C<sub>n</sub>H<sub>m</sub>, and may be a large proportion thereof.

Where the analysis is made by measurements at constant pressure over water, the following shrinkages take place as a consequence of explosion: (1) Marsh gas, 2 vols. + oxygen 4 vols. = CO<sub>2</sub>, 2 vols. + water vapour 4 vols. That is, for each volume of marsh gas there is a shrinkage of two volumes of H<sub>2</sub>O, and after the application of alkali a further one volume, or three volumes in all. (2) Hydrogen (4 vols.) + oxygen (2 vols.) = water vapour (4 vols.). That is each volume of hydrogen is accompanied by  $\frac{1}{2}$  vols. shrinkage after cooling alone. The reduced volumes read off the burette will be due to the removal of the dry gases in direct proportion, and to the removal of water vapour in proportion to the shrinkages stated. But as the marsh gas is predicated from the CO<sub>2</sub> shrinkage, which is of equal volume, that component will suffer no increased error, but it will contribute twice its quota of water vapour in swelling the error of the hydrogen figure. The hydrogen return will to this extent exceed the true content, and the whole series of allowances for moisture will be reflected upon the nitrogen content. The gas engineer who is furnished with an analysis is not told by what apparatus or method it has been carried out; and it is all the more necessary that the figures should show the actual facts—viz., the percentage of water vapour in the gas at the time of analysis. With these limitations in mind, it is now necessary to go into the question with the data available.

### PROPERTIES OF THE AIR REQUIRED AND PRODUCTS PER CUBIC FOOT OF GAS.

Each cubic foot of the gas, per analysis, would require for combustion 1.08532 cubic feet of oxygen, accompanied by 4.092 cubic feet of nitrogen—say, 5.2 cubic feet of dry air. More than this will in practice be admitted to the calorimeter; but as the excess beyond the theoretical behaves differently, it will be considered later. One cubic foot of gas presumably saturated, coming as it does straight from a wet meter, reacts with 5.2 cubic feet of air of unknown degree of saturation, producing exit gases consisting of 4.12 cubic feet of nitrogen, 0.49 cubic foot of carbon dioxide, and (if none had been condensed in the calorimeter), 1.24 cubic feet of water vapour. But as almost the whole of this water is condensed, the exit gases will be as stated, a total of 4.61 cubic feet, plus the saturation quota of moisture; against 1 cubic foot of gas and 5.2 cubic feet of air entering—a reduction in volume of 1.59 cubic feet. As the gas enters and the products leave saturated, the problem, so far as humidity alone is concerned, is reduced to a comparison of 5.2 cubic feet of air of *x* per cent. saturation, versus 3.61 cubic feet of products saturated. It will be noted that the preceding analysis will need to be corrected as to its influence on humidity, but will not materially affect the calculations to follow as to sensible heat.

### DIFFERENCE OF TEMPERATURE BETWEEN THE INGOING AND THE OUTGOING GASES.

**Sensible Heat.**—As the quantity of heat attributed to combustion is upon the assumed condition of the exit gases leaving the calorimeter at the same temperature as the gas and air enter, so any deviation from the uniformity must be taken into account. The correction necessary will vary as to whether or not the theoretical quantity of air required is exceeded. Sections I., II., and III. of Table I. give data when no excess is supplied, and Sections IV. and V. when 25 to 50 per cent. excess.

The correction for sensible heat is strictly made up of two parts—(a) that due to the difference of the temperature of the gas as it enters the calorimeter and as its components leave in the waste gases; (b) similarly that for the air. These two, gas and air, will not often be at the same temperature; but an inspection of Table I. will show that by comparison the effect of (a) is very small, while that of (b) is about 96 per cent. of the whole. Section I. of Table I. shows that to raise the gas 1° C., weighing as

\* See "JOURNAL" for Dec. 21, 1909, p. 817, col. 1.



TABLE I.—Heat Capacity of the Gas and Air Mixture, at 60° Fahr. and 30 Inches Mercury.

Component.	Volume in Cubic Feet.	Weight in Grammes.		Specific Heat by Weight.	Small Calories per Degree Centigrade.	Section.
		Per Cubic Foot.	Present.			
Marsh gas . . .	0'324	19'312	6'2571	0'5929	3'7104	
Hydrogen . . .	0'497	2'414	1'1997	3'4090	4'0907	
Carbon monoxide .	0'099	33'796	3'3458	0'2450	0'8197	
CuHm . . . . .	0'027	58'129	1'5695	0'4040	0'6341	
Carbon dioxide .	0'021	53'108	1'1153	0'2163	0'2412	
Nitrogen . . . .	0'030	33'796	1'0139	0'2438	0'2472	
Moisture (?) . . .	0'002	21'726	0'0434	0'4805	0'0208	
Totals and averages	1'000	14'5447	14'5447	0'67132	9'7641	I.
Oxygen . . . . .	1'08532	38'6241	41'9194	0'2175	9'1176	
Nitrogen . . . .	4'09200	33'796	138'2932	0'2438	33'7141	
Moisture . . . .	0'08978	21'726	1'9506	0'4805	0'9373	
Totals and averages for air only . . .	5'2671	34'585	182'1632	0'2402	43'7690	II.
Do. for gas and air	6'2671	31'387	196'7079	0'2721	53'5331	
Carbon dioxide .	0'490	53'108	26'022	0'2163	5'628	
Nitrogen . . . .	4'122	33'796	139'307	0'2438	33'961	
Moisture . . . .	0'079	21'726	1'729	0'4805	0'831	
Products of combustion, no excess of air . . . . .	4'691	35'608	167'059	0'2420	40'421	III.
Add 25 p. ct. excess of air . . . . .	1'317	34'585	45'541	0'2402	10'942	
Products, ditto . .	6'008	35'383	212'600	0'2416	51'363	IV.
Add 20 p. ct. further excess . . . . .	1'053	34'585	36'432	0'2402	8'754	
Products of combustion, 45 p. ct. excess of air . . .	7'062	35'265	249'033	0'2414	60'117	V.
Products with 50 p. ct. excess of air	7'325	35'241	258'141	0'2413	62'305	

it does 14'54 grammes, and having a specific heat of 0'67132, 0'009764 Cal. is required. Section II. shows that to raise the 5'267 cubic feet of moist air, weighing 182'16 grammes, through 1° C., 0'04377 Cal. is required, or  $\frac{1}{4\frac{1}{2}}$  times that for the gas. Section III. shows similarly that to raise the minimum volume of products of combustion 4'6916 cubic feet, weighing 167'059 grammes, 0'04042 Cal. is required. This means that for every degree rise or fall of the exit gases, compared with the inlet,  $\frac{1}{25}$ th of a Calorie correction is necessary. What then is the number of degrees that must be used as the multiplier? If the temperature of the gas be  $\pm x$  degrees, and that of the air  $\pm y$  degrees, different from that of the waste gases, then it would appear that the correct number would be  $(0'18x + 0'82y)$ ; 9'764 and 43'77 being respectively 0'18 and 0'82 of the total heat capacity of the ingoing mixture—viz., 53'53 Cal. But this view probably attributes too much importance to the effect of the gas, because the products of combustion that escape are more nearly all derived from the air; for the hydrogen of the gas forms the water of condensation, and only the carbon goes into the exit gases, constituting 1'5351 out of the 5'6288 Cal. of the carbon dioxide. This represents but  $1'535 \div 40'42 = 3'8$  per cent. of the heat capacity of the products of combustion. By Section III. it will be seen that the total heat equivalent of the waste gases does not equal that of the air supply (Section II.). It is evident, therefore, that a very minute error only is incurred by leaving out the temperature of the entering gas, and regarding that of the air as the basis of computation. These figures, which are for the sensible heat alone, become accentuated as air in excess of theoretical needs is admitted. Thus in Section IV., with 25 per cent. excess, the amount would be 0'051 per degree, while with 45 per cent. (Section V.) it would be 0'06 per degree. The last one agrees with the estimate by Mr. Coste, when the products of combustion were assumed to be 7 cubic feet. But it is in contrast with 0'16 Cal. required by the Gas Referees' rule, which, however, most probably includes one or both of the factors next to be mentioned.

**Latent Heat.**—The incidence of this factor has two bearings—firstly upon the amount of moisture in the incoming gas *versus* that in the outgoing gases, even when both are saturated, and no change of temperature takes place; secondly, and similarly, when the temperatures thereof differ. Although the first is due to a shrinkage of volume due to chemical action, yet it is convenient to deal with it alongside the second. It will moreover reappear in the section dealing with change of humidity, and therefore must not be reckoned twice.

Firstly. The figures in Table I., for moisture in the gas will need here to be replaced by that normal to moist gas of 60° Fahr. The moisture entering is with gas 0'0172 cubic foot, and with air 0'0898 cubic foot—a total of 0'107 cubic foot = 2'324 grammes. Leaving it is 0'0796 cubic foot weighing 1'729 grammes—a difference of 0'274 cubic foot = 0'595 gramme. Taking the heat of vaporization at 60° Fahr. as approximately 0'61 Cal.,  $0'595 \times 0'61 = 0'363$  Cal. is the latent heat given up to the calorimeter, unduly raising the gross calorific value. It has the effect also of adding 0'595 gramme to the condensation water, making it appear that a greater quantity of hydrogen existed in the gas than was actually

so; in other words, making the (true gross calorific value + error) – (true condensation value + error) = correct net calorific value, but making the heat calculated therefrom as due to hydrogen erroneous to the extent of the error just stated multiplied by 6'13. That is  $0'363 \times 6'13 = 2'22$  Cal. = 8'8 B.Th.U. Or, making the calculation at once in B.Th.U., taking the difference between the gross and net calorific values of hydrogen as 53, we have for 0'0274 cubic foot of water vapour or hydrogen 1'45 B.Th.U. in lieu of 0'363 Cal.

Secondly. Change in the moisture content of the waste gases due to alteration of temperature, per degree centigrade. This is not equal for every degree of temperature, but around 60° Fahr. it increases its tension 0'03 inch of mercury for a rise of 1° C. This is equal to  $\frac{1}{9}$ th of a cubic foot of water vapour per 100 cubic feet of gas = 0'001  $\times$  21'726 grammes = 0'0214 gramme per cubic foot of air or gas. The problem thus becomes: Entering with 1 cubic foot of moist gas and 5'2 cubic feet of air,  $6'2 \times 0'0214 = 0'14963$  gramme more moisture per degree centigrade rise leaving 4'622 cubic feet, containing 0'111575 gramme more moisture per degree centigrade rise. Assuming the variation to be the mean  $\frac{0'1496 + 0'1116}{2} = 0'1306$  gramme  $\times$  0'61 Cal. we

get 0'08 Cal. as the latent heat of the changed water content.

For the sake of clearness, it may be desirable to embody these estimated corrections with the rule given by the Gas Referees in Table II.

TABLE II.—Comparison of Gas Referees Rule, with Deviations occurring through Changes of Temperature.

Source of Heat.	Calories Added to Calorimeter.	Calories Taken from Calorimeter.
Sensible heat of exit gases . . . . .	0'04 $\times$ 6 = 0'24	0'04 $\times$ 6 = 0'24
Latent do., due to altered water content	0'08 $\times$ 6 = 0'48	0'08 $\times$ 6 = 0'48
Do. due to shrinkage of volume of inlet air and gas . . .	Approximately constant, as explained below. 0'363	— 0'363
Gas Referees rule— 1-6th cal. $\times$ 6° . .	1'083 deducts 1'000	0'357 adds 1'000
Difference, after such correction . . . .	0'083	0'643
Conditions under which gases leave relative to air and gas entering . . .	6° C. below, say 12'5° C. <i>versus</i> 18'5° C.	6° C. above, say 18'5° C. <i>versus</i> 12'5° C.

It is noteworthy that in the first instance the Referees' correction meets the case, but in the other does not.

Within the figure given in Table II. as approximately 0'363 Cal., there is a factor which ought to be recognized, although its magnitude is small. It originates in the fact that water which enters with air or gas has a different heat contribution or abstraction from that which is condensed from steam at 100° C. To make this clear, the following particulars are necessary for comparison with the preceding calculation: The latent heat of vaporization at 60° Fahr. is 0'596 Cal., that at 100° C. being 0'5367 Cal., and the sensible heat from 100° to 18° = 0'082 Cal.—a total for the latter of 0'6187 Cal. It is impossible when the water is collected from the calorimeter to say how much is from the air supply and how much from the combustion; and all of it, according to rule, is computed on the latter basis. That from air, under the conditions set forth, would have the effect of 0'595 gramme  $\times$  0'596 Cal. = 0'355 Cal.; while that condensed from steam would have  $0'595 \times 0'6187 = 0'368$  Cal. In other words, the air would give water yielding 0'013 Cal. less than credited in the condensation figure. It is with this explanation that the approximate figure of 0'363 is subsequently employed for both gross and condensation values. The correction under this head may need to be larger than is here given if the range of temperature is wide, and especially if it be initially high. The following values for the vapour tension of aqueous vapour will show the reason for it.

Deg. C.	Millimetres.	Deg. C.	Millimetres.	Deg. C.	Millimetres.
0'0	4'57	15'0	12'67	17'0	14'40
5'5	6'74	15'5	13'09	25'5	24'23
14'0	11'88	16'0	13'51	30'0	31'51

Thus 10° C. above 15'5 C. (or 60° Fahr.), adds 11'14 mm. of mercury to the vapour tension, while 10° C. below that datum only takes away 6'35 mm. Some such influence probably operated in the abnormal condensation values observed with London mixed gas, shown later in Tables XVI. to XVIII.

(To be continued.)

The London and Southern District Junior Gas Association will pay a visit to-morrow (Wednesday) afternoon to the mantle works of the Voelker Lighting Corporation, at Wandsworth. This will be followed on the 25th inst. by a paper by Mr. P. G. Somerville, of the Gaslight and Coke Company, on "The Incandescent Mantle; having Special Reference to the Use of Non-Collodionized Mantles." As already announced, the second annual dinner will take place on March 5, at the Horse Shoe Hotel.



THE FLOW OF GAS THROUGH PIPES.

By D. CHANDLER, of the South Metropolitan Gas Company.

[In reference to the following article, Mr. Charles Carpenter writes: The increasing importance of the "outdoor" department as a necessary adjunct to the "indoor" one (I use the words in the sense usually applied by gas men) leads me to think that some experimental data upon the subject of the flow of gas through small orifices and pipes may prove useful and interesting to your readers. The original experiments were made for me some years ago; but I have had them repeated, under even more careful conditions, by Mr. D. Chandler, who has also, at my request, written a short introduction to them. If you think my view of their usefulness is correct, they are quite at your disposal for publication.]

In June, 1852, the "JOURNAL" published a paper by Dr. William Pole, on the "Motion of Fluids in Pipes," in which were set forth the general laws and principles governing the flow of fluids through pipes. After stating that the friction of fluids upon solids depends on laws altogether different from those which regulate the friction of solids upon each other, Dr. Pole expressed the opinion that the following principles might be considered sufficiently well established for the purpose of constructing a formula affecting the discharge of gas from pipes.

1.—The friction of a fluid upon a solid is independent of the hydrostatic pressure to which the fluid is subjected. Thus the friction of water passing along a pipe under a pressure of 100 lbs. per square inch is no greater than if the pressure were 1 lb.

2.—It is proportional to the area of the rubbing surface. Thus the friction of water in passing along a pipe 100 feet long would be twice as great as if the pipe were only 50 feet long; or if the circumference of a pipe be doubled (the length remaining the same), the friction would be doubled in like manner. If, therefore, L be made to represent the length of a pipe, and C its internal circumference, the friction will be proportionate to LC.

3.—It varies with the velocity; but in what ratio it does not appear to be well determined. As a simple rule, however (near enough for practical purposes), the friction may be assumed to vary as the square of the mean velocity with which the bodies move upon each other, or as V<sup>2</sup>. Thus, if the velocity of water passing along a pipe be doubled, the friction will be increased fourfold, and so on.

4.—It may also be assumed to be proportional to the specific gravity of the fluid, or will vary as S. The friction does not appear to be dependent in any other respect upon the nature of the two substances in contact, provided only that the fluid be in a perfect state of fluidity, and that the surface of the solid be so smooth as not to offer obstructions to the passage of the fluid along it.

COEFFICIENT OF FRICTION.

Dr. Pole stated that, while these laws supplied the bulk of data necessary to construct a formula which would determine the force required to overcome friction by the passage of a fluid of known gravity through a straight pipe of given diameter and length, one element was missing, which could only be determined by actual experiment—viz., the important factor, coefficient of friction—respecting which theory gives no information. To determine this factor, Dr. Pole took four experiments, each made under very different conditions—viz., two on water, one on air, and one on gas. It is somewhat surprising to find (since so much depended upon this element) that Dr. Pole did not make careful experiments himself, but wholly relied upon data obtained from four experiments which, so far as one can gather, were made under ordinary working conditions, and with which no special precautions were taken to ensure the greatest possible accuracy.

The first experiment taken was made by Smeaton, at the Edinburgh Water-Works, upon a 4½-inch pipe, 14,637 feet long, delivering water at a velocity of 1·85 feet per second, under a differential pressure of 22·35 lbs. per square inch. From these data, Dr. Pole obtained the factor 0·0001 as friction coefficient. The data for the second calculation were obtained from an account given by Mr. Provis of an experiment upon a 1½-inch pipe, 100 feet long, delivering water at a velocity of 2·72 feet per second, under a differential pressure of 1·08 lbs. per square inch. The friction coefficient was nearly 0·0001. The third factor was obtained from an experiment made upon the flow of air through a pipe 0·62 inch diameter and 279 feet long, by M. Girard, of Paris. The differential pressure was 6·93 lbs. per square foot, and the velocity equalled 6·93 feet per second. The friction coefficient was 0·00009. The fourth example was taken from particulars of an experiment quoted by Mr. Hawksley, made at the Chartered Gas-Works, Westminster, upon an 18-inch main, 1 mile long, delivering gas at a velocity of 10·4 feet a second, under a differential pressure of 1 inch water column. The coefficient of friction was 0·00011.

Taking the maximum and minimum of these four factors, it will be seen that the greatest coefficient is 9·1 per cent. above, and the

lowest 10·0 per cent. below, the mean; or, stating the case in another way, there is a total variation of 19·1 per cent. from minimum to maximum factor. However, Dr. Pole assumed the mean 0·0001 to be the correct figure for all practical purposes; and from it he deduced the constant 1350 in the well-known formula

Q = 1350 d² √(h / s l)

From the foregoing résumé of Dr. Pole's paper, it will be seen that the value of the formula given by him can only be said to have been demonstrated within the limits of the experiments quoted; and therefore under other circumstances the formula might not be so reliable. As a matter of fact, Dr. Pole himself subsequently quoted results obtained upon water, air, and gas, in which considerable discrepancies are shown; and the Editor of the "JOURNAL" inserted a footnote to the effect that a large and valuable set of experiments on the discharge of coal gas through a 9-inch main, 1125 yards long, under varying pressures, gave results, on the average, about 15 per cent. less than the calculated volume, which would require the constant 1350 to be reduced to 1150.

From this it would appear that while the formula devised by Dr. Pole may be sufficiently accurate under certain conditions, it cannot be entirely relied upon under all circumstances of straight running pipes.

Subsequently to the publication of Dr. Pole's paper, Mr. Thomas G. Barlow published in the "JOURNAL" a series of tables constructed from the formula, on the discharge of gas, in cubic feet per hour, through pipes of various diameters and lengths, and under various pressures—taking for the smallest size a service 0·5 inch diameter, giving the volumes discharged (specific gravity = ·4) through a range of differential pressures from 0·1 to 0·5 inch water pressure. Later, the tables were extended by Mr. Newbigging to a differential pressure of 2½ inches.

NEW EXPERIMENTAL RESULTS.

It has long been a question as to whether this formula applies for small services. But since Dr. Pole did not specify any particular working limits, and results have never been published actually disproving its applicability for small diameters, it has been generally relied upon for practical purposes. The author having occasion to check the results according to formula by actual experiment on a 50 feet run of ½-inch compo. service, surprising results were obtained, which, if correct, demonstrate that for small pipes the formula is hopelessly inadequate and misleading. [See Table I.] It will be seen that the results are not only interesting from the actual discrepancy revealed between practice and theory of volume discharged, but surprising because they demonstrate that, under certain conditions, the fundamental laws upon which Dr. Pole's formula is constructed are inoperative.

TABLE I.—Volume of Gas per Hour from ½-Inch Compo. Pipe, 50 Feet Long (Sp.G. ·425).

Pressure, in Tenths.	Volume by Experiment at N.T.P.	Volume by Formula, Q = 1350 d² √(hd / s l)
	Cubic Feet.	Cubic Feet.
1	9'32	28'40
2	19'80	40'16
3	29'42	49'27
4	37'94	56'70
5	46'50	63'40
6	52'98	69'60
7	61'68	75'00
8	66'04	80'30
9	68'88	85'00
10	71'80	89'70
15	86'01	109'70
20	98'66	126'90
25	110'43	141'80
30	122'98	155'30
35	133'39	167'70
40	144'49	179'30

So interesting was this discovery, that further experiments were made to ascertain, if possible, the principles affecting the flow of gas through small pipes and services.

The results obtained upon varying lengths of ¼-inch, ⅜-inch, and ½-inch compo. pipe clearly show that these laws are totally different from those employed by Dr. Pole, within certain limits of pressure, diameter, and length. The facts demonstrated, within the range of experiments made, are:

- 1. For service-pipes, the constant embodied in Dr. Pole's formula is much too large.
- 2. For small differences of pressure, the law that the volume discharged varies as the square of the pressure is not operative; the volume, apparently, within certain limits, varying directly as the pressure.
- 3. The law that volume discharged varies inversely as the square of the length does not apply with small differences of pressure and all lengths of service.

These results are most important from a practical point of view, and show that implicit confidence in long-established and generally-accepted formulæ is sometimes misplaced. But, apart



TABLE II.—Cubic Feet Discharged per Hour at N.T.P.

Pressure, in Tenths.	A.— $\frac{1}{4}$ -inch Compo. Pipe.				B.— $\frac{3}{8}$ -inch Compo. Pipe.				C.— $\frac{1}{2}$ -inch Compo. Pipe.		
	Length of Pipe.				Length of Pipe.				Length of Pipe.		
	50 Feet.	25 Feet.	12'5 Feet.	6'25 Feet.	50 Feet.	25 Feet.	12'5 Feet.	6'25 Feet.	50 Feet.	25 Feet.	12'5 Feet.
1	0'81	1'20	2'01	3'88	2'69	5'23	9'72	18'34	9'32	18'06	35'24
2	1'42	2'41	4'43	7'97	5'78	11'85	18'79	35'67	19'80	37'09	61'17
3	1'83	3'56	6'55	11'89	8'44	16'47	28'19	43'15	29'42	51'26	73'99
4	2'44	4'53	8'47	14'43	10'60	20'73	37'51	51'78	37'94	66'80	83'89
5	3'05	5'61	10'49	18'13	13'88	25'58	42'34	58'54	46'50	72'63	93'21
6	3'66	6'78	12'91	22'27	16'58	29'65	48'10	62'29	52'98	76'32	103'89
7	4'37	8'07	14'73	24'38	19'28	33'43	52'46	66'17	61'68	81'56	113'25
8	4'99	9'91	15'74	26'05	21'74	37'79	53'12	73'07	66'94	86'89	123'12
9	5'74	10'49	16'74	28'86	23'90	42'57	56'96	78'25	68'88	91'99	129'80
10	6'20	11'30	20'38	31'59	26'85	44'76	58'82	83'47	71'80	97'10	137'06
15	9'24	16'46	28'25	38'07	37'67	54'07	73'65	105'29	86'01	122'34	164'00
20	12'10	21'84	34'03	44'48	47'14	60'73	87'74	123'32	98'66	143'70	192'00
25	16'03	27'09	36'14	51'30	51'35	69'69	99'80	138'81	110'43	157'00	214'00
30	17'67	30'99	38'95	56'11	54'07	76'54	108'89	154'87	122'98	170'00	236'00
35	20'09	33'43	42'16	61'84	57'75	82'90	117'50	169'21	133'39	184'00	256'00
40	23'16	34'65	46'18	66'73	62'01	89'07	129'60	182'40	144'49	195'00	274'00

from the practical value of the experiments, a most interesting field for theorizing is afforded by the figures obtained.

Some light may, perhaps, be thrown upon the flow of fluids in pipes when it is remembered that skin-friction is not the only element to be counted with. Viscosity or internal molecular friction may play a most important part. Dubuat found, in the case of water, that viscosity gave an additional resistance, increasing as the simple power of velocity; and Dr. Pole pointed out its effect by stating that the particles of a fluid move faster at the centre of a pipe than at the circumference.

Viscosity and Velocity.

The importance of viscosity as affecting the flow of water in pipes, &c., has been recognized since the problems of hydrodynamics were first investigated. Dr. Ernst Mach, in his work on the "Science of Mechanics," asserts, in dealing with the question of liquid motion, that when the enormous effects of viscosity are taken into account, anything like dynamical solution of almost every problem is out of the question. If, therefore, its influence is so important in the matter of hydraulics, can we believe that its effect may be altogether ignored in the motion of gases? May we not reason that layers of gas travel in a pipe with increasing velocities towards the centre, and continually interchange molecules by diffusion, with loss of momentum, due to internal work, the ultimate effect of which might be increased temperature of the flowing gas?

If this is the case, we can believe that the effect of viscosity would be greater in pipes of large sectional area than in small services, since with the latter the skin area exposed is greater per unit volume of gas. In the case of a pipe 0'5 inch diameter, the ratio of skin-surface to capacity is 1 to 0'125; while in the case of a 12-inch pipe, it is 1 to 3. Therefore the velocity in small pipes would have to be greater than in large mains for the same pressure-volume law to be operative. This, after all, is only another way of stating what the text-books on mechanics assert—viz., that critical velocity depends upon the size of pipe. If this reasoning is tenable, it is obvious that each size of pipe has its own particular limits, within which the laws upon which Dr. Pole's formula is framed hold absolutely good.

Having suggested that discrimination should be made between actual skin friction and internal molecular friction or viscosity, the remaining point to be emphasized, as affecting the motion of fluids in pipes, is that of velocity. And here the work of Professor Osborn Reynolds throws much light upon the problem.\* Professor Reynolds has shown that there exists a certain relationship between velocity, V, and diameter, B, of any sized pipe for any given fluid, which causes a definite velocity, V, to be critical. So that for values below the critical V the flow of a fluid is in straight, continuous streams; but when the particular velocity is exceeded, the steady equilibrium is destroyed, and sinuous motion characterizes the flow. This was actually demonstrated by Professor Reynolds, with an experiment upon the flow of water coloured with an aniline dye. Below the critical velocity, the water flowed in a steady, straight-line stream; at the critical V, the coloured water suddenly broke up into smoke-like eddying clouds.

If we, therefore, take a given length and size of pipe, and allow gas to flow through under differential pressures ranging from (say) 0'1 inch water pressure up to 100 inches, there may be several points in the scale where a certain velocity becomes critical, requiring a change of law at each particular point. As John Perry has stated, with a fluid flowing at the velocities 1, 2, 3 feet per second, the friction is proportional to 1, 2, 3; whereas at the velocities 1, 2, 3 yards per second, the friction may be proportional to 1, 4, 9, &c. "Thus the friction in fluids is proportional to the speed when the speed is small; to the square of the speed when the speed is greater; and at still greater speeds the friction increases more rapidly than the square of the speed."

\* Phil. Trans., Royal Society, 1883, Part III.

TABLE III.—Cubic Feet Discharged per Hour at N.T.P.

Pressure, in Tenths.	D.—GAS-BARREL, $\frac{1}{4}$ -INCH BORE.		
	Length of Pipe.		
	40 Feet.	20 Feet.	10 Feet.
2½	1'63	3'47	7'65
5	3'67	6'55	14'00
7½	5'20	10'52	21'18
10	7'14	13'70	24'13
12½	8'56	17'09	28'25
15	10'40	19'82	31'54
17½	12'24	22'68	34'84
20	13'46	24'95	37'08
22½	15'30	27'22	38'14
25	16'76	28'65	39'55
27½	18'33	29'19	41'28
30	19'92	30'38	42'89
32½	21'46	31'10	44'35
35	22'68	32'17	46'80
37½	23'91	33'96	48'36
40	24'83	35'64	49'93

TABLE IV.—Cubic Feet Discharged per Hour at N.T.P.

E.— $\frac{3}{16}$ -INCH BRASS TUBE.					
Pressure, in Tenths.	Length of Pipe.		Pressure, in Tenths.	Length of Pipe.	
	4 Feet.	1 Foot.		4 Feet.	1 Foot.
1	0'25	1'22	13	3'30	9'54
2	0'60	2'32	14	3'60	10'26
3	0'80	3'42	15	3'75	10'84
4	1'10	4'20	16	4'00	11'12
5	1'40	5'07	17	4'20	11'56
6	1'60	5'79	18	4'30	12'14
7	1'90	6'36	19	4'50	12'71
8	2'10	6'50	20	4'65	13'45
9	2'40	8'09	25	5'60	15'00
10	2'60	8'24	30	6'45	16'77
11	2'80	8'67	35	7'35	18'50
12	3'00	9'24	40	8'00	19'08

TABLE V.

F.—ORIFICE 0'055 INCH DIAMETER.			
Pressure, in Tenths.	Cubic Feet per Hour at N.T.P.	Pressure, in Tenths.	Cubic Feet per Hour at N.T.P.
1	1'17	13	4'13
2	1'67	14	4'28
3	1'96	15	4'42
4	2'30	16	4'62
5	2'64	17	4'76
6	2'88	18	4'86
7	3'10	19	4'96
8	3'38	20	5'05
9	3'52	25	5'74
10	3'66	30	6'27
11	3'80	35	6'69
12	3'96	40	7'08

DESCRIPTION OF EXPERIMENTS AND RESULTS.

The first set of experiments, A, B, C [Table II.], were made to determine the flow of gas under varying pressures through different lengths of  $\frac{1}{4}$ -inch,  $\frac{3}{8}$ -inch, and  $\frac{1}{2}$ -inch compo. pipe. The volumes discharged per hour were obtained for each 1-10th inch increase of pressure up to 10-10ths, and from 10-10ths up to 40-10ths in increments of 5-10ths of an inch. The pressures were taken with a delicately-adjusted King's gauge, and the volume discharged obtained by direct reading from a test holder (20 cubic feet capacity) certified by the Board of Trade. The terminal end of the pipe, in every case, was open to atmosphere. All volumes are reduced to 30 inches bar. 60° Fahr.; gravity of gas, '425.



TABLE VI.  
G.—ORIFICE  $\frac{1}{8}$  INCH DIAMETER.

Pressure, in Tenths.	Cubic Feet at N.T.P.	Pressure, in Tenths.	Cubic Feet at N.T.P.
2 $\frac{1}{2}$	11'84	22 $\frac{1}{2}$	37'57
5	16'69	25	39'99
7 $\frac{1}{2}$	20'64	27 $\frac{1}{2}$	41'75
10	24'24	30	43'93
12 $\frac{1}{2}$	28'17	32 $\frac{1}{2}$	45'45
15	30'90	35	47'57
17 $\frac{1}{2}$	33'02	37 $\frac{1}{2}$	48'78
20	35'75	40	50'29

An experiment D [Table III.], was carried out on precisely the same lines for various lengths of  $\frac{1}{8}$ -inch bore iron barrel. The volumes were obtained for increments of 25-10ths pressure.

Experiment E [Table IV.] was made on  $\frac{3}{16}$ -inch brass tube, and volumes obtained for every 1-10th increase of pressure. Experiments F and G [Tables V. and VI.] were made to determine the flow of coal gas through (1) an orifice 0.055 inch diameter and  $\frac{3}{16}$  inch thick; (2) an orifice  $\frac{1}{8}$ -inch diameter and  $\frac{1}{8}$ -inch thick. In the case of gas discharged through orifices, it will be seen that the generally accepted law holds good, even for small differences of pressure.

## THE USE OF TAR FOR ROADS.

At a Northern District Meeting of the Institution of Municipal Engineers which was held recently, Mr. WILLIAM WADE, Divisional Surveyor to the Northumberland County Council, read a paper on the "Use of Tar for Road Making and Repairs." In the course of the paper (which was adjourned for further discussion at a meeting to take place at Newcastle-on-Tyne next Saturday), the author made the following observations.

The consensus of opinion from many and varied sources seems to indicate that some combination of tar and pitch is, as yet, the best means of combining the varied kinds of stone used in road making. There are, broadly speaking, three methods of applying the tar: (1) Tar-painting, or waterproofing the surface. (2) Tar macadam, or mixing tar with the stone previous to its being laid on the road. (3) Tar-grouting, or grouting the stone with tar and pitch when the road is being coated. Each of these methods possesses its own distinctive features, though the ultimate aim is the same in all cases—viz., that of binding the stone firmly together, and preventing the wear and tear which arises from the disturbance of the crust owing to weather and the traffic.

### TAR-PAINTING.

Tar painting may be used on either an ordinary road prepared under the old method, or upon a new stretch of metal. In the case of tar-painting a stretch of road which has carried traffic for some time, it is essential that all dust should be removed from the road before the liquid is applied. After the removal, the road is ready for the application of the tar, which is heated in tanks of various sizes. These tanks are fitted with distributors or jets; and tar at the proper temperature is applied by pressure so as to secure a certain amount of penetration as well as equal distribution. The tarred surface has then granite, spar, or other suitable screenings sprinkled over it.

The cost of tar painting works as follows: One gallon of tar will cover an area of from 10 to 20 square yards, at a cost of from 1d. to 1 $\frac{1}{2}$ d. per square yard.

### TAR-MACADAM.

I have now to deal with the second method—that of thoroughly mixing the stone with tar and pitch previous to its being laid on the highway. This is, perhaps, better known as tar-macadam. As it is absolutely essential that all stone should be perfectly dry and free from moisture, a shed or some covered-in structure will materially help in getting the work done in a speedy and efficient manner. The stone used is of three sizes—2 $\frac{1}{2}$ -inch, 1 $\frac{1}{2}$ -inch, and  $\frac{1}{2}$ -inch—and should be free from dust and moisture. The tarring may be done by hand or by machinery. The latter method is much cheaper; and I find that machine-tarred stone is superior to that mixed by hand. After the stone is tarred, it is stacked in separate heaps. The best results are obtained when the tarred material is allowed to be undisturbed for from one to three weeks before it is applied to the road. The proportion of pitch must be greater for the bottom coat than for the two succeeding ones.

The 2 $\frac{1}{2}$ -inch stone is first put on the road foundation. Above this the 1 $\frac{1}{2}$ -inch is placed, and the  $\frac{1}{2}$ -inch is used as a finishing coat, over which is sprinkled  $\frac{3}{8}$ -inch of dry granite screenings free from dust. Each layer of stone is well rolled before the one above is put on. It is very necessary that more than ordinary care should be taken in the consolidation of the separate layers. When completed, the combined thickness of the three coats gives an average depth of 4 inches; the depth of material, of course, being greater in the centre than on the sides of the road. A 15-ton roller is preferable, especially if the traffic be

heavy; for if a light steam-roller be used, when traffic heavier than the roller passes over the road the result will, in all probability, be disastrous for the road. One ton of tarred stone will cover an area of 6 square yards; and the average quantity of tar required for a ton of stone is 8 gallons, and 20 lbs. of pitch.

The 8 miles of tar-macadam laid by the Northumberland County Council cost on the average 2s. 2d. per square yard, inclusive of mixing plant, &c. The roads treated were structurally weak—a penned bottom of 6 inches of whinstone was laid down on the existing road to give a good foundation, on which the tarred stone was placed. Good drainage and strength of structure are important factors in the laying down of a successful tar-macadam roadway.

The cost of reconstructing a road by means of penning it with 6 inches of whinstone varies from 10d. to 1s. 6d. per square yard, according to the distance the stone has been brought.

### TAR-GROUTING.

Now I come to deal with the third method—that of tar-grouting the stone with tar and pitch when the road is being coated. Before beginning tar-grouting, it is necessary to take into consideration the weight of loads and the nature of the traffic the road is likely to be called upon to carry. This will altogether determine the size of the broken stone, its quality, and the thickness of the coat to be laid on the surface. On roads that carry heavy traffic, 3 inches of hand-broken whinstone should be used, while on those where there is no motor waggon or locomotive traffic, I would recommend 2 $\frac{1}{2}$  inches.

After the stone is laid on, it is slightly rolled. The pitch and tar are together heated in tanks to boiling point; and a quantity of creosote oil is added. Stirring is necessary to enable the ingredients to be thoroughly well assimilated. The boiling matrix is poured in the interstices by means of a specially made can and distributor. Each individual stone is thus thoroughly well grouted and embedded in, or surrounded by, the mixture. While still hot,  $\frac{3}{8}$  inch of slag or whin chippings are applied and properly consolidated with a 15-ton roller until an integral crust is formed.

### ADVANTAGES AND DISADVANTAGES.

Tar-painting may with great advantage be used on suburban roads where the traffic is light, or where the dust nuisance is greatly felt and watering has to be resorted to. The tar acts as a protection, and protects the life of the road surface so long as it is dry. It has this great drawback—being only externally applied, it breaks up in wet weather, and the combined action of the wheels and horses' feet soon put the roads into an uneven and dirty condition. This, of course, applies to roads where the traffic is heavy. To sum up, tar-painting is not to be compared with either tar-macadam or tar-grouting as far as lasting properties are concerned. The tar in this case is not so much a binder as a protection to the road surface.

Tar-macadam possesses the following main advantages: (1) The small stone of which the crust is composed being well tarred before being laid on the road, gives a compact and smooth surface. (2) The tar-macadam road is perfectly sanitary and almost dustless, so that cleansing is reduced to a minimum. (3) It is easily repaired, and the cost of maintenance is 30 per cent. less than that of ordinary macadam. For motorists it is an ideal road.

Tar-macadam is not without its drawbacks. The chief of these, so far as road authorities are concerned, is heavy initial cost. From the point of view of those using the road, the slippery nature of the surface, especially during hoar frosts, is an objectionable feature. However, this remedies itself in course of time by the tar gradually leaving the road dry by evaporation. Locomotive traffic tends to cause the top layer, which is only 1 $\frac{1}{2}$  inches in thickness, to become separated from the layer below. This, of course, means the break-up of the road so far as the crust is concerned. This is the reason why tar-macadam is not adapted for heavy loads.

Tar-grouting differs from tar-macadam in these respects: (1) By broken stone being applied in one coat. (2) The stone is of a uniform size. (3) Owing to a larger quantity of pitch being mixed with the tar, the mixture quickly solidifies, and adhesion is instantly secured, in much the same way as is done in wood or granite paving.

The Northumberland County Council have this year tar-grouted 15,436 tons of broken stone on a stretch of upwards of 14 miles of main road in various parts of the county. This work can be carried out satisfactorily by doing half of the road at a time. I did not receive a single complaint while the work was in progress. Furthermore, there was an entire absence of loose stones—generally an annoying feature on ordinary newly-rolled patches. In September last, I supervised the work of making the road approaches over a new bridge. Clay was used in order to bring the roadway to the required level. You are all aware of the difficulty of making a satisfactory highway over newly-filled clay. Yet, after these approaches had been penned with rubble whin, and then coated with 2 $\frac{1}{2}$  inches of hand-broken whinstone, I found that by tar-grouting I was enabled to get a firm and permanent road at once. The cost of tar-grouting is no more than that of repairing a road by the old water-bound method.

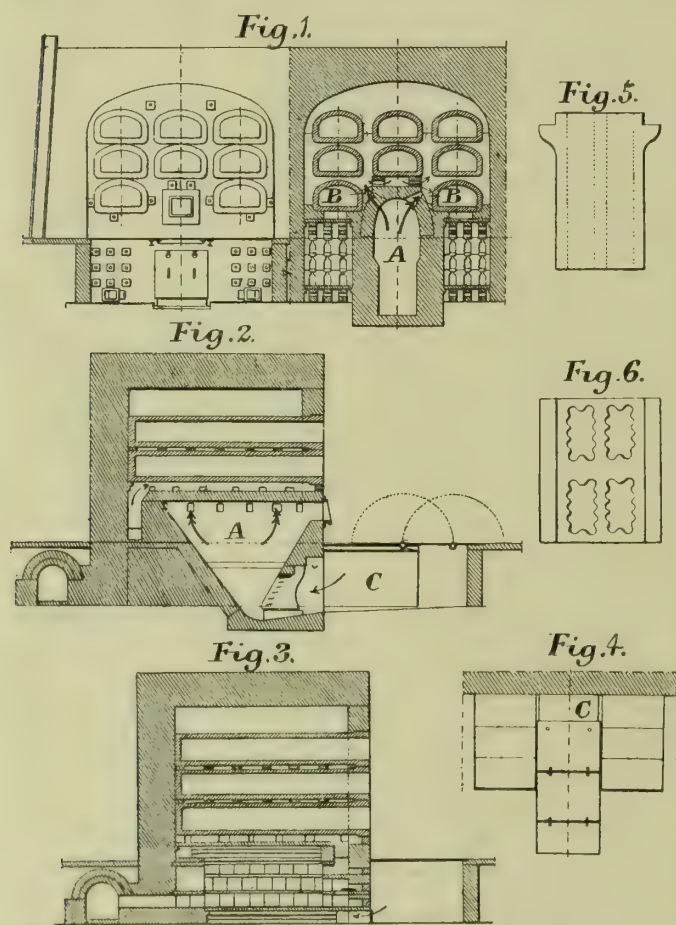
A tar-grouted highway is, as yet, the nearest approach we have to an ideal road. It is certainly for mixed traffic superior to the other methods I have mentioned. Yet, at the same time, I must not omit to say that the surface is not quite so suitable for motors as that of tar-macadam.



## CONVERTING GRATE-BAR FURNACES INTO REGENERATIVE SETTINGS.

A patent has lately been taken out for France by MM. Charles M. Stein et Cie. for a method of converting ordinary grate-bar furnaces into regenerative settings; and it is claimed that the alteration can be made so as to preserve entirely the piers and vault of the ordinary setting, and combine them with a producer charged through a door located in the same place as the door of the old furnace.

In the practical application of the invention, the gas-producer, which is combined with a setting of the ordinary direct-fired type and from five to eight retorts, is vaulted, which allows the burners to project into small combustion chambers formed by the intervals between two rows of retorts—an arrangement which prevents the burning of the latter. The invention also includes a special construction of stoneware fittings employed in the regenerator in combination with the producer; and likewise a special arrangement of the top of the central part of the pit of the producer. The stoneware is intended to ensure perfect regeneration with furnaces of small dimensions; and the object of the arrangement of the top is to facilitate scurfing and the stirring of the contents of the producer.



The accompanying diagrams illustrate the application of the invention. Fig. 1 shows an elevation and a transverse section of the furnace; fig. 2, a section through the axis of the producer; fig. 3, a section through the axis of one of the two recuperators; fig. 4, a plan of the top of the pit; figs. 5 and 6 are an end view and a plan of one of the pieces of stoneware.

As shown in fig. 1, the producer A has a high vault, allowing the burners to enter the small combustion chambers B. The recuperators are placed on each side of the producer, and are furnished with the stoneware fittings already mentioned, which have in them holes with corrugated sides, as shown in fig. 6. The producer is charged through a door situated in the same place as the old furnace door. The pit C has a cover of fluted sheet iron, with three lids or flaps, one of which (that to the right in fig. 2) is fixed, while the others are movable and united by rings as shown. The lids can be opened so as to leave the top of the pit completely free. The sides are covered with cast-iron plates, which are removed when cleaning the regenerator. The single-headed arrows show the courses of the primary and secondary air; the double-headed ones, the path of the gases.

The invention is not confined to the structural details of the setting represented; and the accessory arrangements can be altered to meet different cases which may arise in practice.

The death occurred on the 30th ult., in his 69th year, of Mr. John C. Mortimer, who was for some thirty-eight years one of the collectors of the Gaslight and Coke Company.

## RELATIVE ADVANTAGES OF GAS & ELECTRICITY

Notes by Mr. J. R. Hill, of Manchester.

Owing to want of time, Mr. J. R. HILL, Superintendent at the Bradford Road Gas-Works, Manchester, did not have a chance of submitting his views when the relative advantages of gas and electricity came up for discussion at the last meeting of the Manchester Association of Students of the Institution of Civil Engineers, held at the Chartered Accountants' Hall in the city. The following are extracts from the notes prepared by Mr. Hill on the subject.

We claim that gas can more than hold its own against electricity for heating, cooking, and public and private lighting, and in most cases for power. It is of excellent service for ventilation, is quite as safe as, if not safer than, electricity, and the numerous methods and ways in which it can be used render it a most desirable servant. In heating and cooking, electricity is not a serious competitor. It is generally accepted that 6 cubic feet of gas contain as many heat units as one B.T.U. of electricity, which explains why this is so. One or two of the London restaurants did, as a novelty, fix electric grillers; but I think even the most ardent electrician, if he were hungry, would put his steak under a good gas-griller in preference to placing it either under or over a red-hot hair-pin.

When gas enters into fair competition with electricity for street lighting, the former comes out the victor in practically all cases, be it on the low or be it on the high pressure system. Bradford, among other towns, has had what may be termed competitions between the two systems, both the gas and the electrical engineers being empowered to make the best of their respective methods of lighting in given stretches of road; and gas, as usual, emerged the victor. London sent the Chairman and other members of the Lighting Committee to the Continent to inspect and compare costs; and their report was in favour of gas. The Inspectors of the Local Government Board have frequently of late drawn the attention of those responsible to the cheaper and better light that can be obtained from gas; and in many cases they have gone so far as to refuse loans. In Liverpool, though the electricity works are owned by the Corporation and the gas is supplied by a Company, they are quite content to go on using gas for street lighting, well knowing it to be the cheaper. Not only in street lighting does gas still excel its competitor, but also for large open or partly covered spaces—such as railway stations, &c. Several of the large railway stations in and around London are being lit by one or the other system of gas lighting. Another notable case is the Nottingham Market, the authorities of which have now decided, after a test of some weeks' duration, to discard sixteen 1000-candle arc lamps in favour of sixteen 3000-candle high-pressure "Selas" lights; and, by doing so, they will not only get three times the light, but also save about £250 per annum.

Mr. Robinson's allowance for mantles for interior lighting is most excessive. My own experience is a much longer average life. The figures given by Mr. Robinson for electric lighting are not competitive ones, but are taken from laboratory practice, and are hardly likely to be found applicable to ordinary everyday working. This view is confirmed by a paper read before the Birmingham electrical engineers a month or two ago, in which the cost of metallic filament lamps per 1000 candle-hours, including allowance for renewals (in laboratory experiments), was found to vary with different lamps from 5'6d. to 8'8d., with electricity charged at 4d. per unit. Altering the rate to the standard given for the purposes of the discussion, the cost for 60 candles, 1000 hours burning, would be from 21s. to 33s.—an average of 27s.—against his figures of £1 4s. 3d.

For large rooms, shops, &c., high-pressure lighting is coming more and more into vogue; the lamps being operated from switchboards, so that such parts only as are required may be illuminated. And as flame arc lamps are inadmissible for the work, owing to their "fragile" nature, metallic filament lamps are found unsuitable, and in place thereof gas-mantles are used. For ordinary dwellings, the inverted lamp has come to stay. The careful and economic housewife has a rare choice of burners, varying in size from the small bijou, consuming 1 to 1½ feet per hour, and giving a light of 25 to 30 candles, to the full-sized burner, consuming between 3 and 4 feet per hour, and giving a light of 70 to 80 candles. To suit these, a large and varied assortment of shapes, sizes, and colours of globes and shades can be had; and these, together with the modern artistic, good fittings, make it possible to suit all tastes, fancies, and styles of decoration. As to the cost of running these small burners, it will be found, on the figures given, that electricity would have to be sold below ½d. per unit to compete.

From the ventilation and health point of view, gas has its uses, more especially in large rooms, for the heat set up by the burning gas puts the air in motion, and by suitable ventilators in the ceiling the atmosphere is kept pure and sweet. The stuffiness of small rooms, about which so much has been said, is more a relic of old times when three or four large flat-flame burners, consuming 15 to 20 feet per hour, were in use, and did not give the light now secured by a single burner consuming 3 to 4 cubic feet. The cry of sulphur from the gas is also a favourite one; but this, independent of the large mass of evidence that has of late years been collected, falls to the ground, when it is remembered that



about 20 cubic feet per hour used to be consumed against between 3 and 4 feet now.

Referring to the discussion, the "Manchester Guardian" last Saturday said: "In the course of an argument in favour of gas, Mr. F. H. Robinson quoted £6 5s. as the cost of 180-candle power of gas for 4000 hours of street lighting, and £13 2s. as the cost of similar lighting with electricity. 'In future,' he added, 'all the streets in Berlin are to be lighted with high-pressure gas; and the total cost of 60-candle power gas lighting for 1000 hours is 10s.; while for electricity it is £1 4s. 2d.' Believing there was something wrong in the statement about Berlin, a Manchester correspondent wrote to Dr. Klingerberg, one of the best known electrical engineers in Berlin, for information, and has received a reply in which Dr. Klingerberg says: 'In reply to your inquiry, I beg to say that there is no question of substituting high-pressure gas for electric light in Berlin. On the contrary, a decided increase in lighting by flame arc lamps is to be expected. At the same time, high-pressure gas lighting is extensively used and adopted in the streets which have hitherto been lighted by gas. The adoption of high-pressure gas lighting instead of electric light is, primarily, to be accounted for by the fact that the gas-works are under municipal control, and the city of Berlin, therefore, takes an active interest in their development; while the electrical supply for the city comes through a private company.'"

### THE HEAVY RARE METALS.

In the course of a paper on "The Relation between the Mineral and the Chemical Industries," read by Mr. G. T. Holloway before the London Section of the Society of Chemical Industry on the 3rd ult., he made the following remarks.

The occurrence together of practically all the heavy rare elements, and the almost invariable occurrence with them, or at any rate in the same or similar rocks, of many of the rare alkali, alkaline-earth, and allied elements—such as lithium, caesium, rubidium, cerium, thorium, didymium, beryllium, zirconium, &c.—is of extreme interest. All occur in pegmatites or others of the oldest, and particularly the acid, rocks; and practically none are found elsewhere, except under conditions directly traceable to such an origin. Where uranium abounds, the other heavy metals are usually present in comparatively small quantity, and the other groups of rare elements are practically non-existent; while under conditions where uranium is absent, or only found in comparatively small quantity, the others may be found associated together, either as components of minerals of complicated constitution or each in its own characteristic mineral form.

It is extremely probable that there is a definite connection between these occurrences and the birth or decomposition of the elements, and that a study of them may elucidate many doubtful points more simply and conclusively than attempts, however well directed, to artificially produce results which Nature has already achieved. The occurrence of fluorides with these rare metals, or in the rocks where the same occur, is also of importance. Both fluor spar and cryolite are commonly, although by no means always, associates of them; and it is considered by many that these fluorides, which often occur in fissure veins in granites, diorites, gneisses, &c., of great age, have been produced in many cases by the action of metallic fluorides whose decomposition has resulted in the production of metalliferous deposits.

The peculiar action which the heavy rare metals have when added to steel shows how curiously they stand as a class distinct from others. Uranium, tungsten, molybdenum, tantalum, niobium, vanadium, and even titanium, have extraordinary powers in producing special effects when added to steel, even in small quantity. These powers might be considered only as of passing interest from the point of view of the chemist, were they not practically confined to one group of metals, and possessed more or less by each member of that group. It is true that valuable properties are imparted by other metals, such as aluminium, manganese, nickel, and chromium; but their effects are less marked, and are produced by the addition of a comparatively large quantity of the metal, excepting in the case of aluminium, whose action is, however, of an entirely different nature.

The recent demand for these rare metals has resulted in a large increase in the production of the minerals containing them. They were commonly passed over by the prospector or ignored by the analyst; and the present increased supply is mainly due to increased education, and is much on a par with the production of monazite and other thorium-containing minerals used for incandescent gas-mantles, and now obtainable from alluvial and other deposits in many parts of the world, in addition to its early and only source in Brazil. Upwards of 200 million of such mantles are now produced annually. The best concentrated monazite sand averages only about 5 per cent. of thorium and other earths actually required by the mantle industry, so that a large field is open for research to utilize the ceria, zirconia, didymia, &c., which are obtained as bye-products.

For the post of Assistant Water-Works Engineer, 87 applications have been received by the Water Committee of the Bolton Corporation. The commencing salary is £250 per annum, rising by £25 a year to £300.

### SCOTTISH JUNIOR GAS ASSOCIATION.

#### WESTERN DISTRICT.

A Monthly Meeting of the Scottish Junior Gas Association (Western District) was held in Glasgow on Saturday evening—Mr. D. CURRIE, of Stirling, the President, in the chair. There was only a small attendance.

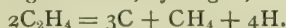
The PRESIDENT having opened the proceedings,

#### CHEMISTRY OF COAL GAS AND BYE-PRODUCT MANUFACTURE.

Mr. D. T. MARWICK (Dawsholm) read a paper on this subject, in the course of which he said:

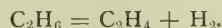
Coal is composed of the elements carbon, hydrogen, oxygen, nitrogen, and sulphur, with ash or earthy matter as impurity. From an analysis of coal, the exact amount of each element present is easily obtained; but no idea is gained as to the combinations of such therein. A very important point gained by the analysis of coal is the ascertaining of the amount of unoxidized hydrogen. As you are well aware, 16 parts of oxygen and 2 parts of hydrogen unite to form water; so that only the hydrogen remaining after combining with the oxygen in the coal is available for the formation of hydrocarbon compounds. For gas-making purposes, a coal should contain at least 4 per cent. of unoxidized hydrogen. Scotch coals, as a rule, contain more than English coals; and this gives us a decided advantage in gas making here. In Scotland, a mixture of the most ordinary coals carbonized and the resultant gas purified by iron oxide, will give 16-candle gas when tested with the "Metropolitan" burner No. 2.

In Dawsholm we have heats of 1900° Fahr. on an average, with heavy charges in horizontal retorts and carbonized for four hours. We find on taking any one coal and distilling at temperatures (say) from 1400° to 1800° Fahr., as the temperature increases so does the yield of gas, while, on the other hand, the illuminating power decreases. Candle power now-a-days being a secondary consideration, this is a strong argument in favour of high heats. We will suppose our coal is in the retort at a temperature of 1800° Fahr. and the carbonization started. The temperature will run about 1400° Fahr. near the walls of the retort, and in the centre of the coal it may be only about 700° Fahr. While again the gas near the coal is at a temperature of 1100° Fahr., that coming into contact with the sides of the retorts is exposed to one of 1800° Fahr. The coal in contact with the retort is immediately decomposed, and hydrocarbons of the olefine series are evolved. These mostly break down to ethylene, which, in turn, decomposes almost entirely, giving methane, hydrogen, and carbon, thus—



In the interior mass of coal, where heat is more moderate, we get passing off with the gas heavy hydrocarbon vapours, which, being liquid at ordinary temperatures, condense on leaving the retort, forming tar. Some of these vapours, getting into contact with the heated sides of a retort, deposit carbon, and give ethylene, which decomposes as shown above.

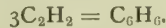
As the heat penetrates through the mass of coal, the whole of the hydrocarbons evolved are immediately decomposed, and free hydrogen is almost the only product. Then the paraffin hydrocarbons which are present in the coal during carbonization are split up into simpler members, and also form members of the olefine series. On contact with the walls of the retort, they give a series of complex reactions. Thus, taking ethane, which is the second lowest member of the group, we find that it forms ethylene and hydrogen—



The ethylene also forms methane and small quantities of acetylene—



Then when the heats are high acetylene readily polymerizes, giving benzene and other members of that series—



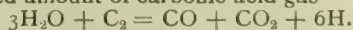
A portion of the benzene tends to condense, losing hydrogen, and forming naphthalene—



The hydrogen in the coal passes off with oxygen as aqueous vapour, and the remainder with the hydrocarbon compounds mentioned, and any excess in the free state.

Sulphur is evolved principally as sulphuretted hydrogen ( $H_2S$ ) and some bisulphide of carbon ( $CS_2$ ) and other compounds in small quantities. When coals are damp, the sulphur compounds are always higher; the aqueous vapour and sulphur readily forming sulphuretted hydrogen. High heats always produce increased yield of sulphuretted hydrogen and more especially bisulphide of carbon, which latter compound may be increased by one-third. The carbon and sulphur at high temperatures readily combine to form bisulphide of carbon.

The aqueous vapour in coal with carbon forms carbon monoxide (CO), carbonic acid gas ( $CO_2$ ), and hydrogen. Wet coals give an increased amount of carbonic acid gas—



Nitrogen on carbonization gives generally 15 per cent. as ammonia, 1.5 per cent. as cyanogen, 35 per cent. in gas and tar, and the remainder (48.5 per cent.) in coke. High heats give an increased yield of ammonia; while very high temperatures greatly increase the yield of cyanogen, at the expense of the ammonia. The

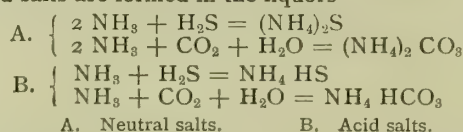


quality and quantity of the tar produced is greatly dependent on the temperatures employed. The higher the temperatures are, so the volume decreases; but the specific gravity, due to the presence of free carbon, increases (1.1 to 1.2). Pitch may increase from 30 per cent. at low heats to 60 per cent. at high heats. The naphtha, creosote, and anthracene in tar falls considerably; while the percentage of light oils disappears almost entirely. The phenols in tar are due to the splitting-up of oxygen compounds in the coal; and they increase with the percentage of that element. The composition of tars varies considerably from different coals. The coke produced, I need hardly add, contains hydrogen, oxygen, nitrogen, and sulphur, and ash as well as carbon. The harder the coke, the higher the percentage of carbon.

Regarding the temperature for carbonization, I favour heats of (say) 1800° Fahr., with heavy charges; and the gas produced will be 16-candle, and the bye-products will show a considerable revenue when worked up. If gas manufacture were carefully conducted, each coal should be tested at various heats, and the exact amount of the gas and bye-products noted, and the value of each. From such data the temperature used and the coals employed in the works would be found. I give an analysis of Dawsholm gas as it leaves the hydraulic main:—

	Per Cent.
Sulphuretted hydrogen and bisulphide of carbon . . . . .	2.0
Carbonic acid gas . . . . .	3.6
Ammonia . . . . .	1.0
Cyanogen . . . . .	0.2
Olefines . . . . .	4.0
Benzene . . . . .	0.5
Oxygen . . . . .	0.2
Carbon monoxide . . . . .	9.5
Methane . . . . .	31.5
Hydrogen . . . . .	45.0
Nitrogen . . . . .	2.5
	100.0

The ammonia remaining in the gas after passing the condenser is removed in the scrubbers. Being an alkaline base that combines with sulphuretted hydrogen and carbon dioxide, both being acids, and salts are formed in the liquors—



Our aim is to obtain the formation of the second series of salts, and so remove from the gas as much sulphuretted hydrogen and carbonic acid as possible. This cannot be carried out in practice, as neutral salts are always also produced; and carbon dioxide has a greater affinity for ammonia than sulphuretted hydrogen. In fact, 100 volumes of ammonia combine only with 50 volumes of carbonic acid and 12.5 volumes of sulphuretted hydrogen. Ammoniacal liquor, being a solution of ammonia, readily gives off ammonia at increased temperatures or in strong solution; so the temperature of the gas and the specific gravity of the liquors are carefully noted. Had we 8 per cent. instead of 1 per cent. of ammonia in gas, we could expect to remove practically all the carbonic acid and sulphuretted hydrogen from it in the ammonia scrubbers. It has been proposed to oxidize sulphuretted hydrogen to sulphur dioxide; and this with ammonia gives ammonium sulphite, which is further oxidized to ammonium sulphate. There is no doubt that the foregoing are the right lines upon which to work. We have ammonia and sulphur in our coal gas, so why have the expense of buying sulphuric acid for the manufacture of ammonium sulphate, and then recovering the sulphur evolved as sulphuretted hydrogen from the sulphate-stills? I think that the above will be the future method of manufacturing ammonium sulphate, and the necessity for sulphur purifiers will be avoided, as the carbonic acid may be left in the gas.

Cyanogen should be removed before the gas is passed into the ammonia scrubbers; otherwise a considerable portion of it is lost. At Dawsholm, the Foulis process is used; and in it the gas must be free from ammonia. The gas passes into round scrubbers containing a mixture of ferrous and sodium carbonate, when sodium ferrocyanide is formed, and any oxygen present forms insoluble prussian blue. After being worked up in the scrubbers, the liquors are evaporated, and the product contains 30 per cent. of sodium ferrocyanide and 10 per cent. of water. This product is treated with caustic soda, and the insoluble prussian blue is converted into soluble ferrocyanide. From this potassium cyanide is prepared, and used for the extraction of gold from low-grade ores of the Transvaal. The cyanogen is produced by ammonia reacting with hot coke in the retorts. Ammonia passing into the cyanide scrubbers forms ammonium sulphocyanide, which is not recovered by this process.

Carbon dioxide lowers the illuminating power of the gas. But now-a-days, with low candle power standards, this is a matter of small importance; so lime as a purifying agent is unnecessary. Sulphuretted hydrogen must be removed from the gas, and iron oxide is the material generally used. It has no effect on carbon dioxide; but cyanogen passing forward forms iron ferrocyanide, and cyanogen can be extracted from this compound. Lime purification is used when carbonic acid gas has to be removed. It is also employed when bisulphide of carbon and any other sulphur compounds have to be kept down to a very low figure. As a means of removing sulphuretted hydrogen it is most expensive, as the waste lime commands no price worth speaking of. Car-

bon bisulphide is removed to a small extent by the lime purifiers; but if air has been drawn in, it will be almost completely removed. The drawing in of air in lime purification results in twice as much sulphuretted hydrogen being taken out as if none were used. The various sulphur compounds formed seem to be oxidized by the air, giving thiosulphate and free sulphur, which latter shows the largest increase. I consider it is a most expensive and ridiculous method of sulphur purification to draw in air to lime purifiers. You use lime to remove the effect of the carbonic acid in coal gas, and then draw in air, which also is a diluent.

The ammoniacal liquors from the condensers, scrubbers, and hydraulic main, are collected and distilled in special stills by means of steam; lime being added to liberate the fixed ammonia. This is absorbed by sulphuric acid, and crystals of ammonium sulphate are formed. The waste gases from the still consist of carbonic acid and sulphuretted hydrogen; and they are either absorbed by oxide of iron or burnt in a Claus kiln and sulphur obtained. The yield of sulphate per ton of coal varies; but 28 lbs. of  $(\text{NH}_4)_2\text{SO}_4$  may be considered very satisfactory.

Coal tar is distilled in wrought-iron stills, and the vapour passing off condenses in iron worms immersed in water. A thermometer in the stills will give the temperature, and show when the receiver should be changed. The method of procedure naturally varies in different works with regard to the temperatures when the receiver is changed and the number of fractions taken. I give you an analysis of tar, showing the amount by weight of products, from the Dawsholm Chemical Works.

Ammoniacal liquor . . . . .	2.0
Crude naphtha . . . . .	2.0
Creosote . . . . .	30.0
Pitch . . . . .	66.0
	100.0

The products that are obtained from coal tar are: Pitch, used for asphalt and varnish. Benzene, prepared from 90 per cent. benzol. Nitrobenzene, formed from benzene. This compound is often used instead of oil of bitter almonds for perfuming purposes, but chiefly for the manufacture of aniline, from which aniline dyes are produced. Phenol (pure carbolic acid). By the action of sulphuric and nitric acids, picric acid is formed. This substance is an explosive, and as lyddite in South Africa and melenite at Port Arthur is all too well known. It is of great value for dyeing silk and wool a brilliant yellow. Naphthalene, used for the manufacture of various dyes. Naphthol, which gives us naphthalene yellow. Anthracene, which is the starting-point for the manufacture of alizarine colouring matter used in producing turkey red dye. This alizarine is a substance which has been used for dyeing since the earliest time, and was always prepared from roots until the discovery of the above process. Triphenylmethane, which can be prepared from benzene. From it we obtain various compounds used as dyes.

#### Discussion.

Mr. P. M'DOUGALL (Helensburgh) said it would be out of the question to attempt to travel over in detail extemporaneously the very important points contained in the paper. This must be left till they had it in the Technical Press. However, viewing the gas industry on broad lines, it resolved itself into a system of partial conservation and distribution of energy, governed by important chemical and physical laws. It was interesting to note that chemical reactions could be of two kinds—viz., exothermic and endothermic. During exothermic reaction, heat was liberated, as indicated by  $\text{C} + \text{O}_2$ ; and when endothermic reaction was taking place, heat was absorbed, as indicated by  $\text{C} + \text{H}_2\text{O} = \text{HCO}_2$ . It was equally important to note that the difference in energy between two identical conditions of a system must be the same, irrespective of the method by which the system was transferred from one condition to another. To put it in a different way, the complete combustion of carbon with oxygen was carried out with the liberation of 14,500 B.Th.U., whether combustion went on in one or two phases. In one phase they had  $\text{C} + \text{O}_2 = \text{CO}_2 + 14,500 \text{ B.Th.U.}$ ; and in two phases they had (1)  $\text{C} + \text{O} = \text{CO} + 4000 \text{ B.Th.U.}$  and (2)  $\text{CO} + \text{O} = \text{CO}_2 + 10,500 \text{ B.Th.U.}$  The total heat generated was equivalent to that evolved by the first. By the term "combustion," when speaking of producers, they meant the interaction between carbon and oxygen in the development of sensible heat. It was interesting to note that this interaction could take place in two forms—thus: (1)  $\text{C} + \text{O}_2 = \text{CO}_2 + 14,500 \text{ B.Th.U.}$  for 1 lb. of carbon; (2)  $2\text{C} + \text{O}_2 = 2\text{CO} + 8000 \text{ B.Th.U.}$  for 2 lbs. of carbon; and (3)  $2\text{CO} + \text{O}_2 = 2\text{CO}_2 + 21,000 \text{ B.Th.U.}$  for 3 lbs. of carbon. Each of these was a true combustion in the sense that both were accompanied by the production of sensible heat. In order to work retorts properly, it was essential that the last two reactions should take place distinctly, and be realized in different parts of the setting.

Mr. F. CUTHBERT (Kirkintilloch) pointed out that the author told them that unoxidized hydrogen in Scotch coal was 4 per cent., while in English coal it was less; and he asked if Mr. Marwick could give them the figure for English coal. He also spoke of the introduction of 1 per cent. of oxygen. What would he recommend if oxygen were not available?

Mr. J. FRASER (Provan) said he could corroborate what Mr. Marwick had stated about high heats. They had had experience with them, and could prove conclusively that they increased the value and improved the illuminating power of the gas. So much was this the case, that at Provan they were in a position to reduce



their gas to the standard; whereas he understood that at some smaller works it was very difficult to bring it down to anything approaching this.

Mr. A. KELLOCK (Alloa) agreed with the previous speaker that the higher the heats the better the results. Two or three years ago, at Alloa, they started with heavier charges and higher heats; and the results had shown that they were on the right lines. But there was always one thing they had to say, which the previous speaker had forgotten to mention—that the naphthalene trouble started with them. This was a thing not heard of in Scotland some years ago. With them, it came with the high heats and the high gas yields; and they had to look elsewhere in order to find some means of getting rid of the naphthalene. They had tried an Everitt's tar extractor, and now they were not so much troubled with naphthalene. In the matter of purification, they could not be too careful of the way they looked after their scrubbers. In Alloa they had saved their purifiers considerably by doing so. The author did not say much in regard to the quantity of air used to revivify oxide *in situ*. They had done a good deal of this of late. They could put in 3 per cent. of air; and they had been able to pass through one purifier, before they required to turn out the contents, as much as 120 million cubic feet of gas, which was nearly equal to a year's production.

Mr. FRASER wished to mention that he had overlooked the matter of naphthalene; but the same thing applied to all gas-works where high heats were in use. It applied to Provan; but with a little care it could be avoided. They made it a point to clean the scrubbers thoroughly in summer, and so saved the purifiers as much as possible during the winter.

Mr. T. W. SAVILLE (Thornliebank) asked for more information about the working of coal tar and the proportion of pitch.

Mr. D. FULTON (Dawsholm) remarked that Mr. Marwick probably had done full justice to his subject, and had touched on matters which were new to the Association. A paper like his gave information which the members generally could only acquire by reading up text-books; and therefore they were the more indebted to him.

The PRESIDENT considered that Mr. Marwick had, in his paper, conveyed to the members a lesson as to how gas should be manufactured—viz., that the gas maker ought to know exactly what was taking place in every process, from the time he received the coal into the works until he had sold the bye-product. The scope of the paper had been so great that they could not devote the time to go into any detail of the methods employed in the carrying out of tests or the methods of operation in the works with which he was connected. But in bringing the various operations before them, the author had directed their attention to what ought to be the method adopted in manufacturing gas. Several speakers had dealt with the question of high *versus* low heats. The subject was one upon which there was great diversity of opinion, even at the present time. Previous speakers had, however, omitted to mention what they meant by heavy charges. What might be a heavy charge to one man might be a medium charge to another; so that they could not make any comparison from results, so far as naphthalene was concerned. His own observation with regard to heavy charges was that what they might call high heat—that was to say, simply roasting the coal—he did not believe in at all. He believed in having a heat just sufficient to burn off the charge in a given time, with no excessive heat. Of course, with hand stoking heavy charging could not be adopted on the same scale as with machinery. With this they could charge a retort up to 3 inches of the crown. They could get in about 12 cwt., and could lay it level. If the charge were uneven, or if the heats were too high, they would begin to find naphthalene. Again, if the retorts were charged low towards the mouthpiece, they would be troubled with choked ascension-pipes; but if charged full up, the same as in the centre, there would be no trouble. These were matters which cropped up periodically through the conditions of extra high heats with uneven charges. He asked the members to accord Mr. Marwick a hearty vote of thanks for his most interesting and instructive paper.

This having been cordially agreed to,

Mr. MARWICK thanked the members for their reception of his paper. He was asked about unoxidized hydrogen in English coal. What he said was that English coal might be about 4 per cent., and that Scotch coal might be  $4\frac{1}{2}$  or 5 per cent. As to oxygen, he said that for 1 per cent. of sulphur they drew in 3 per cent. of air. Where they had naphthalene, the principal trouble was cooled water. He would not consider 1800° Fahr. to be a high heat. Some authorities said that the best temperature for carbonization was when the free compounds were broken down, and benzene was formed, but that they should not go so far that the benzene would form naphtha. The other was, they should strike the heat where they had a small proportion of benzene formed. He did not believe in very high heats, and taking everything out of the coal. What the President said about heavy charges was very interesting. He approved of having the retorts well filled up, because it gave less surface, and the gas was not so exposed to heat all over; moreover, naphthalene was not formed. One speaker mentioned that he might have given some particulars about coal tar; but he had not gone into any details.

#### MR. FLETCHER'S PAPER ON INCANDESCENT GAS LIGHTING.

The PRESIDENT reminded the meeting that the discussion upon the paper by Mr. Laurence Fletcher, the Chief Engineer to the Welsbach Incandescent Gaslight Company, Limited, on "Incan-

descent Gas Lighting—Some Points of Interest," which was read at the January meeting of the Association [see *ante*, p. 105], had been postponed to that evening. He said the paper was a very interesting one, and the members had had the opportunity of studying it in the Technical Press. It was certainly worth studying, because the members would gain a good deal of knowledge from it—Mr. Fletcher being an expert authority on the subject. One thing which must have attracted their attention was his description of the quality of gas best suited for incandescent gas lighting. He advocated gas of from 12 to 14 candle power, with a minimum pressure of 2 inches at the burner. This statement, coming from an authority such as Mr. Fletcher was, must make them think of the quality of their own gas. Very few gas undertakings in Scotland supplied gas of less than 20-candle power; so that, in order to get the best results from incandescent gas lighting, they would have to make a big stride in the direction of reducing the illuminating power. It was very interesting to hear of the importance of having a properly fitting mantle.

No other remarks being offered,

The PRESIDENT asked the members to accord a hearty vote of thanks to Mr. Fletcher for his paper.

This was heartily given; and the proceedings closed.

#### Beckton Rifle Club.

On Saturday evening, the annual prize-giving and dinner of this club was held at Beckton in a room adjacent to the Rifle Ranges. The "G" company of "The Rangers" (the 12th Battalion County of London Regiment) dined with the Rifle Club. The room was beautifully decorated. The chair was taken by Mr. Corbet Woodall, who is President of the Rifle Club, and Hon. Colonel of the Rangers. The Gaslight and Coke Company have furnished the club with admirable covered and open ranges of 25, 50, and 100 yards respectively. Of the Rangers, three companies, or more than 300 men, are recruited from the stations of the Company, and seven of the officers are in the same employ. The Rifle Club has some 400 members; and the standard of shooting, as evidenced by the year's record of competitions, is very good indeed. Mr. J. N. Reeson, the Engineer of the Beckton station, has taken great interest in the Club, and is himself an excellent marksman. The proceedings on Saturday evening were characterized by much enthusiasm, and evidenced the good relations existing between all ranks in the service. After dinner the toast of "The King" was honoured. Then followed "The Navy, Army, and Reserve Forces," proposed by the Chairman, and responded to by Colonel H. S. Coldicott, V.D. The distribution of prizes by Mr. Woodall succeeded. In his usual happy vein, Mr. D. Milne Watson, the General Manager of the Gaslight Company, proposed a hearty vote of thanks to the President; and needless to say there was enthusiastic reception and compliance. Mr. H. Marks, the Editor of the "Marksman," submitted the toast of "The Gaslight and Coke Company," and response was made by Mr. J. Douglas Walker, K.C., one of the members of the Board. An excellent programme of music was rendered during the evening. The enjoyment of the occasion will further increase the pleasurable anticipation of the next annual dinner and prize-giving.

**Notes from Hythe.**—In the paper which he read before the London and Southern District Junior Gas Association last Friday week, entitled "Notes from Hythe," Mr. C. E. Rosevear stated that "for the year ended June 30, 1909, the leakage amounted to about 21 per cent.; while for the six months to Dec. 31, it was only about 6 per cent." He has since discovered that this calculation was based on a wrong figure as to output, and that the leakage for the past half year was in reality 18 per cent., and not 6 per cent.

**Analyses of Municipal Gas Accounts.**—We have received from Messrs. John Allan and Co. the "Gas World Analyses of Municipal Gas Accounts" for 1908-9. The accounts of 69 municipal gas authorities are analyzed; all the items of revenue and expenditure being worked out at per 1000 cubic feet of gas sold. The makes of gas of the undertakings range from 45 million to upwards of 7000 million cubic feet per annum. Comparisons can be made of the make and sale of gas per ton of coal, of the residuals produced, of the capital charges, and of the capital employed in proportion to the volume of business done, &c. Cardboard rules, either in blank to allow of figures being filled in, or with the figures of any particular undertaking in the series printed thereon, are supplied with the "Analyses," so as to facilitate the comparison of one account with another. The price of the book is 10s. 6d. net.

**Presentations to Mr. J. W. Schofield, of Huddersfield.**—Last Friday week, as many of the chief officers of Huddersfield Corporation as could attend assembled in one of the committee-rooms at the Town Hall to make a presentation to Mr. J. W. Schofield, the Water-Works Manager, on the occasion of his forthcoming marriage. The article presented was a handsome oak writing-table, to which was affixed a brass plate bearing the following inscription: "To J. W. Schofield, Esq., by his brother chief officers, Huddersfield Corporation, with sincere regard and best wishes on the occasion of his marriage, 31st January, 1910." The Mayor (Alderman John Holroyd) presided, and made the presentation. He said he had the greatest pleasure in asking Mr. Schofield's acceptance of the handsome piece of furniture which had been selected, hoping that he and his wife might live many years to use the table.



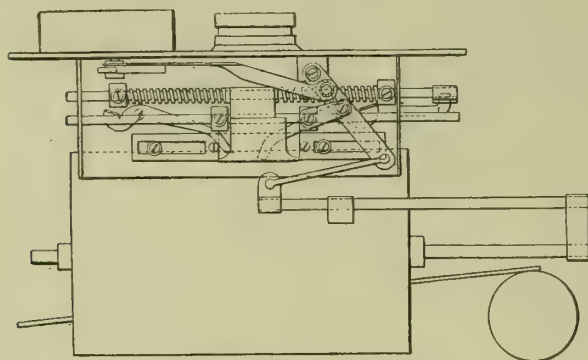
## REGISTER OF PATENTS.

### Liquid Meters.

DONISTHORPE, E. S.; a communication from W. BERESFORD, of Bristol, R.I., U.S.A.

No. 1143; Jan. 16, 1909.

This invention relates to liquid meters of the class in which the reciprocating movement of a piston in a measuring cylinder actuates the valve by which the liquid to be measured is directed to either end of the cylinder alternately.



Beresford's Water-Meter.

The liquid, on its way to the cylinder, passes through a valve chamber in the form of a cylinder open at both ends and having near each end a port leading to a measuring cylinder—the inlet port being at the middle of its length. In this chamber is a valve consisting of two pistons connected together, but at such a distance apart that when one is at one end of the chamber (which is thus closed) the other lies between the inlet port and the outlet port at the other end. The valve is preferably operated as follows: A rod parallel with the piston-rod, and sliding backwards and forwards by its motion, has upon it a pair of lugs actuating a sliding block loose upon the valve-rod, which carries two helical springs, the outer ends of which are secured to adjustable stops on the valve-rod while the inner ends are loose and butt against the sliding block. A pair of pivoted catches is adapted to engage the stops, at either extreme position of the valve-rod; and the catches are tripped by a slide near the end of the travel of the piston. Preferably the rod first mentioned is slid backwards and forwards by a link connecting it to an arm suspended from a pivot about which it is rocked by the reciprocating movement of another rod directly connected to the piston-rod. The lugs and stops may both be adjustable on their rods so that the amount of liquid passing on each stroke can be adjusted.

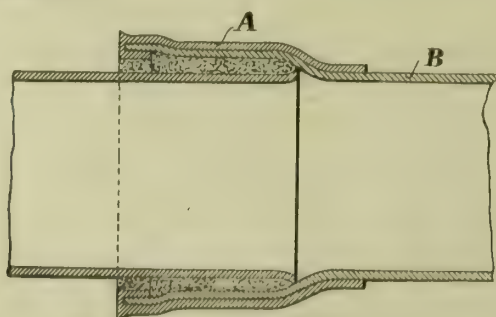
The action is as follows: Supposing the piston and valve to be at the left of their travel, the left stop being engaged by its catch. The left end of the valve chamber is closed; and liquid entering it passes through the left port to the left end of the cylinder—moving the piston to the right. The liquid in the cylinder will thus be expelled through the right port and away through the right end of the chamber. The movement of the piston causes the block to move to the right, compressing the right-hand spring and allowing the left-hand spring to extend. As the piston nears the end of its travel to the right, the left catch is tripped, releasing the valve-rod, which is thrown over to the right by the right-hand spring—thus giving a sudden movement to the valves. The valve-rod is then caught by the right-hand catch, and corresponding movements in the reverse direction ensue.

### Pipes with Reinforced.Sockets.

ISENBURG, L., of Bous-on-the-Saar, Germany, KÜHN, P., of Landore, South Wales, and the BRITISH MANNESMANN TUBE COMPANY, LIMITED, of Salisbury House, E.C.

No. 1601; Jan. 22, 1909.

According to this invention, the reinforcing sleeve placed over the socket end of the pipe is held fast on the socket end by beading the end of the sleeve over the end of the socket, which latter end is preferably flattened out.



Reinforcing a Mannesmann Pipe Socket.

As shown, one portion of the reinforcing ring or sleeve A is mounted in the usual way on the end of the pipe B. The end of the ring projecting over the top end of the pipe is beaded over on the inside of the pipe, so that it fits against the inside of the pipe—this tight fitting being brought about and assisted by pressing. The beaded end of the

ring is preferably flattened out, and the top end is provided with sharp edges similar to the old socket pipe ends provided with thickened ends.

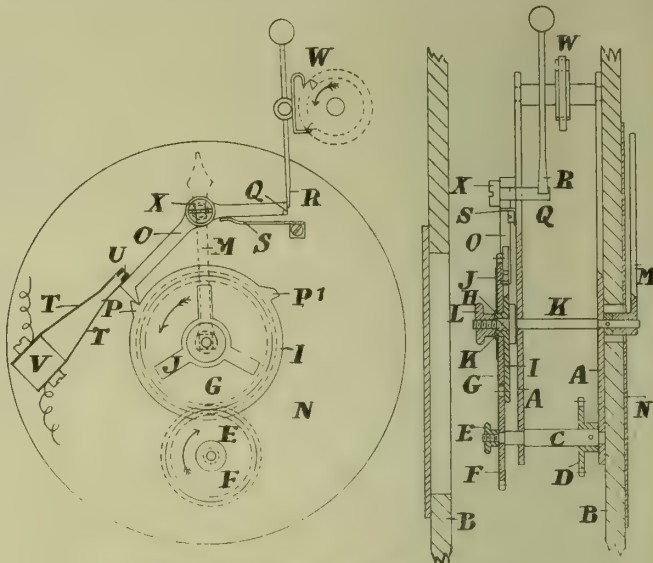
The projection formed by the reinforcing ring in the interior of the pipe socket prevents the packing leaving its place; and, moreover, the projection resists a pulling apart of the pipes. This resistance can be increased by bending the end of a pipe adapted to fit into the socket a little in the upper or outward direction, so that it will engage behind or in the packing.

### Indicating the Expiration of Certain Intervals in the Manufacture of Water Gas.

CLUDERAY, E. S., of Harrogate.

No. 1835; Jan. 26, 1909.

This invention has for its object the timing of certain operations occurring in the manufacture of water gas and the like.



Cludera's Water Gas Cycle Recorder.

The apparatus (shown in back and side elevation) is carried by plates A, enclosed in a case B. The arbor C is driven by clock-movement through the spur-wheel D, in the usual manner, and carries, held in position by the knurled nut E, an interchangeable spur-wheel F, which gears with a spur-wheel G, held on the round bush H, integral with the tappet-wheel I, by the spring J. The tappet-wheel has a square hole in the centre, and is held on to a squared arbor K, by a left-handed knurled nut L. The arbor carries at its other extremity a pointer M, moving round a dial N. A lever O, pivoted on the screw X, is moved at certain intervals by the tappet-wheel teeth P, so depressing the detent Q, and releasing the alarm W, by means of the hammer tail R. The lever O is kept in contact with the tappet-wheel I by the spring S. The friction spring J allows the pointer, arbor, and tappet-wheel to be revolved independently of the wheel G. To change the time of revolution of the pointer, and the ringing of the alarm, it is only necessary to unscrew the nuts E L and replace the spur-wheel F and the tappet-wheel, spring, and spur-wheel I J G with others having the required ratios. The lever O is also arranged to close an electric bell circuit by means of the springs T, having platinum contacts U, carried on the insulating block V.

In order to better understand the use of his invention, it is explained that in the manufacture of water gas the operator must open or close certain valves at definite intervals while the plant is in operation—say, open alternately a blast-valve for three minutes and a steam-valve for six minutes, and to repeat this cycle as often as is necessary. The object of the invention is to show more distinctly and more accurately, by the pointer and dial, the interval of time which has elapsed since the valve was opened, and also, by the ringing of an alarm, to indicate accurately to the operator that one valve must be closed and others opened. To accomplish this, the arbor carrying the pointer and tappet-wheel is caused to make a revolution in the time of a cycle of operations (say, nine minutes); the tappet-wheel teeth being at such positions as will correspond with these times.

The apparatus is used as follows: The clock being stopped by a lever (not shown), immediately after opening the blast-valve the lever is moved, starting the clock, which causes the arbor, tappet-wheel, and pointer to revolve by means of the spur-wheels. When the required interval has elapsed, the tooth P<sup>1</sup> comes into contact with the lever O, and releases the alarm for a few seconds until the lever O drops off the tooth. The alarm is now silent until the tooth P comes into action, causing a second ringing of the alarm, which may be longer or shorter than the first, according to the width of the tooth. The pointer will now have returned to zero, and the cycle may be repeated as necessary.

### Gas-Lamps.

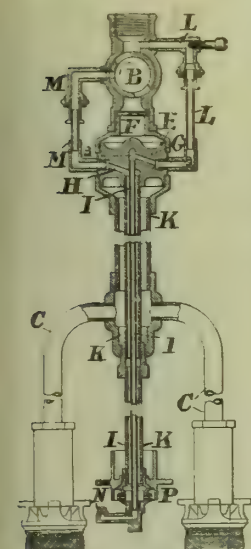
BREEDEN AND CO., LIMITED, of Birmingham.

No. 5972; March 12, 1909.

The patentees arrange below the main supply or down pipe of the lamp an extension consisting of two concentric tubes the inner or axial tube extending through the bottom or closed end of a "flash-light" body part with which the outer or larger tube terminates. The bent-up projecting part of the inner or axial tube is provided with a pilot-burner adjacent to the "flash-light" body part, which latter has in its cylindrical portion a series of perforations, and over the perforated part is a cap or depending shield having in it a series of notches. The



inner tube (to which a permanent supply of gas is maintained by the ordinary bye-pass supply pipe to which it is connected) provides a constant flame to the pilot burner; while the outer tube is attached to a supplementary bye-pass pipe connected to the barrel of the main supply tap, a passage in which tap opens temporarily to the supplementary bye-pass pipe as the main supply tap opens.



Breeden's "Flash-Light" Burner.

from the burners D; and as the main supply tap is fully opened, the supply to the supplementary or secondary bye-pass pipe M is cut off.

The main supply pipe of the lamp is controlled by the tap B; and in connection with the main pipe are two branch pipes terminating at their lower ends in inverted incandescent burners. At the junction of the tap with the main supply pipe is a short tubular body E, having a partition F crossing it diametrically and having gas-ways on each side and radial gas-ways G H within the wall of the partition. These gas-ways communicate with concentric inner tubes I K. The gas-way G is connected to the bye-pass gas-pipe L; while H is connected to a secondary bye-pass gas-pipe M, which is opened momentarily as the tap is turned from its fully-off to its fully-on position. The tap is represented partially turned on and the pipe M fully open. The lower end of the pipe I is connected to the pilot-burner N; while the pipe H is connected to the "flash-light" body P, having the series of jets surrounded by a cap S having in it a series of notches.

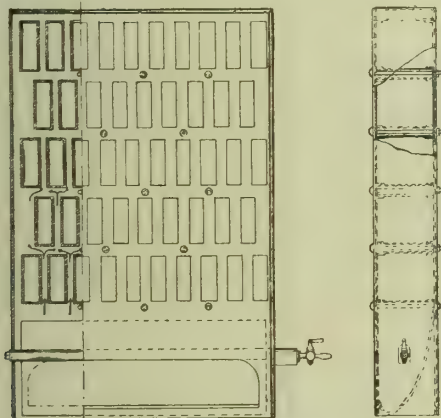
When a supply of gas issues from the perforations in P the pilot-light N causes the series of jets in it to ignite the gas issuing from the burners D; and as the main supply tap is fully opened, the supply to the supplementary or secondary bye-pass pipe M is cut off.

### Gas-Stoves.

BERGER, M., of Zurich, Switzerland.

No. 13,940; June 14, 1909. Date claimed under International Convention, Aug. 3, 1908.

To "secure more efficient utilization of the heat of gases burnt in gas-stoves," the patentee proposes to arrange, above the gas-burner pipe, channels (of rectangular cross section) in rows in the heating body; the channels in each row being staggered relatively to those in the rows above and below. The channels, which traverse the heating body, are



Berger's Gas-Heating Stove.

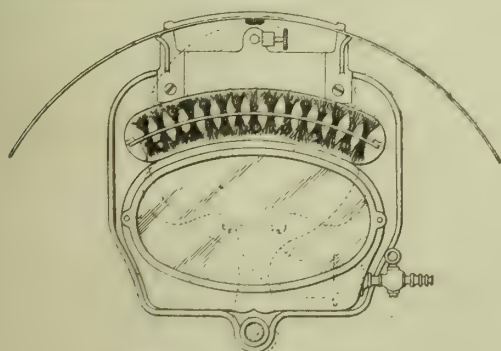
open at both ends—an arrangement that compels the heating gases to traverse a long path from the bottom to the top, and "by this means efficient utilization of the heat is obtained." The cooled gases leave through openings at the top; and the waste gases are preferably led away to a chimney.

### Gas-Heating Stoves.

SPONG, J. O., of High Holborn, London.

No. 14,157; June 16, 1909.

This invention relates to the class of gas-stove used for heating described in patent No. 23,610 of 1908. The proposal is to take a sheet of mica of the desired size and perforate it in any desired manner. In



Spong's Gas-Heating Stove.

the perforations are placed bunches of asbestos fibre or thread in such a manner that the bunches project from both sides of the mica sheet,

which is placed in a vertical position between two rows of gas-burners, the flames from which lick up between the asbestos fibre and render it incandescent, "conveying great heat which, with the aid of a reflector behind, becomes thrown or diffused into the room and at a great distance away from the burners."

### Settings of Vertical Retorts.

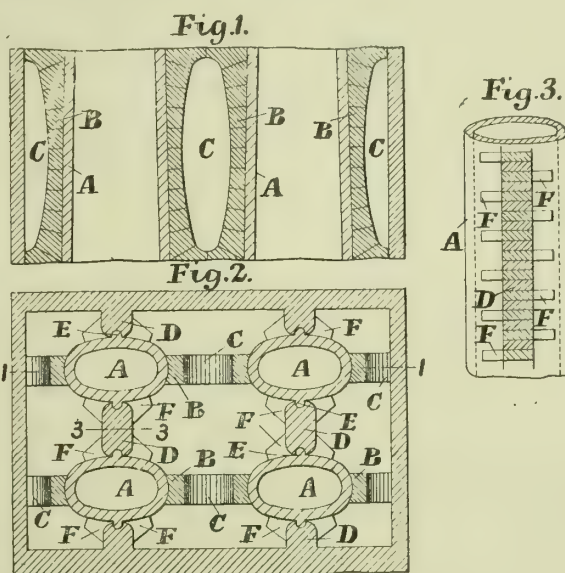
WOODALL, H. W., of Bournemouth, and DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 21,554; Sept. 21, 1909.

In constructing the settings of vertical retorts, the patentees point out that "it is difficult to provide for the adequate support of the retort without obstructing the interspaces which constitute the flues and leaving exposed too small an area of retort."

According to the present invention, the thickness of the supporting columns of the setting may be considerably reduced by forming the openings therein, through which the combustion gases pass, of lanceolated shape. Owing to this construction, the columns may be comparatively thin—thus allowing the maximum cross section for the flues and covering as little as possible of the retort surface.

They add: Vertical retorts are generally of elliptical section, and require better support on the long sides than on the short sides. To secure this without unduly covering the surface, the columns supporting the long sides are, according to this invention, built in such a manner that at frequent, and preferably regular, intervals there is inserted a brick having wings which extend over a greater surface of the retort than that covered by a brick without wings.



Woodall and Duckham's Vertical-Retort Settings.

The invention is illustrated as applied to a setting of four retorts—fig. 1 being a vertical section on the line 1 of fig. 2 (a horizontal section); while fig. 3 is a part section on the line 3.

The narrow sides of the retorts A are supported by walls or columns B, in which, at a suitable distance from each other, are openings C, of lanceolated shape, for the passage of the combustion gases. The columns D, which engage ribs E on the retort (as described in patent No. 24,695 of 1906), are built of bricks, of which each alternate one has a wing F; the wings extending alternately to the right and to the left of the column.

### APPLICATIONS FOR LETTERS PATENT.

- 1722.—VIVIAN, F. G., "Asbestos top rimmed incandescent burner." Jan. 24.
- 1724.—ROSE, A., and BELLAMY, W., "Regulating the gas supply to burners." Jan. 24.
- 1869.—LUCAS, O. D., "Fluid-meters." Jan. 25.
- 1900.—GUTEHOFFENUNGSHUTTE AKTIENVEREIN FUR BERGBAU UND HUTTENBETRIEB, "Gas-producers." Jan. 25.
- 1909-10.—DEPREZ, O., and RICHIR, A., "Carburettors for illuminating or heating." Jan. 25.
- 1954.—COOPER, A., "Gas fire-lighter." Jan. 26.
- 2017.—WILLIAMS, G. A., "Gas-regulators." Jan. 26.
- 2046.—CUMMINS, F., "Regenerator furnace." Jan. 27.
- 2083.—AKT.-GES. VORM. H. MEINECKE, "Preventing unmeasured quantities of fluids from passing meters." Jan. 27.
- 2170.—SCHMITZ, W., "Inverted burner." Jan. 28.
- 2171.—SCHMITZ, W., "Mantle protector." Jan. 28.
- 2180.—BURNETT, J., "Liquid meters." Jan. 28.
- 2181.—LUCAS, P., "Incandescent gas-lighting." Jan. 28.
- 2220.—NEMEROVSKY, J. M. & F., "Burning machine for mantles." Jan. 28.
- 2222.—NEMEROVSKY, J. M. & F., "Machines for burning-off incandescent mantles." Jan. 28.
- 2223.—NEMEROVSKY, J. M. & F., "Looping and shaping mantles." Jan. 28.
- 2308.—PLATTS, H. C., "Packing for joints." Jan. 28.

In the "JOURNAL" for the 18th ult., p. 184, some particulars were given of a modified form of gas-main stopper, the invention of Mr. Patrick Goodman, of New York. We learn that Messrs. Parker and Lester, of Ormside Street, Old Kent Road, who have for many years past interested themselves in the introduction into English gas-works of Mr. Goodman's earlier arrangement of stopper, are handling the improvement covered by the 1909 patent.



## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### National Memorial to the late Sir George Livesey.

SIR,—“Now the hurly-burly's done, now the battle's lost and won,” may I (politics apart) crave space to advocate a National Memorial to the late Sir George Livesey? However commendable the endowment of a Chair of Chemical and Physical Research in Leeds University may be, in my opinion it inadequately expresses what we feel for his loss, our admiration for his work, or his memory richly deserves.

To the man who made profit-sharing and co-partnership a living and practical force; produced an antidote to the moral, brutal, and social poison engendered by strikes, lock-outs, and kindred methods of settling labour disputes; forged and presented a weapon of peace to the manufacturing and other industries of the world—surely a National Monument is due, and should be provided; and I suggest that his statue in bronze be placed in the Embankment Gardens, in the Metropolis of the World, overlooking the Thames, upon whose waters are borne most of the raw material used in the metropolitan area in the production of artificial light, heat, and power.

A more appropriate position could not be imagined; and it would be an honour to the gas profession to carry it out.

But, Sir, bearing in mind the beneficial effects of co-partnership, and its extensive adoption and universal applicability, I appeal to a larger field of subscribers than the gas profession *per se* compose, and invite the co-operation of the vast industrial undertakings of the English-speaking race; and even those who speak a foreign tongue, if they desire to assist, should not be excluded from testifying their respect to the memory of our countryman, and to the lasting benefits that co-partnership and profit-sharing bring in their train. Its universal adoption would bring about “peace on earth and goodwill towards men”—“a consummation,” Sir, “devoutly to be wished.”

A commemorative statue of Isambard Brunel adorns the Embankment; and I hope to see our late leading gas engineer and administrator similarly honoured. Although not a man of means, my mite towards the necessary fund shall be forthcoming.

In conclusion, Sir, I ask for the use of your columns for correspondence, in order to bring this proposal to a successful issue.

34, Victoria Street, S.W., Feb. 2, 1910.

C. E. JONES.

### Removing Scurf from Retorts.

SIR,—I see in your issue of yesterday (p. 300) a notice of a patent taken out in France by M. Rudolph Tenckhoff for a process for scurfing retorts. I have cleaned retorts in a similar way for more than twenty years. For some years I used a special malleable iron pipe  $\frac{3}{4}$ -inch thick (after working on with thin ones for a long time); but even these would not stand more than a few cleanings. Some twelve or fifteen years ago, I tried ordinary 3-inch sanitary pipes just laid along the bottom of the retorts, with the spigot end pressed into the faucet, and pushed back to the end of the retort. The cap was then taken off the ascension-pipe, and the door closed up, with the pipe projecting for air supply. Since then we have not had one-fourth of the damage done to the retorts, as very often the carbon will clear off in a thin slice, without the use of a cleaning-bar, and with a very great saving of labour in cleaning. We sometimes use the same pipes for five or even six retorts. It is true we have not half the carbon for sale that we had before; but the loss of this seems to me only a secondary consideration compared with the saving of the retorts.

Seaham Harbour, Feb. 2, 1910.

J. WHYTE.

### Chartered Institute of Secretaries.

SIR,—Referring to a paragraph in the “JOURNAL” of the 1st inst., I should like to say that the Council of the Chartered Institute of Secretaries has expressed its willingness to further the question of sectional meetings of its members. I am sure something might come of it, if gas secretaries who are members would write to the Secretary of the Institute at No. 65, London Wall, E.C., saying: (1) If they desire to meet or not; (2) the most suitable time of the year; (3) whether the meeting be confined to their own industry or open to others.

Feb. 3, 1910.

ANOTHER F.C.I.S.

### Mr. Fletcher W. Stevenson on Coal Gas and Its Uses.

Considerable interest was evinced in a very instructive lecture delivered at the Coventry Municipal Technical Institute last Tuesday by Mr. Fletcher W. Stevenson, M.Inst.C.E., the Engineer and General Manager of the Corporation gas undertaking, who dealt with the history, manufacture, and uses of coal gas. The lecturer prefaced his remarks by referring briefly to the means employed for artificial illumination before the possibility of lighting by gas was discovered; the explanations being accompanied by an excellent series of lantern slides. Mr. Stevenson reviewed the history of coal gas, and gave a detailed description of the various processes connected with its production. Reference was made to the Welsbach mantle, and to the part it had played in the gas industry; and the lecturer gave some hints as to its use. The apparatus employed for testing the illuminating power of gas was described; and the utility of gas for cooking and heating purposes was dilated upon. The lecturer informed his hearers that there are in the United Kingdom at the present time more than 2 million gas-stoves in use; and he said that, thanks to their cleanliness and handiness, the number was rapidly extending. Progress was also being made in the use of gas-engines, of which there are now upwards of 120,000 at work. Mr. Stevenson gave statistics showing the growth of the gas industry in the last twenty years; and at the close of an entertaining lecture, for which he was cordially thanked, he answered a number of questions.

## LEGAL INTELLIGENCE.

### THE LAW AS TO THE GUARDING OF TRENCHES.

At the Edmonton County Court on Monday of last week, Walter Machin, a commercial traveller, of Forest Gate, brought an action against the Tottenham and Edmonton Gas Company to recover £50 as damages for personal injuries. Plaintiff met with an accident on Nov. 5, which he attributed to the negligence of the Company's servants in not protecting a trench made in the pavement, in order to lay on the gas to a shop in Lymington Avenue, Noel Park.

Mr. MEDCALF appeared for the plaintiff; and Mr. SCARLETT, for the Gas Company.

Plaintiff, giving evidence, stated that he was walking along at about 3 o'clock in the afternoon, when his foot caught against a paving-stone, and he was thrown across the trench, which he had not previously observed. There was a dense fog at the time; and he was short-sighted. He struck the side of his head against the pavement, and injured his left ear; and his leg was also bruised. When he picked himself up, he was in a dazed condition; and after someone had brushed his clothing, he proceeded home. On Nov. 9, he consulted Dr. Johnson, of Forest Gate; and from that date up to the present time, he had been under his treatment. For three weeks he was unable to follow his business, thus suffering a loss of £6 6s. in wages. He declared that the trench had been left unprotected.

In cross-examination, witness admitted he was blind in the left eye.

A witness who saw the plaintiff fall said that he did not notice any rods protecting the opening.

Mr. SCARLETT submitted that there was no case to answer, as the accident arose entirely owing to plaintiff's impaired eyesight.

Judge TINDAL ATKINSON, however, directed him to call evidence.

Two of the Company's servants, who were employed in making the connection to the premises, swore that the trench was protected by iron rods, which were fixed to an upright near the kerb, and stretched quite across the pavement. The point where they were attached was about 3 ft. 6 in. from the ground; and they sloped down till they were about 1 ft. 9 in. above the pavement near the shop front. It was denied that there was a thick fog at the time. The occupier of the shop gave similar evidence.

Mr. MEDCALF urged that the rods should have been fixed at the same level right across the pavement.

His HONOUR, in giving judgment, said that he was of opinion that the Company's servants did what was reasonable to protect ordinary persons from injury, and that the accident happened solely in consequence of the plaintiff's extremely defective vision. If it were held that it was obligatory on the Gas Company to so guard their trenches as to protect from accident all persons, whatever might be the condition of their eyesight, then the plaintiff would be entitled to judgment; but he did not think this was the law. He considered that the Company were only bound to take reasonable and proper precautions to protect those with ordinary eyesight; and he therefore gave judgment for the Company, with costs.

### GAS MANAGER CHARGED WITH EMBEZZLEMENT.

At the Newport (Salop) Police Court, last Tuesday, James Wild, Working Manager of the Newport Gaslight and Coke Company, Limited was charged, before a Bench of Magistrates, with embezzling certain sums of money.

Mr. WATSON, in opening the case for the prosecution, said defendant was charged with embezzling on Oct. 11, 6s. 10d.; on Oct. 28, 2s. 6d.; on Dec. 3, 6s. 2d.; on Dec. 29, 2s. 1d.; and on Jan. 15, 10d. Part of his duty was to attend to the sale of coke and other products, and to enter these in a book, which book should contain a copy of the sales. It was also his duty to receive payments for these various sales, and at the end of each week to make a list of all the payments to the collector, who checked them, entering them in his books. Tickets for the sale of coke had been made out, giving the weight and the cash received; but in the duplicate copy both the weight and the amount were different. The discrepancies had not occurred because the defendant was not receiving sufficient remuneration, for he was in receipt of £2 per week, a house rent and rates free, together with coal and light. The discrepancies had been going on for twelve months.

Evidence was then given by persons that they had purchased and paid for coke on the dates named; and also by Mr. F. W. Hood, the Company's collector. The latter said, in cross-examination, that, in addition to managing the works, defendant had to connect services, read between 300 and 400 ordinary meters, and look after the prepayment meters.

Mr. ELLIOTT (for the accused) said defendant pleaded that he had received the moneys, but had not accounted for them. For nine years he had been a most faithful servant of the Company, who had recognized his services by giving him from time to time a bonus. During those years, hundreds of pounds had passed through his hands, and been duly accounted for. He was looked upon by everyone in Newport as an honest, straightforward, and hard-working man. From time to time he had to rely upon his memory, for only at the week-end did he notice that the figures in the duplicates were not clear. A man in defendant's position would not injure his character for such small sums. Having regard to the character borne by defendant previous to coming to Newport, and also his character during the nine years he had been there, the loss of his situation, and the trial and trouble he had brought, by being placed in his present position, upon his wife and children, he would ask them to deal with the case, having regard to the circumstances, under the Probationers' Offence Act.

The CHAIRMAN said the Bench would deal very leniently with the case. The defendant would be given the option of a fine of £10, including costs, or two months' hard labour.



## THE GASLIGHT AND COKE COMPANY.

The One Hundred and Ninety-Sixth Half-Yearly Ordinary General Meeting of proprietors was held last Friday, at the Chief Office of the Company, Horseferry Road, Westminster—Mr. CORBET WOODALL (the Governor) in the chair.

The SECRETARY (Mr. H. Rayner) having read the notice convening the meeting, the seal of the Company was affixed to the Register of the Proprietors, and the report and accounts (which were given in the "JOURNAL" last week), were taken as read.

## THE ACCOUNTS.

The GOVERNOR: It is now my duty to move that the report and statement of accounts be received and adopted. The report reminds you that the inclusion of the undertaking of the West Ham Company became an accomplished fact on Jan. 1 last. The accounts of the West Ham Company are published separately from ours for the past half year; and the dividend will also be paid independently. Henceforth, there will be no such distinction; and shareholders may for a time find more difficulty than at present in comparing the accounts of corresponding periods. We welcome any West Ham shareholders who may be present to-day. I have also to welcome a large body of co-partner proprietors who have acquired their holdings, and consequent right to be present, within the past half year. It is too early yet to say how far our hopes, founded on the adoption of this system, are being realized. The work of the half year has been excellent; and some share in the good results may fairly be attributed to the new relations which have been established. All ranks in the service are zealous and earnest. The number of co-partners is now 8700.

## FAVOURABLE RESULTS.

I think you will agree with me that the results of the half-year's trading are creditable. You will remember that our charge for gas was less than in the corresponding period, and that the reduction represented a loss of revenue of more than £46,000. Yet, broadly stated, we have earned the full dividend of £4 13s. 4d. per cent., and have £67,000 to spare. Deducting from this the contribution of £10,000 to the redemption fund, and a similar sum added to the insurance fund, we are still able to increase the balance to the credit of profit and loss by £47,000. The details of the accounts deserve attention. Of capital, we have spent £76,000 almost entirely upon mains, meters, and stoves. Against this, we have credited £45,000 for renewals and depreciation; leaving the net increase on the expended capital for the half year £31,000.

## THE CAPITAL ACCOUNT.

The story of the capital account is interesting. In 1903, Parliament gave us power to raise £750,000 in the form of 3 per cent. debenture stock. At that time, our unspent or floating balance was £845,000. Since then, the output of gas has increased by 2000 million cubic feet, and the floating balance has been reduced to £361,000; while we have issued no debentures. The capital spent in the seven years has thus been £484,000—equal to £240 per million cubic feet upon the additional gas sold. During the past four years, it has not averaged £110. In the year ended at Christmas, there was an increase of 600 million cubic feet in the quantity of gas sold; and the capital spent has been at the rate of less than £50 per million. The gross expenditure, which was £640 per million cubic feet sold in 1903, is now reduced to £596. If, in the future, we can maintain this rate of progress, we may increase our dividends; but the charge per 1000 cubic feet on account of capital will still fall.

## INCREASED SALES.

The sale of gas has been 4½ per cent. greater than in the corresponding half of 1908. This means, in quantity, 515 million cubic feet, and £70,000 in money. We have thus overtaken the loss of revenue due to the reduction in charge for gas, and have £25,000 to the good. I hope the future may prove that the lower price of gas opens up new applications and wider uses, and that our prosperity is not due simply to the sunless days of which we had so many before Christmas. The check to the development of the sale which we have experienced during the past decade was due to the competition of electricity and the vast improvement in gas-burners. As the demand for the former becomes satisfied and our district is fully furnished with economical burners, we shall hope to see what may be called normal rates of increase return. The increase in the number of our consumers continues. We have added during the half year now closed 18,000; and we have sent out altogether 35,000 additional stoves. These have brought in a further rental of £3000, and augur well for the future consumption of gas.

## COST OF COAL AND OIL.

There has been a reduction in the cost of coal of £72,000. This is partly due to the new contracts under which we are now working; these contracts having been made at a lower price than the previous ones. The reduction is also partly due to a larger make of gas per ton. The cost of oil was £16,000 less than in the corresponding period of 1908, due partly to the fact that the new contracts are at a considerably reduced price, and also to better working. Since 1904, we have increased by 10 per cent. the quantity of gas made per ton of coal. Had the make continued as in 1904, the tonnage of coal carbonized in 1909 would have been greater than was actually needed by about 180,000 tons. To the corresponding improvement effected in the yield of gas from oil, we owe a reduction in the same period of 2½ million gallons. The saving on these two items, coal and oil, in the year amounts to £82,000. Our manufacturing, salaries and wages, and purification are all better. The wear and tear (manufacturing) shows an increase of £13,000. Against the large saving in the cost of coal and oil, we have to set a reduction in the revenue for residuals of only £26,000. In the distribution section of the revenue account, nothing calls for comment except the repairs and renewals of meters, which show an increase of £10,000, due to the fact that more meters are now being returned for repair and a freer condemnation of old stock. Management charges

show an increase of £3500. Of this, £1000 represents the addition to the Directors' fees; and the remainder is accounted for by expenses attending upon the amalgamation.

## CO-PARTNERSHIP AND OTHER ITEMS.

The charge of £13,000 for co-partnership calls for no comment. Parliamentary charges are higher than last year, including, as they do, much of the cost of the Company's Bill in Parliament. To the same cause is also due the special charge of £12,000 for stamp and conveyance duties. As you will see, the latter charge is "on account;" but we do not expect it to be increased more than a few hundred pounds when the exact figures have been ascertained. The other items on the revenue account show but little fluctuation, except the rental of fittings, which has increased by some £10,000.

## FINANCIAL RESULTS.

The financial result of the half-year's working is that, after providing for fixed charges, setting aside £10,000 towards the redemption fund (in accordance with the provisions of the Company's Act of 1903), and contributing £10,000 to the insurance fund, there remains a balance of £400,402 14s. 8d., to which has to be added the amount brought forward from the previous half year of £409,893 4s. 4d. This makes the total sum available for distribution £810,295 19s., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum, which will absorb £353,302 14s. 4d., and leave the sum of £456,993 4s. 8d. to be carried forward to the credit of the current half year. I am glad to be able to report that the condition of the works throughout is excellent; and that the whole of the manufacturing plant is in admirable order. One of the largest retort-houses at Beckton, containing retorts of small sectional area, will be refitted this year at a rather heavy cost as against revenue. At the Stratford Station, late West Ham works, important reconstruction is already in progress. The vertical retorts installed at Kensal Green have rendered good service this winter.

## THE AMALGAMATION.

The Company's Bill in Parliament received the Royal Assent on Aug. 16 last; and the amalgamation of the West Ham Gas Company with this Company took effect on Jan. 1. It is an early date yet to speak of the working of the amalgamation; but I can at least say that there is every prospect that it will be of considerable advantage to both the Companies concerned and to the consumers. The announcement of a further reduction in the price of gas, of 1d. per 1000 cubic feet, has been made by the Directors with much satisfaction. This is the fourth reduction within 5½ years.

## COAL OUTLOOK.

During the past few months, there has been considerable unrest at the collieries in the North; but I am happy to say that we have had ample supplies of coal during the winter, and have now a large stock at the stations. We have no cause for anxiety in this regard. The disputes at the collieries appear to be practically settled; and there is good reason to hope that full work will soon be resumed, and the supply abundant.

## INCANDESCENT LIGHTING.

We have during the half year revised our charges for mantle maintenance; and we hope that by this means we will secure a large increase in this important branch of the Company's business. The Directors feel assured that if consumers realize the advantages now to be claimed in this direction, they will hasten to avail themselves of the opportunities offered. The success of incandescent lighting largely depends upon proper attention being given to the mantles; and the Company can guarantee that this shall be efficient if the consumers will put the care of their burners in our hands.

## THE SECRETARY'S SALARY.

You will see from the report that the Directors recommend an increase in the salary of the Secretary. In 1903, the shareholders fixed his salary at £1000, and at this amount it has remained. The duties of the office are, like those of all our officers, steadily increasing. We have dealt with the others; but the Secretary is in your hands. We have every reason to be satisfied with the way in which Mr. Rayner fills his important post; and we recommend that his salary be raised to £1250 from Jan. 1 last.

## MUNICIPAL TRADING IN ELECTRICITY.

Before closing my observations, I desire to say a few words on a question of much importance to us—that of municipal trading in electricity, particularly in its competition with gas. The decrease of 2096 in the number of public lamps lighted by the Company's gas, is due entirely to preferential treatment of electricity by interested local authorities. Since the advent of the incandescent gas-mantle as a practical method of street lighting, no local authority in this Company's district has adopted electricity largely for public lighting, except where the local authority have had their own electric light works. On the other hand, gas has always beaten electric light in fair, open competition where the local authority have no axe of their own to grind and the two services have competed on their merits. In other words, only when the buyer of light has been also the seller of one particular form of light, has that form been preferred to gas. In the latest instance—that which has entailed the loss of the lighting of 2000 lamps—the Borough Council never notified this Company that they desired to reconsider the question of their street lighting, or asked us for any quotations for a new contract. The Electricity Supply Committee, having knowledge of the cost of the existing gas lighting, submitted a scheme for the lamps adjacent to their cables, which showed a very small saving over the cost of gas. The candle power of the electric lamps specified was only two-thirds of the candle power which the existing gas-lamps were easily able to provide, if properly looked after. The Borough Council then appointed a Special Committee to consider the



question of street lighting—which Special Committee had, for three of its five members, the Chairman and two members of the Electricity Committee, upon whose scheme they were supposed to be giving an impartial report. This Special Committee on Street Lighting did not even communicate with one of the two contractors who were in a position to quote them for public lighting; the one ignored being the Gaslight and Coke Company. The Company were privately advised of the proposals of the Special Committee; a letter of protest was addressed to the members of the Council; and proposals were made for improving, and at the same time reducing the cost of, the existing gas lighting. But to no purpose. The Electricity Supply Committee a once discovered that their quotation was £1300 a year more than it should have been; and the Council decided to adopt their scheme, overlooking or ignoring the fact that the reduction of £1300 a year came out of their own pockets—they being the sellers as well as the buyers. Accordingly, application was made to the London County Council for a loan to cover the cost of the alterations. This application was made the subject of a strong adverse report by the Finance Committee, who, after the fullest consideration, decided that the substitution of electricity for gas would not be to the advantage of the inhabitants either as citizens or as ratepayers; and the application was unanimously refused by the London County Council. The advocates of electricity at any price were not to be diverted from their intention of capturing the street lighting by any such obstacle as the opposition of the London County Council. Not being able to borrow the money for the work, the Borough Council decided to utilize the balance they had in hand and to anticipate future profits in order to provide the necessary funds. Whether their action in so doing was legal or not, I will not here inquire; for, however that may be, the work is done. We have lost our business; and the ratepayers are substantially out of pocket as a result—among the ratepayers being the Gaslight and Coke Company to the tune of some £7000 per annum. That the ratepayers are losing money is due to the fact that the cost of the street lighting by electricity, *plus* the heavy loss which their electrical undertaking is undoubtedly making on the contract (though the responsible administrators will never admit the fact), much exceeds the price at which this Company were prepared to light the streets more efficiently than they are now being lighted, despite the fact that the electric lamps now being used in the principal streets are of higher candle power and are consuming more current than those which were originally intended to be used. The Borough Council are now contemplating the installation of electricity in all their remaining gas-lamps, though the Electricity Committee have had to quote a still more unremunerative price in order to compete with us. It remains to be seen whether, and whence, the money will be forthcoming to finance the alteration. This story seems little to the credit of the system of municipal trading in electricity.

The Electric Lighting Act of 1882, which has borne these fruits, was intended to give municipal bodies preference in electricity supply; and its fundamental assumption was that local authorities would prove as competent as companies to carry on this kind of business. Therefore, it seemed good to Parliament to prevent the appropriation by private speculators of what was held to be likely to become a profitable trade. On the face of appearances at that period, there was no gainsaying this *prima facie* case for entrusting public electricity supply to local authorities; while the affirmative assumption was supported by the common knowledge that gas and water supply, originally provided by private enterprise, had in numerous instances been taken over, and was successfully conducted, by public bodies. One vital circumstance invariably attaching to these transactions was, however, quite overlooked or disregarded. Both gas and water supply had long ceased to partake of the nature of speculative investments. Nearly all, if not all, municipal acquisitions of the kind were successful examples of well-developed private enterprise; and there was nothing problematical about their financial future, nor experimental in their operations. Moreover, the correct principles of successful administration and management had become a settled tradition; and the inexperienced public bodies, on assuming direction of these old-established undertakings, had the advantage of being advised and served by the same trained executive that had helped to create the property. Yet, with all these safeguards and facilities for successful municipalization, it has not always followed that the result has, in the long run, justified the transaction. Too often, in regard to gas, a small immediate benefit has been outweighed by the erection of an administrative system conceived in the alleged interest of the "ratepayers," distinguished for the purpose from the rest of the community, including the consumers. The price of gas is kept up, ostensibly to protect the ratepayers whose credit is pledged for the financing of the undertaking, really to subsidize the spending departments of the municipality and conceal their extravagance from the public. So far, however, it must be admitted that the ratepayers do not suffer. It has been reserved for municipal electricity to show the seamy side of municipal trading. The event has proved, in my opinion, that it was a mistake to admit so speculative an enterprise as electricity supply within the scope of municipal affairs. With few exceptions, such ventures with public money have been unfortunate. Generally, theirs is an experience of disappointment, and failure to pay their way. Heavy annual charges are borne upon the rates, notwithstanding the omission to provide sufficiently for a depreciating investment, and the transfer of undisclosed expenses to other accounts. As in the instance already referred to, the nominally controlling superior authorities may refuse further capital loans; but their limited powers are defied. Whether is all this tending? If I speak strongly, I think the patent facts are my justification. Who shall raise a protest against so grievous a miscarriage of the system inaugurated with such different views and hopes more than a quarter-of-a-century ago, if not we who are so heavily mulcted in rates to support this unfair rivalry? We are not afraid of competition, so long as it is by traders like ourselves. What we do complain of is this reckless competition, without count of the cost, on the part of amateurs elected for a few years with power to play ducks and drakes with the ratepayers' money, secure in the knowledge that no responsibility will follow them when they lay down their offices. I think this situation, for which there is no legislative remedy, calls for searching investigation and prompt action. Neither the Local Government Board nor the Board of Trade appears to possess powers adequate to deal with the emergency which has

arisen; and I venture to suggest that one or the other, or the Treasury, should procure the appointment of a Commission, or a Committee of Inquiry, having the necessary competence.

I beg leave to move—"That this meeting do agree with, and confirm, the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 27th ult."

Mr. ULICK J. BURKE (Deputy-Governor) seconded the motion.

#### DISCUSSION.

Mr. H. D. HALL congratulated the Board on the successful report. He had listened with pleasure to the full explanation of the gradual change of policy which originated some years ago in keeping the capital account right, because it had had the effect of increasing the value of the Company's stock, as evidenced by the market quotations on the London Exchange. It was particularly gratifying to them to know that this was caused not only by a good, sound financial policy, but by a saving in the cost of manufacture. He was also pleased to hear that, in addition to the saving in the price of coal and oil, there had been an increase of 10 per cent. in the production of gas from the coal; and he thought the thanks of the shareholders were due not only to the Board but to the staff of engineers and workmen employed in producing so satisfactory a result. He did not quite know why the Company should have been charged £12,000 for stamp and conveyance duties; and he should be glad of an explanation as to this. Also, with regard to Account No. 14, on the left-hand side they were debited with reserve fund, insurance fund, and depreciation fund, and during the half year there had been added as interest to the reserve fund £959, insurance fund £1592 odd, and depreciation fund £1061. He asked how these sums were arrived at, because it seemed to him to be rather small interest, taking the reserve fund, of £67,000, to earn only £959 for the half year. Also, he noticed that the amount invested was £211,000; and he asked if there was any objection to a rough list of the investments being given in the accounts, as was done in a great many companies; and whether any part of the £211,000 was set aside for the reserve, insurance, and depreciation funds. He had listened to the well-thought-out argument with regard to the injustice to the Company inflicted by the enthusiastic county councillors; but he was sorry the name of the borough had not been mentioned. He hoped the Board would succeed in getting either a Commission of Inquiry or a Committee to inquire into the matter.

Mr. H. C. PELLY said as a stockholder in the Company he had no question to ask; but as a Director of the old West Ham Gas Company he could not allow this opportunity—the first since the amalgamation—to pass without acknowledging the way in which the Gaslight and Coke Company had carried out their obligations to the West Ham Company under the recent Act of Parliament; and he hoped the results of the amalgamation would come up to their expectations. He thought it must be as great a satisfaction to the Governor and the Board that the amalgamation had come about, as it was to the stockholders of the West Ham Company. It was true that the Gaslight and Coke Company was vastly larger than the West Ham Company, but still the latter Company was a very vigorous one, and was rapidly growing. He ventured to think that, with the nursing it would receive from the present Board, it would continue to develop and maintain the large increase of 4½ per cent. He thanked the Chairman sincerely for welcoming the West Ham stockholders to the meeting; and he was sure the support they had hitherto given to their Board would, in the future, be continued to the Gaslight and Coke Company Board.

Mr. KILLINGWORTH HEDGES, as an old shareholder, desired to preface his remarks by agreeing with the first speaker (Mr. Hall) in saying that their success was due to the able management of the Board. He also desired to testify to the very intelligent interest shown by members of the staff in taking up anything which was likely to promote the interests of the Company. Some time ago, he began to use gas-stoves throughout his house; but they were not altogether satisfactory as a substitute for coal-fires. Then he made experiments; and he was enabled to reduce his gas bill to a certain extent. He then got an idea from their Chief Inspector, and he was encouraged to proceed with his experiment, and he had produced a simple apparatus which could be had upon the hire-purchase system. He thought more attention had been given to lighting than to heating; but he paid a tribute to the liberal way in which the Company had met him with a view to popularizing gas-stoves.

THE GOVERNOR: Let me first of all say how highly the Board appreciate the graceful remarks by the Deputy-Chairman of the West Ham Gas Company (Mr. Pelly). Nothing could have exceeded the businesslike way and the friendly manner in which the negotiations were conducted; and when the matter is a *fait accompli*, it is very gratifying to find everybody satisfied all round. Replying to Mr. Hall, I must refer him to the Inland Revenue Commissioners as to why we are made to pay so large an amount for stamps and conveyance. Of course, the King's Government must be carried on; and that is one of the ways in which money is found. With regard to a list of investments, I do not know there is any objection to one being published. The investments are in India 3 per cent. stock, £66,943; in 2½ per cent. Consols, we have £116,901; and in the Gaslight and Coke Company's ordinary stock (a temporary matter in connection with the arrangements with the West Ham Gas Company), £28,000—making £211,000 in all. With regard to the interest, where the amount is not fully invested in securities outside the Company, we charge the Company with 3 per cent.; and we carry that to the credit of the fund. The depreciation fund is not invested outside, but is invested in the Company's ordinary stock. Mr. Killingworth Hedges has acknowledged the friendly manner in which we received his proposals for improving gas-stoves; and I can only say that this is a matter which occupies the attention of our officers and ourselves constantly. We are as keen as any consumer can be to increase the efficiency of gas-stoves; and he has rightly said that any inventor who has a proposal to bring forward is quite sure of a welcome from the Company.

The resolution was then carried unanimously.

#### THE DIVIDENDS.

THE GOVERNOR: I will now ask the Secretary to read the proposal as to dividends.



The SECRETARY: "(1) That the sum of £10,000 be set aside out of the divisible profits of the Company for the half year ending on the 31st day of December last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903; and (2) That a dividend as follows for such half year be declared—viz.: On the 4 per cent. consolidated preference stock at the rate of £4 per cent. per annum, on the convertible 5 per cent. preference stock at the rate of £5 per cent. per annum, on the 3½ per cent. maximum stock at the rate of £3 10s. per cent. per annum, and on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum—subject to deduction of income-tax."

The GOVERNOR: I beg to propose the adoption of this recommendation.

The resolution was seconded and carried unanimously.

#### RE-ELECTION OF DIRECTORS.

The retiring Directors, Mr. Ulick John Burke and Mr. Herbert Jameson Waterlow, were re-elected, as also were the Auditors, Mr. John Allen Stoneham and Mr. John James Walker.

#### INCREASE OF SECRETARY'S SALARY.

The GOVERNOR: I now propose, as I promised earlier to do—"That the salary of the Secretary be increased, as from the 1st of January past, by £250 per annum."

Mr. THOMAS WILKINS: I have much pleasure in seconding that.

The resolution was carried unanimously.

Mr. RAYNER (Secretary): Ladies and gentlemen, I can only thank you very sincerely indeed for having adopted this recommendation of the Directors for making such a handsome addition to my salary, and express the hope that I shall prove myself worthy of it.

#### VOTES OF THANKS.

A vote of thanks to the Chairman and Directors having been passed unanimously,

The GOVERNOR said: On behalf of my colleagues and myself, I thank you cordially for this vote. I see no reason why these very amicable and cordial meetings should not continue for a long time to come; and I think the prospects before the Company are sufficient to satisfy even the wishes of the Governor. Allow me now to propose a vote of thanks to the officers of the Company; and I should like to include in that the workmen also, because I believe that all round there is a spirit of devotion to the Company.

The resolution was carried unanimously.

Mr. D. MILNE WATSON (General Manager): I thank you very much indeed, on behalf of the officers and workmen generally, for the very kind way in which you have received this motion. It has always been our desire to do our best for the Company; and these resolutions, which you pass so cordially, are a great encouragement to us all to go on in the same way.

### TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday, at the Offices, No. 639, High Road, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. E. Topley) read the notice calling the meeting; and the Directors' report and accounts were taken as read.

#### CAPITAL IN RELATION TO BUSINESS.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had again a very pleasant story to tell. The Company showed, as the report informed them, a considerable amount of growth; and so long as this growth continued, there was no reason why they should have any fear for the future of the Company. He would draw the attention of the proprietors to a few of the salient figures in the accounts. During the half year there had been spent on capital account £14,528. More than half of this was for mains, service-pipes, and meters; some of the mains being of large diameter, and necessary in order to carry gas over the very extensive area served by the Company. That the capital was not extravagantly spent was shown by the relation obtaining between the amount of business done and the amount of money expended on capital account. The capital per million cubic feet was now £436. This was £10 per million feet less than last year, and £114 less than it was ten years ago. At the risk of wearying the proprietors by repeated reference to what he regarded as this most important matter, he would quote one or two further figures which had been prepared by the Secretary. In 1899, ten years ago, the price of gas was 3s. per 1000 cubic feet, and last year it was 2s. 5d.; so that the reduction had been equal to 7d. per 1000 cubic feet. Ten years ago, the charge for dividends and interest upon the capital amounted to 8.9d. per 1000 cubic feet—that was to say, for every 1000 cubic feet of gas sold, they required, to pay the dividend and the debenture holders' interest, nearly 9d. per 1000 cubic feet. Last year the amount needed for the same purpose was 6d.—a difference of practically 3d. per 1000 cubic feet. So that of the 7d. reduction in price, nearly half—40 per cent. at any rate—of the saving was due to the careful manner in which the capital had been watched and expended. The Company had effected very considerable economies in manufacture by the introduction of machinery, and by the improved methods of handling both the raw material and the products used and produced at the works. But all of these changes together were not much more than equal to the advantage gained by the careful and successful way in which capital had been issued. In the ten years, the output of gas had improved by 170 per cent.; while the amount of capital had been raised by 110 per cent. only. In the decade, the number of consumers had increased from 15,983 to 53,700. The percentage of growth in the number of ordinary meters was 113; but the percentage growth of the prepayment meters was 337. Naturally, the average quantity of gas used by the consumers was less now than it was, because the prepayment consumers took a comparatively small quantity. But he was glad to say these latter had shown in the ten years an average increase in consumption of 13 per cent. per meter. An interesting result of connecting so large a number of additional meters was that, whereas in 1899 they had 129 consumers per mile of

main, they had last year 247. He did not know anything that illustrated better the manner in which the use of gas had become essential to the population as a whole.

#### REVIEW OF THE REVENUE ACCOUNT.

The revenue account showed that, although the price charged for gas was less than in the corresponding half year, the receipts had been larger by £2569. The rental for meters, stoves, fittings, and maintenance of mantles exhibited together a gain of £1400; and residuals were £63 more. On the other side, the purchases of coal and oil had been made on more favourable terms, and the results of manufacturing had also been materially improved. They had, in effect, used 3700 tons more coal, and paid only £147 for it. There had been a small decrease in carbonizing wages, and a large increase in the expenditure upon repairs and maintenance of works and mains, a large proportion of which expenditure was for labour. This was a matter to which he was not sorry to have an opportunity of drawing attention. One of the drawbacks of the economies that had been effected in gas-works generally was the fact that, in the carbonizing department, the number of men employed had been materially reduced. But, as he had had occasion to remark before, the end and aim of gas companies, if they were to prosper, must be to increase the output; and they could only do this by reducing the price. Now, as the price of gas was reduced, and the output was increased, so the number of men necessary in order to produce the gas increased. But, on the other hand, because of the manner in which the increase was achieved—that was to say, through the use of gas for heating and cooking and so forth—there was a vast augmentation of the number of men employed in making the appliances, and (so far as the Company were concerned) in introducing them to, and in fixing them for, the consumers. Therefore, in one direction, there was a reduction in the number of men employed; but, taken on the whole, there was a large increase in the number employed, through the varied and extended operations of the Company.

#### THE GENERAL RESULT.

Comparing with the corresponding half year, deducting the savings on one side (£3600) from the extra payments (£5361) on the other, they had a net increase of expenditure of £1760. The total receipts being greater by £4027, the difference or £2267 was the additional profit in the half year. Out of this profit they were able to pay the full statutory dividends, and carry forward £20,682, as against £18,592 brought from the accounts of the previous half year. This very satisfactory position of their financial affairs was due to no unusual or fortuitous circumstances, but to the continued growth of the demand for gas, and to the steadily improving results obtained in carbonizing. There was still room for improvements. This was a time of progress in the industry; indeed, he could hardly remember through his long connection with the Company a time at Tottenham when it had not been a period of progress. The Directors saw no reason why the present year should not be as prosperous as the past, or more so. The Board had bought a substantial portion of the coal requirements from June forward at the prices obtaining for the current contracts, and the supply of oil to December, 1911, at a very much reduced price. Under these circumstances, they had not hesitated to announce a further reduction in the price of gas to the consumers, bringing the charge per 1000 cubic feet to 2s. 4d. With this reduction came, as the proprietors were aware, an increase of 2s. 6d. per cent. in the dividend.

#### ELECTRICITY COMPETITION AND BURNER MAINTENANCE.

The Company had had in the last year some experience of electrical competition; but so far it had not had any serious effect upon them. When incandescent gas-burners were kept in good condition—especially the inverted type—they gave so beautiful a light that it could hardly be improved upon, while the quantity of gas burned was so small as to make the cost beyond the reach of competition. Most of their neighbours who were using electricity continued the use of gas, and in some places the current was generated by means of a gas-driven motor. The Company were now maintaining incandescent burners free of charge for labour—charging only the cost of the materials employed. He would strongly urge upon all consumers of gas to fall in with this arrangement on grounds both of economy and efficiency. It would be greatly to their advantage.

#### CO-PARTNERSHIP.

With regard to co-partnership, he firmly believed the employees were thoroughly well pleased with their position; and the Directors felt that their anticipations in regard to the scheme were in process of being realized. He did not by any means say that all had been accomplished they had hoped for. These radical changes did not reach full fruition at once; but they believed that the improvement in the effort, energy, zeal, and capacity of the employees would proceed from year to year, as the workers realized how much their future prosperity depended upon their own endeavours. He had mentioned that the reduction of 1d. in the price of gas would add 2s. 6d. per cent. to the dividend of the shareholders. It would also add ⅓ per cent. to the bonus paid to the workers. This was the second time within the short period that the scheme had been in operation that the percentage had been altered in the direction of improving the return to the co-partners. They commenced with a bonus of 4½ per cent. on the wages; it was now 6 per cent.; and the end was not yet by any means. Of the total number of co-partners (601), 519, or 86 per cent., were now stockholders. The trustees had had to deal with a total sum of £9435, of which some £3000 represented money brought in by co-partners out of savings prior to the adoption of the scheme. This had been dealt with as follows:—

Value of stock transferred to co-partners . . . . .	£4995 19 4
Withdrawals of half bonus . . . . .	244 0 0
Withdrawals of deposit cash . . . . .	247 16 6
Payments to co-partners who have left Company's service . . . . .	90 19 10
[This was simply waiting until the amounts grew large enough to allow of their being invested.]	
Balances owing to co-partners on trust account . . . . .	1616 12 8
Balances owing to co-partners on "withdrawable" account . . . . .	2739 17 5

£9439 5 9



The small percentage of the bonus which had been withdrawn was one of the very satisfactory features of this statement.

#### FURTHER CAPITAL REQUIRED.

He had only to add that the Company were in need of funds. The capital raised had been overspent by £40,000; and they were necessarily dependent on their bankers and upon their uninvested balances of profit and loss, and reserve and insurance funds for working capital. This was good finance in that they were able to find the money on better terms than they would have to pay the shareholders who subscribed for additional stock. But this must not be carried too far. They owed their bankers at the present time £40,000. The Directors had therefore decided to offer next month £30,000 of stock to the shareholders and public at a minimum price of £111. To those of the Company's friends who had funds to invest, they did not hesitate to say, "You can hardly find a better way of placing it."

Mr. HENRY BAILEY seconded the motion. In the course of his remarks, he said that perhaps the most important matter they had to deal with was the question of co-partnership. The Directors had expected it to be a great success; and they had not been disappointed up to the present time. As the price of gas was lowered, the more difficult would it become to make further reductions; and therefore it depended greatly on the co-partners as to the profits in the future. Each one must do his best in his own department, because the Directors could not do everything, nor could the officers. Without the aid of the workers, reductions became problematical.

#### AUTOMATIC LIGHTING MECHANISMS—UNACCOUNTED-FOR GAS.

Mr. EDWARD SAWYER asked whether it was possible to tamper with the automatic mechanisms fixed to the public lamps for lighting and extinguishing them, because he had had occasion to drive boys away from lamps in his neighbourhood who were attempting to interfere with the mechanism.

Mr. HAWARD referred to the unaccounted-for gas, which amounted to nearly 8 per cent. A year or two ago they had a high proportion; then there was an improvement. Now they appeared to have fallen back again.

The CHAIRMAN, in reply, said far be it for him to put limits to the possibilities of small boys in regard to mischief-making; but so far as he knew, it was almost impossible for boys to do damage to the self-lighting arrangements which were adopted so generally throughout the district. With the arrangement they were very well satisfied; but there had been causes of complaint. The Company had now taken the maintenance of the automatic lighters entirely into their own hands, instead of leaving them with contractors, as had hitherto been the case. He felt sure there would be no trouble with them henceforth. With regard to the amount of unaccounted-for gas, he thought he had stated before that, for some reason which he could not undertake to adequately explain, the unaccounted-for gas in the first half of the year was always much less than in the second half. He believed it had something to do with the collection of money from the prepayment meters; but he could not say exactly how. Take the last five years. In 1904, the average was 7½ per cent.; in the Christmas half of the next year, 7·86 per cent.; in the June half, 2·87 per cent. So it went on. In the December half of last year, it was 8·64 per cent.; and in the June half it was 1·67 per cent.—the average being about 5 per cent. As Mr. Haward had said, the average last half year was nearly 8 per cent., or 7·64 per cent. This was 1 per cent. less than it was in the corresponding half year.

The motion was unanimously carried.

#### THE DIVIDENDS.

Sir DANIEL F. GODDARD, M.P., proposed the declaration of dividends at the rate of 6½ per cent. per annum on the "A" stock, and 5½ per cent. per annum on the "B" stock, both less income-tax. In the course of his remarks, he referred to the mistaken notion on the part of a section of the public that it was the easiest thing possible for a gas company to earn a dividend; but he knew, from his own experience, that it involved a great deal of hard work and constant attention on the part of everybody connected with the undertaking. In the gas industry, in every department, things were advancing so fast that it was a constant struggle to keep up to the mark; and it was only by the heartiest co-operation of all in the undertaking that they could accomplish results such as were seen in the report. Above all things, the Company were fortunate in having at the head of affairs one who held such a high position in the gas industry as Mr. Corbet Woodall. He always had kept everybody up to the mark; and he (Sir Daniel) was sure he would always do so.

Mr. G. T. WATSON seconded the motion, which was adopted.

#### VOTES OF THANKS.

On the proposition of Mr. MICHELL, seconded by Dr. SCOTT, a cordial vote of thanks was passed to the Chairman, Directors, and Auditors.

The CHAIRMAN, having responded, moved a vote of thanks to the chief officers, staffs, and workmen of the Company. Of Mr. Broadberry, he could not speak in too high terms. He (the Chairman) did not think any Company could have a servant who was more thoroughly devoted to his work, and who more conscientiously fulfilled the duties that fell to him. The same remarks would apply to the Secretary.

Mr. ROBERTSON seconded the motion, and it was heartily carried.

Mr. BROADBERRY responded on behalf of himself, his staff, and the workmen. In the course of his observations, he said the Chairman had referred to the displacement of labour by stoking machinery. He did not say, however, as he might have said, that stoking was the most exhausting part of any of the workmen's duties. He (Mr. Broadberry) knew of many of the stokers who were co-partners who were grateful to the Directors for having introduced machinery, for it had enabled them to continue their work when Nature would have failed them if they had been compelled to go on working in the old-fashioned manual way. Though using machinery, the men were getting good wages.

Mr. TOPLEY also acknowledged the vote on behalf of himself and the secretarial staff.

### YORK UNITED GAS COMPANY.

The Half-Yearly Meeting of the Company was held at the Merchants' Hall, Fossgate, York, last Thursday—under the presidency of Mr. JAMES MELROSE, J.P. (Vice-Chairman).

The SECRETARY and MANAGER (Mr. J. H. Hill) read the 131st half-yearly report and balance-sheet. This showed that the balance of profit amounted to £8491, to which had to be added £358 interest on the reserve fund, making £8849; and after payment of £618 interest on the debenture stock, there remained a surplus of £8231. The Directors recommended the payment of a dividend at the rate of 4 per cent. per annum on the preference stock and the consolidated ordinary stock. There was an increase in the quantity of gas sold, compared with the corresponding half of the previous year, of over 4½ million cubic feet. During the six months, 1366 yards of additional mains were laid, and 605 meters fixed for new consumers. The Directors reported, with the utmost regret, the death of their colleague, Mr. Matthew Leaf, after 55 years of devotion to the interests of the Company. They desired to record their deep sense of personal loss, and their high appreciation of the inestimable value of Mr. Leaf's untiring service and unrivalled knowledge and experience.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said his first duty was to express regret for the absence of the Chairman (Mr. J. R. Hill). Other members of the Board were also absent; but the unfilled place which they most deplored was occasioned by the death of Mr. Leaf. Only those who had been long associated with him in the service of the Company could fully appreciate what the loss of his ripe experience and sound advice meant. In presenting the record of operations for the past half year, there was little for him to say beyond what appeared in the report. After paying the interest on the debenture stock and providing for the usual dividends on the preference and ordinary stocks, they carried forward a surplus of £321, which was a little more than the surplus carried forward last half year. They also had the satisfaction to report a continued increase in the quantity of gas sold, and a steady growth in business in all directions. While the laying of the new tramway lines had been in progress, they had taken the opportunity of examining the mains and of executing renewals and repairs where required. The plant generally had been maintained in a state of efficiency; and they were making provision for such renewals as appeared necessary. For some time it had been felt that the accommodation in the Davygate premises was capable of improvement and extension; and the property now acquired would enable them to make alterations of considerable advantage.

The report was adopted, and the dividends agreed to.

Major LINDBERG moved a vote of thanks to the Chairman and Directors for the efficient manner in which they had conducted the business of the Company during the past half year, and also to the Secretary and Manager. He was sure every shareholder would endorse the remarks of the Chairman with regard to the late Mr. Leaf. They all appreciated the loss the Board had sustained by the death of so valuable a colleague.

Mr. JOHN CROSS seconded, and also expressed regret at the death of Mr. Leaf. He referred to the excellent manner in which the business had been conducted.

The motion was unanimously carried.

### CO-PARTNERSHIP AT CARDIFF.

The Annual Meeting of the Cardiff Gas Company was held at the Offices, Bute Terrace, last Wednesday, under the presidency of Colonel WILLIAM TAYLOR, M.D.

The CHAIRMAN, in proposing the adoption of the report and accounts for the twelve months to Dec. 31, remarked that the Company were making very satisfactory progress in every way. The use of gas had widened out in all directions. They had not to resort to the practice of fixing lights for nothing in order to attract business, as was being done by some in Cardiff. The revenue for the year was something like £4000 more than the previous year; and the output of gas, notwithstanding competition, was 21 million cubic feet more. They must not, however, expect the increase to continue to be so much, as the incandescent system materially reduced the quantity of gas used. With regard to the quality of the gas, this was as good as it had ever been; and when a deputation from the Corporation visited the Directors a few weeks ago, he challenged them to produce any complaints from their Analyst's report. They could not do so, as their own report showed the gas to be as high as 16·30 candles; whereas their standard was only 14 candles. An experiment had been made by one of the stove-makers in opening premises in Cardiff for the sale and hiring-out of gas-stoves; and this had been so successful that the Directors intended opening a suitable branch office and show-room in a central part of the city for the convenience of consumers generally. The returns from the different residuals sold during the year had been highly satisfactory. The question of making their own sulphate of ammonia was under consideration by the Board; and he was looking forward to profitable returns from this source. The co-partnership scheme inaugurated last year had fully realized their expectations, and meant a great saving in all directions. They had a faithful and loyal body of workmen; and they were pleased with the institute and rifle club which the men formed. They were exceedingly fortunate as a Company in having, considering the size of the district supplied by them, so few bad debts; the average being less than 5s. per £100. There were now over 12,000 slot-meters in use; and the revenue therefrom showed a progressive increase. The Directors had under consideration the possibility of being able in the near future to lower the price of gas; but, of course, they were dependent on the state of the coal market. It was their duty to let the general public have the benefit of the Company's prosperity.

The report was adopted; the usual dividends were declared; and votes of thanks were accorded to the Chairman and Directors, the Manager and Secretary (Mr. George Clarry), the Engineer (Mr. H. D. Madden), and the general staff.



## CAMBRIDGE GAS COMPANY.

## Adoption of Co-Partnership—Progress of the Company.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Sidney Street, Cambridge—Mr. E. H. PARKER, the Chairman, presiding.

The SECRETARY (Mr. A. E. King) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended Dec. 31 last, was presented. The report set forth that during the half year the new offices at No. 52, Sidney Street, had been opened; and the opportunity thus afforded of displaying a large variety of gas stoves, lamps, and other appliances had been appreciated by gas consumers, and had been beneficial to the Company. The Directors had established a co-partnership scheme with the regular employees; and they expressed their confidence that it would prove as advantageous to the Company as it had been to other companies who had adopted a similar scheme. In conjunction with some fifty other companies, they had deposited a Bill in Parliament for the purposes of authorizing the adoption of the "Metropolitan" No. 2 burner as the standard burner for the official testing of the illuminating power of the gas. Since the year 1906, the burner had been adopted by the London Gas Referees, and was already the authorized burner with many companies and local authorities. The accounts showed that the total revenue for the half year was £34,922, and the expenditure £29,351, compared with £34,795 and £29,170 in the corresponding period of 1908. The balance carried to the profit and loss account was £5571, against £5624. The amount available for distribution was £21,740; and the Directors recommended the declaration of dividends at the maximum rates, less income-tax. The statements relating to the working show that in the second half of last year 193,871,000 cubic feet of gas were made, 173,993,000 feet sold, and 175,804,000 feet accounted for; the figures for the corresponding period of 1908 being 186,843,000, 167,657,000, and 169,138,000 cubic feet respectively.

The CHAIRMAN, in moving the adoption of the report, said he thought the Directors might congratulate the shareholders on the prosperity of the Company. He would like at once to say that they considered a great deal of the prosperity which the Company was now enjoying was due to the skill and ability of their Engineer and Manager, Mr. Auchterlonie. The Directors, consumers, and shareholders were very much indebted to him for the great care and ability he bestowed on the interests of the Company. The accounts for the half year spoke for themselves. There was only one item to which he wished to call attention, and that was on the debit side of the revenue account, where they would find a line "Co-partnership account, £350." This brought a new departure under the notice of the shareholders—the establishment for the regular employees of the Company of a co-partnership scheme. He hoped it would have the approval of all the shareholders. The plan of the scheme was simply this—that a bonus, varying with the price of gas, was given to every regular employee, not in cash, but in stock of the Company; at any rate, this would be the case for some time to come. It would thus be seen that very soon all the employees would become shareholders of the Company, and be directly interested in its prosperity and its economical working. He hoped that in a few years the scheme would be found working smoothly, and greatly to the advantage of all concerned. He was very glad to say the Directors were able to recommend the payment of dividends at the maximum rates. They were met for the first time in their new offices, which had been found very convenient, and which he thought would lead to a larger business being done in gas fittings, stoves, &c. On the 25th of October last, the Mayor of Cambridge was kind enough to open the Workmen's Institute and Recreation Rooms which had been built at the works. Here, again, the Directors had—he was sure with the full approval of the shareholders—been trying to do something for the employees; and he was given to understand that the Institute and recreation rooms had been found of great benefit, and had been very much appreciated by all the employees. With respect to the working, the make of gas for the half year had increased by 7,028,000 cubic feet. Perhaps the best indication of the prosperity of the Company would be shown by the figures he would now give. The increase in the ordinary consumers during the half year had been 213, and in the ordinary consumers using cookers 62. Heating-stoves had increased by 44, slot meters by 160, slot cookers by 99, and public-lamps by 10. All these increases, he thought they would agree, showed the great vitality of the Company. As to the prepayment meters, they would see how important they were to the Company when he told them that through these meters the sale of gas for the half year was 26,820,200 cubic feet, meaning in money £5031 1s. 5d. These were interesting figures, showing a large increase in the sale of gas due to the introduction of slot-meters.

Mr. STANDLEY seconded the motion; and it was agreed to.

The dividends recommended having been declared, a vote of thanks was accorded to the Chairman, Directors, and officials of the Company.

The CHAIRMAN, in responding, expressed his pleasure at hearing the appreciative remarks in regard to the services of the staff, and said he could only hope that the Directors and officials would continue to do their best in the interests of the Company, and might be successful.

The business of the ordinary meeting then closed.

## The Standard Burner Bill.

A Special General Meeting was then held for the purpose of considering the Bill, of which notice has been given for next session, to provide for the adoption of the "Metropolitan" No. 2 burner as the standard test-burner.

The CHAIRMAN explained the existing conditions under which gas is tested, as prescribed by Parliament, and went on to say that the object of the Bill was to make the burner they used a fair and scientifically accurate test. The burner proposed to be substituted for the one at present in use had been approved by the Metropolitan Gas Referees after very careful experiment. They had satisfied themselves that the "Metropolitan" No. 2 burner was the best known burner for testing

the illuminating power of gas; and since 1906 they had adopted it for the purpose of testing the illuminating power of gas supplied by the three Metropolitan Gas Companies. It seemed to have been proved that the burner gave a fair and true result of all qualities of gas up to an illuminating power of 20 candles; and this limit covered the statutory obligation of the Company. The burner was now invariably prescribed in all Acts and Provisional Orders conferring powers of supply upon gas companies and local authorities, and also in Acts and Provisional Orders promoted by existing companies and local authorities for further powers. Therefore it was pretty certain that it was the best. He understood that the Corporation of Cambridge would oppose the introduction of the new burner for testing purposes. The Bill was merely to authorize the introduction of the burner, and therefore it could not be amended, in the opinion of the Directors, by the insertion of any other clauses not connected with the one purpose the Bill had in view. It was a little hard to see why the Bill should be opposed, as, in the opinion of the Directors, it was an endeavour to obtain for the consumers the benefit of the best and fairest test-burner. The use of the new burner tended directly to cheapen gas; and it seemed to him that any local authority who might oppose a Bill of this kind would not be doing a good, but rather a bad, turn to the public or the gas consumer.

Various questions in regard to the Bill having been put,

The CHAIRMAN, in reply, said the reason for the opposition of the Corporation, so far as he could understand, was that they wished to introduce into the Bill provisions relating to other subjects, which, as he had said, could not be tacked on to the Bill. A great many gas companies and local authorities had been authorized by Parliament to use the new burner, which was a better test-burner, and it did justice to all the different grades of gas required for various purposes. He hoped its adoption would reduce the expenses and costs of production. If consumers had incandescent burners, they might use a cheaper gas with no ill result to anybody; and it would be as good, if not better, for motive power and heating.

The motion was carried unanimously; and the meeting terminated with a vote of thanks to the Chairman.

## READING TOWN COUNCIL AND THE BURNER BILL.

## Council Decide to Oppose.

At the Meeting of the Reading Town Council last Thursday, the Finance Committee presented the following report with reference to the Gas Companies (Standard Burner) Bills: "The Committee were informed that at the conference of local authorities which was held at the Westminster Palace Hotel with reference to the Gas Companies (Standard Burner) Bills, it was decided to recommend the local authorities affected by the Bills (1) to present petitions against them, (2) to take united action in the matter, (3) to share the cost of the opposition in proportion to the rateable values of their respective districts, and (4) to instruct one firm of Parliamentary Agents to act on behalf of the associated authorities save as regards the preparation and presentation of the petitions. The Committee were further informed that a Committee had been appointed to consider the details of the grounds of opposition and the concessions to be demanded (a) in regard to the prescription of a standard calorific power, (b) the prescription of a method and apparatus for testing the illuminating and calorific power, and (c) the extension of the times for making the official tests of gas; and that it had been agreed that each authority should have power to negotiate with the company supplying gas in its own district, and to discontinue its opposition in the event of the negotiations being successful."

Alderman J. W. MARTIN, the Chairman of the Committee, moved that the Council oppose the Gas Companies (Standard Burner) Bill (No. 2), as recommended by the Committee. In doing so, he remarked that if the members of the Council had read the able and learned report of the Medical Officer of Health (Dr. Ashby), they would have learnt that there were ample grounds for filing a petition against the Bill, so that they might see what shape it took when it came before the Committee of the House of Lords, and also to ensure that they would not have a worse quality of gas than they had at the present time, but if possible a better one. The Gas Company were acting in combination with about twenty other companies; and if it were left entirely to the "sweet will" of their dear friends and neighbours, the Gas Company, they would have no difficulty whatever in coming to some arrangement, as had been suggested by Dr. Ashby. But as they were acting in combination with the other gas companies, they could not, of course, accept the Council's terms without the consent of the other companies. The Council were not opposing the Bill alone, but were acting in conjunction with other towns.

Alderman C. G. FIELD seconded the motion.

Dr. J. HOPKINS WALTERS, in supporting the motion, expressed regret that the Gas Company could not come to terms with the Corporation; but they had really forced the Council's hands by joining with other companies. The Company were in a peculiar position, because they were limited to a 5 per cent. dividend on their shares; and whatever profit was made after this was paid, went to benefit the consumer by the reduction of the price of gas. He had the advantage of attending the conference in London, and also of seeing the proposed burner; and there was not the slightest doubt that it was a great advance on the one at present in use, so on that ground alone there was no reason why the Council should oppose the introduction of this particular burner. But there were other questions which arose, and one was the great advantage of standardizing the apparatus by which the illuminating power of gas was ascertained. It was also right that they should have some guarantee as to the heat-giving and light-giving qualities of the gas which was being supplied. With regard to the Gas Company, he thought they could be trusted to supply a good gas, because they had no interest adverse to that of the Council in the matter; and he was quite sure that they were anxious to provide the very best quality gas, and one which was suitable for the requirements of the public. Still, he did not think it was unreasonable that the Company should give some guarantee as to what this quality should be, and that they should



have a standard for heat and also for light. They had in Reading at the present time a rather low standard of illuminating power; and if the Company did not come to terms with them, he thought it was quite reasonable that the Corporation should insist upon having a much higher standard. In Liverpool and some other large towns, the standard was 20 candles; whereas in Reading it was only 14. There was another point. In the interests of the gas consumers, they must insist on a higher standard of illuminating power, if they had this improved burner, for the benefit of those who used flat-flame burners. What he should much like to see was the Gas Company and the Corporation coming to terms, because it would save the Council the expense of opposing the Bill. At the conference in London it was agreed that all corporations could negotiate with their own gas companies; and if these negotiations were successful, they were at liberty to retire from the opposition. He must say that, considering the condition of the Reading Company's finances—that was to say, that they had no personal interest in trying to "do" the public in the quality of their gas—he thought it would be very easy for the Council to arrange terms, unless the Company were so pledged to the other companies that they could not withdraw from the Bill. He was sorry that so unfortunate a position had arisen; but, under the circumstances, the Council had no option but to oppose the Bill.

The motion was carried with one dissentient.

## COST OF GAS AND ELECTRIC LIGHTING.

### "The Times" Controversy—Mr. Hanbury Thomas Replies.

Further correspondence on this subject appeared in the Engineering Supplement to "The Times" last Wednesday; the first letter being a reply by Mr. Hanbury Thomas, the Managing-Director of the Sheffield Gas Company, to the remarks of the contributor of the original article and to the letter of Mr. H. H. Holmes as given in the "JOURNAL" last week (p. 312). Mr. Thomas's letter is as follows.

In replying to my letter in the Engineering Supplement of the 19th of January, "Your Contributor" first deals with the question of the average price of gas, which he states is much nearer 3s. than 1s. 4d. per 1000 cubic feet. For the purpose of comparing the cost of electricity and gas, I contend that only large towns should be taken into consideration. In Field's tables I find that the average price charged for gas in 1908 by the following ten Corporation gas undertakings—Birmingham, Bolton, Bradford, Carlisle, Leeds, Leicester, Manchester, Nottingham, Oldham, and Salford—was 2s. 2½d. per 1000 cubic feet; and the average price in the following nine towns supplied by Companies—Bath, Brighton, Bristol, Derby, Newcastle-on-Tyne, Plymouth, Portsea, Rochester, and Sheffield—was 1s. 11½d. per 1000 cubic feet. This, I think, will materially affect the calculations on which "Your Contributor" founded his statement that metal filament lamps are cheaper than gas-mantles. "Your Contributor" also states that "the annual cost of lamp renewals is less than that of mantle renewals"—a remark which further shows how utterly unreliable his arguments are. The respective prices of metal filament lamps and mantles are 2s. 6d. to 3s. 9d. each for electric lamps, and 3½d. each for gas-mantles. This Company [the Sheffield] maintains about 27,000 burners; and the average number of mantles used during twelve months works out to 3½ per burner, many of which are fixed in public-houses and shops, and come in for somewhat rough usage. In my own house, mantles easily last for twelve months, and, if the burners and globes are kept clean, with very little deterioration of light.

As to the amount of light afforded by the rival illuminants, I quite agree with "Your Contributor" that "the most reliable comparisons are those based on actual experience;" and I, at any rate, have not sought to argue the matter theoretically. But if the actual illuminating power developed by the respective lights is to be compared, the comparison, to be of any real value, must be based on careful determinations carried out by photometric experts. Therefore, in my previous letter I took a responsible electrician's statement as to the performance of metal filament lamps, and compared them with corresponding results obtained from incandescent mantles—the latter being purposely understated in order that the comparison might not be unduly favourable to gas.

Now, "Your Contributor" goes on to assert that the yield of light from gas-mantles falls off very rapidly from their initial lighting power. This I distinctly assert is not the case if mantles of good quality are employed; nor do they compare unfavourably in this respect with electric lamps. In proof of this assertion, I may again refer to Mr. Lavender's paper, which has been my authority for the case for metal filament lamps. I find it therein stated that the useful life of five lamps tested varied from 1500 to 2350 hours; the mean candle power developed throughout the period ranging from 80 to 98 per cent. of the initial lighting power. With regard to gas-mantles, I have found these yielding 94 per cent. of their initial lighting power after burning 2600 hours, and 90 per cent. after burning 4000 hours. Therefore, as regards sustained lighting power, I am justified in contending that the comparison is not unfavourable to gas.

With regard to the statement that "the light from electric lamps is much more easily reflected and concentrated than that from gas-lamps," such an assertion hardly deserves serious notice. "Your Contributor" will surely not contend that the light from gas is not subject to the same physical laws as that from electricity. Suffice it to say that for all practical purposes of illumination (apart, that is, from merely decorative effects) the light from incandescent gas-mantles is just as amenable to modification, by the use of shades and reflectors, as is that from metal filament lamps, with the additional advantage that, the glare from naked filaments being greater than from mantles, the unshaded light from the latter is less hurtful to the eyesight.

Regarding the matter of ventilation as affected by the method of lighting, "Your Contributor" remarks that the products of combustion are "heavier than air." As I wish to keep the argument on the plane of practice rather than of theory, I will merely remark as to this that, in gas-lighted rooms, the carbonic acid contents of the atmosphere

are always highest at the highest level. On the other hand, it is well known that in electrically lighted buildings it has been found necessary to introduce gas-flames at the ceiling level in order to secure an upward current of air, and thus prevent the unpleasant and hurtful draughts hitherto experienced. As bearing on this matter, I may remark that some twelve months ago serious complaints were made of the impure atmosphere in the Council Chamber of the Sheffield Town Hall, where the electric light is installed and no gas is burnt. The matter was investigated by the Medical Officer of Health, who found that there was four or five times more carbonic acid gas in the room than in the street outside. Had gas been in use there, it is not difficult to surmise where the blame would have been put.

With regard to the combustion of oxygen, electricians will continue to harp on the conditions which obtained under the old-fashioned mode of illumination by flat-flame burners. With the modern incandescent burner, two of which will adequately light a good-sized room, the amount of oxygen required to support combustion is really a negligible quantity; moreover, we do not live in air-tight compartments, and with the warmer atmosphere of the room fresh air is always being drawn in, to say nothing of the replacement of oxygen every time the door is opened.

Your correspondent Mr. H. H. Holmes very correctly states that the true comparative costs of electricity and gas are the quarters' bills; and he gives sundry examples showing a saving in favour of electricity. He does not, however, state the conditions in which gas was previously used, nor whether there is still a consumption of gas which was included in the previous gas account. My general experience is that in cases where electric light has been installed there is still a considerable quantity of gas used for various purposes. I also give below several cases showing the amounts paid for gas and electricity during corresponding periods. Mr. Holmes further makes the amazing statement that electric light is going ahead tremendously, while gas is practically stationary. That this is mere imagination on his part will be seen by the following figures. During the three years ended Dec. 31, 1908, the meters in use in this Company's district (we have no penny-in-the-slot meters) have increased from 81,269 to 93,029, or 14·47 per cent.; and during the same years the consumption of gas has increased from 2,799,214,000 cubic feet to 3,328,883,000 cubic feet, or 18·92 per cent. This is in spite of the large replacement which has taken place of flat-flame burners by incandescents, and of the notoriously poor trade during the latter part of that period.

Jan. 1, 1908, to Sept. 30, 1908.	Electricity	£46	1	1
" 1908	Gas	45	19	1
		£92	0	2
Jan. 1, 1909, to Sept. 30, 1909.	Gas (solely)	49	7	3
	Saving	£42	12	11
Oct. 1, 1907, to Sept. 30, 1908.	Electricity	£16	12	11
" 1907	Gas	4	12	8
		£21	5	7
Oct. 1, 1908, to Sept. 30, 1909.	Gas (solely)	9	6	8
	Saving	£11	18	11
Jan. 1, 1908, to Dec. 31, 1908.	Electricity	£32	6	0
" 1909	Gas	9	17	6
	Saving	£22	8	0
Oct. 1, 1905, to Sept. 30, 1906.	Electricity	£113	9	5
" 1908	Gas	29	12	6
	Saving	£83	16	11

### The Products of the Combustion of Gas.

The second letter is by Mr. John S. Owens, who deals with the statement by the contributor to "The Times" that "the products of combustion, being heavier than air, cannot be got rid of merely by the use of a ventilator or by keeping the top windows open." Mr. Owens writes as follows:

I think that this statement, as it stands, is misleading, especially in a paper which is so widely read, not only by the engineering profession, but also by the general public. It conveys the impression that the products of combustion tend to collect near the floor in a room, by virtue of their greater weight; but this is not a true statement of the case. It is true that carbon dioxide gas, which is the chief product of combustion, is heavier than air; 2 cubic feet of carbon dioxide weighing about the same as 3 cubic feet of air. It is not true, however, that in a room heated (say) by gas-fires the carbon dioxide exists in greater proportion near the floor than near the ceiling—in fact, it is exactly the reverse of this. I will give one case out of a long series of tests of gas and other fires conducted by me for the Coal Smoke Abatement Society; and this is not exceptional, but typical. It refers to a so-called "condensing" gas-stove, the products of combustion from which were discharged into the room. At one time, when the amount of carbon dioxide, in parts per 10,000 by volume, was 15·5 at the floor level, it was 18 at 3 feet above the floor and 20·1 at 12 feet above, or within a foot of the ceiling. Thus it will be seen that the purest air is near the floor in an ordinary room, and the most vitiated near the ceiling. In fact, the distribution of impurities is determined chiefly by the air currents in a room, and not so much by their relative densities; and these air currents are not by any means the simple matter generally supposed, as I have found by exploring the currents by a special instrument devised for the purpose. It is, however, true that, on the whole, the heated air rises and the colder descends; hence the products of combustion, if they do get into the room, are carried towards the ceiling. I would here like to say, however, that no gas-fire need discharge impurities into a room. That some of them do is evidence, not of any inherent tendency of gas to vitiate rooms heated by it, but simply of faulty design in the stove or of a bad flue draught.



## BIRMINGHAM GAS SECRETARYSHIP.

At their Meeting last Tuesday—held under the chairmanship of the LORD MAYOR (Alderman Bowater)—the Birmingham City Council had presented to them the report of the Gas Committee, particulars regarding which were given in the "JOURNAL" for the 25th ult., p. 246.

Alderman Sir HALLEWELL ROGERS moved that the Gas Committee be authorized to fill the vacant office of Secretary and Manager of the Gas Department, and to offer such salary as they might consider reasonable. After a sympathetic allusion to the loss sustained by the death of Mr. G. Hampton Barber, he asked for the support of the Council in the trying times through which the department were passing while searching for a successor. It would, he said, be within the memory of the Council that, upon the retirement of Mr. Henry Hack, they did not recommend the appointment of another Engineer-in-Chief, but advised that the four Engineers-in-Charge be made responsible for the works under their particular control. A weekly staff meeting was organized, at which each of the Engineers was present, together with the Chief Chemist and Secretary. This combination of engineering and commercial elements proved very successful; and after careful consideration, the Committee recommended that the system should be continued. They therefore advised the Council to authorize them to fill up the vacancy by the appointment of a thoroughly competent commercial man, accustomed to organizing and controlling a large staff, and capable of buying all the coal, oil, and other material required, and also of successfully negotiating the sale of coke and other residuals. In the opinion of the Committee, it was not absolutely necessary, though it might be desirable, that he should have an intimate knowledge of gas engineering; but they did think it essential he should have had such training as would enable him to form an opinion as to the commercial value of the various proposals that the Engineers from time to time brought forward, and advise the Committee thereon. Such an official it was not easy to find; and this was why, in the resolution, no mention was made of the exact amount of salary that the Committee proposed to offer. It must depend entirely upon the qualifications of the man himself. He was quite prepared, if the Council insisted upon it, to tell them the figures in the minds of the Committee; but he trusted he would not be pressed on the point, as he was sure it would not be in the interests of the city or the department. If he mentioned a somewhat low figure, it would not attract the right candidate. On the other hand, if he mentioned a high figure, and the right candidate was not forthcoming, and they appointed someone at a lower salary than that stated, it would not have satisfactory results, inasmuch as it would show the official concerned that he was not really the man whose services they were seeking. The Council might trust the Gas Committee not to offer an exorbitant figure; but, at the same time, they felt that, having regard to the importance of the gas undertaking, and the difference it would make to the ratepayers of the city if the department were not efficiently managed, it was a wise policy to obtain the services of a thoroughly competent officer. These services could not be secured unless adequate remuneration was offered.

Mr. WALTHALL objected to the proposal, because he did not consider Sir Hallowell Rogers had given any sufficient reason why an unusual course should be adopted. Whatever salary was offered, it ought to be mentioned, as was done when Mr. Barber was appointed many years ago.

Mr. PENTLAND asked whether it was proposed to make an appointment subject to the confirmation of the Council.

Alderman BEALE approved of the proposal of the Gas Committee, as the best way to get the best man.

Mr. PARKINS asked whether, in the event of the resolution being carried, anything would be done contrary to the spirit of the amendment carried with reference to a proposed advance in Mr. Barber's salary.

Mr. JACKSON said he could not see any business end to be gained by members of the Gas Committee going about with the amount of the salary they proposed to give "tucked up their sleeves." It was far better, he thought, to state the commencing salary, and reward a man according to his merits.

Sir HALLEWELL ROGERS, in reply, pointed out that the post they were now seeking to fill was not exactly the same as that when they appointed Mr. Hampton Barber. Mr. Barber was appointed as Secretary only; but they were now looking for a rather different class of man to work with the Engineers. In reply to Mr. Pentland's question, they were proposing to fill the present vacancy in the usual way. They would bring up one name, and one name only. If he and Mr. Jackson did not agree with that name and the salary proposed, they must vote against the Committee. With respect to increases in the salary, he (Sir Hallowell) would not like to pledge himself; but they would not go further than to recommend a certain increase after a short trial. He sincerely trusted the Council would pass the resolution, because he could not agree that it would be in the best interests of the Council that the remuneration should be known at the present time. It was essential that they should attract the right man; and when they had got him, they could consider whether he was worth the salary they were prepared to offer.

Eventually the Council agreed to the following resolution: "That the Gas Committee be, and are hereby, authorized to recommend a person to fill the office of Secretary and Manager to the Gas Department, and to offer such salary as they may consider reasonable."

The report was then put and approved.

**The Extensions at Burton and Sutton-in-Ashfield.**—The contract for the settings of ten beds of eight retorts each, on the Klönne principle, at the Burton-on-Trent Gas-Works, has been placed with Messrs. Graham, Morton, and Co., of Leeds. The firm are also at the present time building a bench of inclined retorts—seven beds of six retorts each—at the Sutton-in-Ashfield Gas-Works, together with the coal-handling plant, consisting of elevators, breaker, conveyors, structural work, &c., in accordance with the specification of Messrs. Corbet Woodall and Son, of London.

## EDINBURGH AND LEITH GAS COMMISSION.

## The Extra Charge for Prepayment Meters—The Reorganization of the Office Staff.

The Edinburgh and Leith Gas Commissioners held a monthly meeting on Monday of last week, at which Lord Provost BROWN presided.

The Works Committee reported that they had reconsidered the subject of the extra charge to prepayment meter consumers; that the Clerk repeated his opinion that the Commissioners were entitled to charge such consumers for the extra expenses entailed by their meters, beyond ordinary consumers, and read correspondence which he had had with the Town Clerk of Glasgow, showing that the Corporation of Glasgow were in similar circumstances to the Commissioners and held a similar view to that which the Clerk expressed; and that the Committee had, by a majority, adopted the recommendation of the Engineer, to charge at the rate of 1d. per 20 cubic feet, subject to rebates. The recommendation of the Engineer is equal to the rate of 1s. 2d. per 1000 cubic feet; and the two opposing proposals were that the extra charge should be 7d. and 10d. respectively, per 1000 cubic feet.

Judge PENNELL, in the Commission, moved that the extra charge be 7d. Prepayment meters, he said, were only one of a series of appliances belonging to the Gas Commissioners which were made use of by consumers. They had the Stove Department, in which a charge of 10 per cent. was added, to cover the Commissioners' rent. Another was the use of extra meters, for which no additional charge was made. In the case of prepayment meters, it was not 10 per cent. which they added to the cost of the gas, but 38 per cent. They had obtained from various places information as to what was the cost of working prepayment meters; and they had also ascertained that there was, in the case of certain English undertakings, a model clause which allowed an added rate of 10d. They found in seven or eight places the average extra charge was 7d. This was the charge which was made in Glasgow; and he thought it was right that, to this extent, they should relieve those people who paid in advance.

Mr. DOUGLAS ELLIOT seconded. The very object of their existence, he considered, was to see that the whole of the inhabitants could get gas at reasonable prices; and the poorer consumers ought to be supplied on terms as favourable as the larger ones.

Bailie LINDSAY moved that the extra charge be 10d. per 1000 cubic feet. Mr. Herring, he said, had gone very minutely into the matter. The only fault he had to find with his report was that it was written from the standpoint that the Commissioners had for years been not in favour of the prepayment meter system being extended. However unbiased a gentleman writing a report might be, there was just the possibility that, when writing with a certain end in view, he might put in facts and figures rather to bear out that view. He thought that a charge of 10d. would not lead the Commissioners into any substantial loss. An extra charge of 1s. 2d. seemed to the ordinary lay mind to be a very exorbitant one; and it was difficult for them to explain why it should be so much.

Treasurer CALDER seconded.

Lord Provost BROWN suggested that they might hear Mr. Herring's explanation.

Judge PENNELL said it would be out of order to call in an official to speak to the Commission; and he pointed out that Mr. Herring had reported on the subject.

Judge BRYSON moved approval of the recommendation of the Committee, which was seconded, and on a final vote was adopted by 13 votes to 8.

The Works Committee submitted a long report by a Sub-Committee upon the subject of the reorganization of the office staff, in which it was stated that instructions were given to the Treasurer and the Engineer to report: (1) Their suggestions as to what new appointments should be made for vacancies occurring at Whitsunday next, and in consequence of the probable amalgamation of the offices of Treasurer and collector; (2) as to the holidays allowed to the staff; (3) as to the hours of work of the staff; (4) as to the suggestion that certain of the gas accounts should be paid by cheques sent by the debtors to the office and not handed to the runners; and (lastly) generally as to working out the scheme for organizing the staff.

In the report of the Treasurer (Mr. J. S. Gibb) there was incorporated a statement prepared by the Collector (Mr. R. Cockburn) to the effect that in the year ending May 15, 1890 (being the first complete year of the Commissioners' existence), the number of payments was 275,819, while in the year ending May 15, 1909, the number was 306,663—an increase of 90,844; but that if the prepayment meter payments for 1909 were included, the increase would be 163,323, or 75·768 per cent.

The report of the Engineer (Mr. W. R. Herring) was an interim one. In it he dealt with some proposed changes in the keeping of the meter surveyors' books, and other matters of detail. In conclusion, Mr. Herring said he had endeavoured to keep prominently in view the following factors: First, the efficient administration of the Commissioners' affairs and the economical interest of the undertaking, and that of the gas consuming public as being of primary importance; second, that in any changes in the method of doing the work, or alteration in the duties of members of the staff, not more than a fair day's work should be demanded from any individual person; third, should it be found that, with efficiency, economies could be introduced and the work accomplished with a smaller staff, care must be taken that no hardship was done to members of the staff who had been led to believe that their positions were permanent. The changes that would inevitably result from retirements in the various departments of the Commissioners would, he had little doubt, permit of most, if not all, of the services of those at present in their employ being retained in some or other of the departments of the undertaking. At the conclusion of any reorganization that might take place, the Committee should be empowered to review the present scale of salaries, and adjust them if found necessary.

The Sub-Committee after careful consideration of these reports, agreed: (1) That in order to conform to the spirit of the Provisional Order, all members of the staff should retire at the age of 65, unless



specially retained longer; (2) that the present Treasurer and Collector should remain in service till completion of the next balance-sheet, not later than Aug. 31; (3) that the Treasurer's recommendations as to the present temporary clerks being made permanent should be left over for consideration till a later period; (4) that the holidays of all the staff should be one fortnight, *plus* public holidays; (5) that the office hours should be, all the year round, from nine to five, with one hour off for lunch; (6) that the offices presently held by the Treasurer and Collector should be amalgamated under one official; (7) that the Engineer should have charge of the working department, including the consumers' clerks and meter surveyors; (8) that the Treasurer should have charge of the Financial Department, including the collectors and financial clerks; (9) that the Sub-Committee should consider at a future meeting as to the payment of accounts by cheques sent to the office; and (lastly) that the Engineer should consider and report his views as to adopting the interleaving system for meter-readers' books.

Subsequent to these findings, the Sub-Committee had a further meeting, at which they again took up consideration of the Treasurer's recommendations as to the temporary clerks, and resolved that, pending readjustment of the permanent staff between the Engineer's and the Treasurer's Departments, consideration of this matter might meantime be delayed; and it was also reported that the Engineer having reported as to the impracticability of adopting the interleaving system in connection with the meter-readers' books, the Sub-Committee were satisfied, and approved of the Engineer's proposed change in the method of keeping the meter reading and consumers' ledger records, and in the inclusion of the stove-rental in the gas ledger and the issue of one account for both items.

Judge BRYSON moved approval of the report, which was agreed to unanimously.

### HEYWOOD CORPORATION GAS-WORKS.

#### Mr. Whatmough's Twenty-First Year of Management.

The fourth annual social gathering in connection with the Heywood Corporation Gas-Works was held last Saturday week in the Conservative Club, when about 120 workmen and friends sat down to an excellent tea. As this was the 21st year of Mr. Whatmough's management of the undertaking, he generously defrayed the whole of the expenses.

During the evening, in the course of a short speech, Mr. Whatmough gave some interesting particulars of the progress of the undertaking in the period mentioned. The number of meters and appliances had, he said, increased by over 11,000. The make of gas had gone up from 75,000,000 cubic feet to 135,000,000 feet—an increase of 60,000,000 feet. The price had been reduced, including this year, by just under *s.* per 1000 cubic feet, representing a saving to the consumers of £6000 per annum; £14,000 had been transferred from the profits to the reduction of the rates; and the reserve fund stood higher than it had ever done in the history of the concern. He expressed the opinion that the time had come when the Corporation ought to devote the whole of the surplus profits to the reduction of the debt of the undertaking, as, in view of the severe competition of electricity and power plants, there was not much field for further developments. He thanked the employees for the good feeling exhibited towards him, and the way in which all worked together for the good of the department. Owing to illness, the Chairman (Councillor David Healey, J.P.) was unable to be present; and Mr. Whatmough apologized for his absence.

On behalf of the Committee, Councillor M'Murdo expressed his pleasure at being at the gathering, and agreed with Mr. Whatmough that the profits of the Gas Department should not be handed over to the rates.

A vote of thanks to Mr. and Mrs. Whatmough for their kindness and hospitality was heartily agreed to; and Mr. Whatmough suitably responded.

### GAS AND ELECTRIC LIGHTING AT BISHOP'S STORTFORD.

The gas and electric lighting questions have lately been much before the residents of Bishop's Stortford. It may be remembered that a Bill has been promoted to effect an amalgamation of the Bishop's Stortford and several neighbouring Gas Companies, and its scope was fully dealt with in the "JOURNAL" for the 4th ult. (p. 23). The Urban District Council also decided that they would promote a Bill to sanction the purchase by them of the Gas Company's undertaking. This project was, however, rejected by the Council at their meeting on the 11th ult., as recorded in the "JOURNAL" the following Tuesday. The question then arose as to the Council opposing the Company's Bill; and this was considered at a special meeting held on the 27th ult.

The Chairman of the Council (Mr. J. L. Glasscock) presided, and explained that the meeting had been called, pursuant to the provisions of the Borough Funds Acts, for the purpose of taking into consideration a Bill affecting the interests of the inhabitants, and intended to be introduced into Parliament in the ensuing session. It was unnecessary to read the preamble of the Bill; and if the Council believed it to be expedient to oppose the Bill, there were certain resolutions which must be carried. He thought they must have an absolute majority of the whole number of the Council; and the first thing would be for those in favour of the opposition to propose the resolution, and then they would have an opportunity of voting upon it.

The Clerk (Mr. T. Swatheridge) said that the resolution before the Council was as follows: "That, in the judgment of this Council, and in order to protect the interests of the inhabitants of the urban district of Bishop's Stortford, it is expedient for this Council to oppose the Bill intended to be introduced into Parliament in the ensuing session and now submitted to this Council for consideration." He said if this were carried there would be a subsequent resolution.

The Vice-Chairman of the Council (Mr. H. Kent) said that as he moved that the resolution should be submitted to the statutory meeting of the Council, he would propose its adoption. He had no antagonistic

feeling towards anyone; but he considered it to be the duty of the Council to oppose the Bill, in order that they might, if possible, obtain some concessions which would be to the benefit of the gas consumers. If he knew that the ratepayers of the town were diametrically opposed to any opposition to the measure, he would fall in with them; but until such an expression of opinion had been given, the Council should, in his opinion, place themselves in a position to oppose. If, after the elections for the new Council in April, there was an understanding that there was to be no opposition to the Bill, it could be dropped. He considered, however, that the existing Council should go forward with it by depositing a petition against the Bill. Mr. Flinn seconded the motion, because he looked upon the question as one for the future. If the new Council wished to take action, they ought to be able to do so. After some discussion, the Chairman said that while he quite admitted there was a great deal of force in Mr. Kent's and Mr. Flinn's arguments—that the subject should be kept alive until the next Council was elected—it seemed a half-hearted policy. It had not been said that there was any particular point the Council wished to go for, but that they should put themselves in a position to allow their successors to oppose the Bill if they wished to do so. He personally could not take this view. He considered it was rather a hazardous policy to act upon; and therefore he could not support any further expenditure in opposing the Bill. On the resolution being put, six members voted for and three against it. The Chairman thereupon announced that, as the statutory number of eight members had failed to vote for the resolution, it fell through.

The Vice-Chairman asked when he could raise the question of representatives of the Council being sent to urge the Herts County Council to oppose the Bill; and on being informed by the Clerk that the following Tuesday would be time enough, he gave notice that he would move to this effect. Accordingly, at the meeting of the Council last Tuesday, at which he presided in the absence of the Chairman through indisposition, he said he did not intend to go into details in reference to the proposal standing in his name. The Chairman had several times stated that whenever he (the Vice-Chairman) had spoken upon the Gas Company's Bill, he had not put his finger upon any particular clause which would be detrimental to the common interests of the town. He had answered the Chairman to the effect that he was opposed to the measure on account of the huge monopoly it would create. He was still of the same opinion; and he felt convinced that the Bill would never have the seal put upon it which many people desired. Although he and his supporters had lost two or three times in reference to the Bill, he was going to propose a resolution which was not likely to entail much expense. They had a County Council which cost them a good deal of money, and there was now an opportunity of making them serve their purpose by asking them to do the work which the District Council seemed unwilling to do in opposing the monopoly which was in their midst. He proposed that the Council should appoint a deputation to wait upon the Herts County Council and request them to oppose the Bill, or get it amended in some of the ways the Council desired. This was his object in moving the resolution. He hoped it would find a seconder. Mr. Flinn seconded the motion; remarking that it required no comment from him. After some discussion, it was carried by four votes to two, and a deputation was thereupon appointed.

At the annual meeting of the Bishop's Stortford Ratepayers' Association on the 24th ult., the Gas Company's Bill was under consideration. The meeting favoured the application by the District Council for an extension of time to enable the town to consider the advisability of proceeding with the Electric Light Order; and it was resolved that a public meeting of the ratepayers should be held on the following Monday. This duly took place; and a resolution was carried by 46 votes to 15, out of an attendance of 90, to urge the Council to proceed with the Electric Lighting Order, and to place themselves in the best position for carrying it out. At the meeting of the Council next day, the question was brought forward and adjourned.

### A NEW HOLDER AT SCUNTHORPE.

The completion of a new gasholder at the Scunthorpe Urban District Council's works was celebrated by a dinner at which the members of the Council were entertained by the Contractors, Messrs. C. & W. Walker, of Donnington. The capacity of the holder is 420,000 cubic feet; and the contract price was £4612. Mr. R. J. Milbourne, Assoc. M.Inst.C.E., Engineer to Messrs. Walker, presided at the dinner; the vice-chair being occupied by Mr. T. Sudlow, the Chairman of the Gas Committee. Mr. J. W. Turner, the Gas Manager, presided at a table composed entirely of the employees from the gas-works.

In the course of the toast list, the Chairman proposed "The Town and Trade of Scunthorpe." He remarked that the gas-works were built in 1900; and the undertaking had since made rapid strides, which showed that the town had had a prosperous ten years. It was about twelve months ago when the order was given to his firm to erect the new holder. In responding, Mr. D. Dixon, the Chairman of the Council, said the event they were celebrating that night showed the development of the district. The importance of extending the gas undertaking was very apparent.

Mr. John Long proposed "Success to the Gasholder and the Gas Undertaking;" pointing out that the question of a reduction in price was worth thinking about. The more gas they made, the cheaper they could make it. They had now a plant which did away with Friday and Saturday night fears of not being able to keep the town going. In reply, Mr. Sudlow said that when the Council were considering the provision of a new holder, they decided to go in for one of the newest type, and one which would prove the most serviceable. The work was entrusted to Messrs. Walker; and right from the beginning to the finish, it had gone through without a hitch, and without an accident. The work on the foundations was of a serious character. They had had to put in 2 feet of solid concrete; and as the excavation was 101 ft. 8 in. diameter, it would be seen that there was something to do. This work had been entrusted to a local man, and satisfactorily carried out. He mentioned to Mr. Milbourne, when his firm had secured the contract, the fact that



they had steel works in the locality; and he was pleased to say that a good part of the steel used was the production of the Frodingham Iron and Steel Company. At the Local Government Board inquiry, the Inspector congratulated the Council on beginning these extensions at the right end, and said they were wide awake. The old gasholder was too small. At week-ends there was more gas consumed in one night than filled it. The new holder had a capacity of 420,000 cubic feet; the old one, of 120,000 cubic feet. The gas undertaking was only of recent growth. They commenced in 1901 to manufacture gas, and had 185 consumers; now they had 1400 consumers. When they began, their output was 5 million cubic feet per annum; to-day it was 35 million cubic feet. Recently they had had an inquiry into the question of supplying gas to Crosby, which he hoped would result in powers being granted. This would mean a further demand on their holder. The gas undertaking was a monument of the foresight of the members of the Council. In conclusion, he paid a tribute to the staff at the gas-works.

Other toasts were, "The Gas-Works Staff and Workmen," proposed by Dr. Behrendt, and responded to by Mr. Turner; and "Success to the Firm of Messrs. C. & W. Walker," proposed by Mr. Sudlow, and responded to by Mr. Milbourne, who said his firm had placed as much work as possible in the district. The new holder had been prepared for another lift, which at any time would, at a comparatively small cost, enlarge it to a third more than its present capacity.

## EFFECT OF THE PARIS FLOODS ON THE CITY LIGHTING.

Now that the gradual fall of the Seine has brought relief to the thousands who have been affected by its recent overflow, the inhabitants of Paris and its suburbs are beginning to realize how easily, by an abnormal rise in their usually calmly flowing river, they may be deprived not only of light, but of supplies of food by the obstruction or the disorganization of the ordinary means of transport. Fortunately, so far as we have gathered from recent reports, the gas supply has suffered but slightly in comparison with the electric light. This was absent over a wide area of the city on Wednesday night; and next day, according to the Paris Correspondent of the "Daily Telegraph," numbers of workmen were opening streets to get at the electric conduits, and cables were being laid on the surface and over the roofs of houses to carry current to the streets and quarters which had been deprived of it. Other workmen were busy emptying water out of the conduits round gas-mains, and repairing broken pipes. Petroleum lamps were in use in such places as the Champs Elysées and the Quai de l'Archevêché, and gave out a faint glimmer at night, as in country villages. The central boulevards were still without electric light.

From present inconveniences, it may not be out of place to take a glance into the future. According to an instructive statement to the "Matin," M. Millerand, the Minister of Public Works, considers that it is unfair to put the blame for the disaster on the works which render Paris more accessible. He points out that no disaster can be eternally averted; but he says some guarantee must be given that a future catastrophe, should it come, will be less extensive. The bridges were wonderfully solid; but the roads leading to them were submerged. This, says M. Millerand, must be improved. Referring to the telegraph service, he testifies to the excellence of the efforts of the employees; but, despite the marvellous efforts of all, he passed two days of anguish thinking that the Central Office would be unable to work, and Paris be isolated from the rest of the world. Why? Because the electric force indispensable to the apparatus was not safe from an invading flood. He declares that "henceforth no inundation must deprive the capital of the Republic of the telegraph." Gas, electricity, and drains are all together underground, so that an accident to one affects the rest; and they must be separated. A Commission is to study this, and when finished the plan will be submitted to Parliament.

## DEMURRAGE CLAIMS BY RAILWAY COMPANIES.

The Committee on Gas Supply of the Glasgow Corporation had recently under consideration the question of demurrage claims by railway companies; and they intimated to the Corporation last Thursday that it had been reported to them by the Town Clerk that application had been made to the Railway and Canal Commissioners by the Coal-masters Associations, traders, and the railway companies, in connection with the question of demurrage charges. The Town Clerk also reported to the Committee that the Engineer to the Edinburgh and Leith Gas Commissioners had been in communication with the Board of Trade as to the position of Scottish municipalities owning gas undertakings, and that the Board had stated that it was quite open to the municipalities to apply on their own part for the appointment of an arbitrator in regard to the charges, and that the award of the Railway and Canal Commissioners in connection with the applications already made would technically apply only to the specific cases submitted for arbitration. The Town Clerk stated that he understood that the Edinburgh and Leith Gas Commissioners were of opinion that joint application on behalf of the municipalities should be made to the Railway and Canal Commissioners prior to their dealing with the other applications, and that they were desirous of again conferring with representatives of the Glasgow Corporation on the subject. The Glasgow Gas Committee, being strongly of opinion that no such application should be made by the municipalities at this stage, and that any action to be taken by them should be delayed until the decisions in the other applications had been given by the Railway and Canal Commissioners, agreed to a representation to this effect being made to the Edinburgh and Leith Gas Commissioners. The Corporation assented to this course.

The Lincoln City Council have resolved to ask the sanction of the Local Government Board to the borrowing of £13,500 for the purpose of constructing a tower and tank in connection with the new water undertaking.

## EARLY DAYS OF GAS LIGHTING IN AMERICA.

The first article in the number of our American contemporary "Gas Logic" for the past month bears the title of "Where Gas was First Used;" and the following particulars are given in regard to the early days of the illuminant named in the United States.

The writer of the article begins by pointing out that, like most inventions, gas lighting was not taken seriously. It seemed to the American and European world of 1800 to be on a par with the Laputan's philosopher's scheme for making sunshine out of cucumbers. People were afraid of what was at first called "burning air," and could not be convinced that fire or explosion would not be the inevitable result of its general use. When the first daring New Yorker, Mr. Samuel Leggett, lighted his house, No. 7, Cherry Street, with gas, people stood at a respectful distance. But it does not take long for human nature to get used to novelty. It is somewhat remarkable, considering the difficulties of communication and the meagre resources of a new country, to note that America was but little behind England in the use of gas, and that Newport (R.I.) and Baltimore (Md.) were, with New York, the American cities to lead the procession. The first public street lighting with gas was on Jan. 28, 1807, in Pall Mall; on Dec. 31, 1813, Westminster Bridge was lighted. Baltimore was lighted by gas in 1821. American inventors and experimenters had paralleled those of England and the Continent in the meantime. In America, David Melville, of Newport (R.I.), had in 1806 completed an apparatus by which he lighted his house and the street in front with gas of his own manufacture. On March 18, 1813, he secured a patent, and lighted with the new illuminant mills at Watertown (Mass.) and two mills near Providence.

All this experimenting and demonstration had been closely watched by enterprising Americans. On Dec. 30, 1815, the "American and Commercial Daily Advertiser" (now the Baltimore "American") published a brief and pointed article on gas, calling attention to the facts that Covent Garden Theatre and some London streets were lighted by gas, and that the inventors had offered it eight or ten years earlier to the people of Baltimore, who had laughed at the idea. The following year, gas lights were exhibited in Peale's Museum on North Holliday Street, Baltimore, which is still standing.

In the Baltimore paper already mentioned, on June 13, 1816, this announcement appeared:

### GAS LIGHTS

WITHOUT OIL, TALLOW, WICK, OR SMOKE

It is not necessary to invite attention to the gas lights by which my Saloon of Paintings is now illuminated; those who have seen the ring beset with gems of light are sufficiently disposed to spread their reputation. The purpose of this notice is merely to say that the Museum will be illuminated every evening until the public curiosity shall be satisfied.

REMBRANDT PEALE.

When the Museum was discontinued, the building was for some years used as a City Hall, and later for a Public School. It is now occupied by the Baltimore City Water Department. The demonstration by Mr. Peale resulted in the formation of a Company for the manufacture of gas in sufficient quantities to light the entire city; and the Company began operations in 1821.

## PUMPING AT THE BRAINTREE WATER-WORKS.

The water-works of the Braintree Urban District Council have been equipped with new pumping machinery; and an official test was carried out a few weeks ago, with satisfactory results. In the course of a report thereon to the Council, Mr. Percy Griffith, M.Inst.C.E., furnishes the following particulars.

A full and constant supply of 15,000 gallons per hour can be obtained with a depth of 40 feet of water in the well; in other words, pumping at this rate does not lower the water-level more than 80 ft. 9 in. from the surface, leaving a reserve of 40 feet depth of water in the well available to cover any falling off in the supply. Increases in demand are fully covered by the fact that by pumping for 24 hours per day the Council now have an available supply of 360,000 gallons, or sufficient for a population of 18,000. Mr. Griffith says the economy of pumping costs estimated by him in his former reports will be fully realized, and, as a result, the capital outlay now incurred will not involve any increased demand on the rates; in other words, the recent alterations and extensions will not cost the ratepayers anything. The Contractors (Messrs. Davey, Paxman, and Co., as regards the engine and producer plant, and Messrs. Glenfield and Kennedy, as regards the pumps and gearing) have fully satisfied Mr. Griffith in all the essential features of the new plant. The guaranteed duty has been exceeded as regards consumption of fuel per unit of horse power developed in the engine and per unit of work done measured in water lifted; the slip of the pumps is less than 4 per cent., which is remarkably low; and the whole plant works smoothly and well under the conditions for which it has been designed.

Mr. Griffith concludes his report by saying that steps have been taken which will, he is confident, prevent any risk of contamination of the well water by surface water. He trusts the Council will at once authorize him to carry out the proposed extension of the tank, and so complete a scheme which he is sure will be found to be a valuable asset to the town. The question of lowering the old pumps in No. 2 well should, he thinks, now be considered. He says it is clear that if these were fixed at the bottom of the well, they could be worked at such a speed as to deliver 15,000 gallons of water per hour, and thus secure considerable economy and convenience in working, and at the same time provide an effective duplication of the pumping plant.

At the Middlesex County Council's gas-meter testing-station at Edmonton, 21,497 meters were tested during the quarter ended Dec. 31; the fees received amounting to £643.



## NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

The meeting of the Western District of the Scottish Junior Gas Association in Glasgow to-night was, in point of number, the poorest which has ever faced a Chairman in the West. The subject was "The Chemistry of Coal Gas and the Bye-Products;" and it is one that does not appeal to a very extensive section of the members. It was handled by the author, Mr. D. T. Marwick, who is Chemist at Dawsholm, in a manner appropriate to the occasion—not being of too deep a nature nor too crowded with detail; and it was very cordially received.

At the weekly meeting of the Glasgow Corporation on Thursday, Mr. P. G. Stewart called attention to the action of the Gas Committee in reference to a letter from the Municipal Employers' Association, in which it was pointed out that men not trained as gas-fitters had been engaged by the department to make the connections between the street-mains and the street-lamps and properties. After having heard from the Manager, the Committee recommended that no action be taken in the matter. The gas-works, Mr. Stewart said, were a seething mass of discontent. Owing to a cheeseparing policy, retorts had been allowed to get into disrepair; and men had been discharged to save money. He contended that during the recent fogs the Gas Department, owing to their parsimony, had been responsible for the breakdown in gas-fires. Twenty men had been discharged, and others taken on to do the work cheaper. The latter were paid 22s. and 24s. a week, instead of 34s., which was the former wage. He asked the Convener to take the minute back. The Convener—Mr. M. W. Montgomery—declined. He said he never heard of a single man being dismissed. After some heated remarks by Mr. Stewart, Mr. Montgomery explained that the rearrangement made was simply a reversion to the state of matters during the *régime* of Mr. Foulis. Personally, he was quite willing to receive a deputation of the men. The Committee were anxious to take the men with them. The minutes were adopted by 31 votes to 15. Mr. Moir moved that there be provided in some convenient part of the Municipal Buildings, situated and so arranged as to test the illuminating power of the gas supplied by the Corporation, a photometer with an experimental meter and other necessary apparatus; the burner to be used in connection with the testing to be that known as the "Metropolitan" argand burner No. 2, the photometer to be a bar photometer, and the standard light to be that supplied by Harcourt's 10-candle pentane lamp, and that, in making the test, the burner be so used as to obtain from the gas, when burned at the rate of 5 cubic feet per hour, the greatest amount of light. The motion was defeated by a large majority.

The Edinburgh and Leith Gas Commissioners on Monday got through a more than usually large amount of public business. It will be observed, from a report of the proceedings upon another page, that, though strongly urged to give easier terms to prepayment meter consumers, they adopted the recommendation of the Works Committee, based upon the exhaustive report upon the subject by the Engineer—Mr. W. R. Herring (published in the "JOURNAL" for July 20 last, p. 195)—to continue the differential rate, which is equal to 1s. 2d. per 1000 cubic feet, with rebates. The report upon the reorganization of the office staff is an important document, which is attracting some interest in gas circles, and outside of them, as there is shortly to be faced by the Commissioners the task of filling up the vacancy in the desirable post of Treasurer to the Commission, which will become vacant on Aug. 31, when Mr. J. S. Gibb, the Treasurer, and Mr. R. Cockburn, the Collector, retire, and their offices are conjoined. There are also expectations of other posts being open, through the changes in the staff—posts, however, which, in the nature of things, may be expected to be filled up from within, although there can be no certainty upon this point; a popularly elected body being open to influence. There are other changes which are not without interest to the staff, consequent upon the transference to the Engineer's Department of the consumers' clerks and meter-surveying departments. It is satisfactory to note the increased volume of business which is being done—the Engineer's report showing an extra output of gas during December of 26,272,000 cubic feet—equal to 9.89 per cent.; and since May 16 an increase of 81,118,000 cubic feet, or equal to 7.05 per cent.

In the Dysart Town Council on Tuesday, Mr. Gallacher, in terms of notice given, moved that the Council adopt the Burghs Gas Supply Act, with a view to acquiring the gas-works. There were numerous complaints about the exorbitant price charged by the Gas Company; and he believed that the gas would be supplied much cheaper. Treasurer Spalding, while sympathizing with the motion, pointed out that the harbour and three farms which were owned by the Corporation were heavily mortgaged. He thought they should endeavour to redeem some of these mortgages, which were crippling the enterprise of the burgh, before they incurred new burdens. Other gentlemen spoke to the same effect; and no one seconding Mr. Gallacher, his motion fell. In the course of the discussion, it was stated that the Gas Company's dividend was 5 per cent. per annum until a few years ago, when it was raised to 7½ per cent. Another reason for delay, which weighed with some of the councillors, was a desire to see what price will be fixed for the gas-works in the neighbouring and larger town of Kirkcaldy.

In connection with the gas transfer at Kirkcaldy, now in progress, the Gas Committee of the Town Council have unanimously appointed Mr. Arthur Silverthorne as expert on their behalf.

The gas transfer at Carnoustie, which has had a few ups and downs in its early stages, bids fair to proceed now. A special general meeting of the Carnoustie Gaslight Company was held last Saturday to consider and determine as to the offer made by the Town Council to acquire the Company's undertaking under the Burghs Gas Supply Act. Ex-Provost M'Corquodale presided; and it was unanimously agreed to entertain the offer of £21,000 made by the Corporation.

The Inverkeithing Town Council last night again considered the subject of acquiring the gas undertaking. Mr. Gibson moved that a Special Committee be appointed to confer with the Directors of the Gas Company as to the purchase. The Company had offered to sell for £25,000; but he did not know that any reply had been sent to the Company, and he did not think that the town had made an offer. The purchase of the gas-works might not be profitable in the meantime; but he

considered that the step would be so in the end. The motion was not seconded; and it accordingly fell through.

In the Dundee Town Council on Thursday, the question of the introduction of a high-pressure gas system was discussed at some length. Mr. Paton moved that the matter be sent back to the Gas Committee for further consideration. He said that the system would mean an increased consumption without any increase in the quality of the gas, and it would be detrimental to fittings in old properties. Mr. Graham, in seconding, said he was not satisfied that this was an ideal system. If they put something like a force-pump at the end of a pipe, they were bound to force the gas through the pipe, and it would increase, and not decrease, the bills; and nobody but the Gas Commissioners would benefit. Mr. High moved approval of the recommendation of the Committee. Treasurer Soutar, in seconding, said that this was a technical matter, and if they were to attend to the proper development of the Gas Department from a business standpoint, they must to a very great extent be guided by their expert Engineer, who had this qualification—that hitherto none of the suggestions he had made had turned out anything other than successful. Bailie Macdonald said it was not pressure, but gas, that they wanted. The motion for a re-commit was carried by fourteen votes to eleven.

The most amusing instance of the vagaries of electric lighting that has come under my notice occurred during a concert which was being given in the Oddfellows' Hall, in Edinburgh, on Thursday evening. Following upon the address of the Chairman, the first item on the programme was a duet. Scarcely had the Chairman intimated the title of the piece when the electric lights went out, leaving the audience in almost total darkness. Luckily the old gas-fittings had not been removed; and they were resorted to. The fittings were, however, as might be expected, in very bad order; and the concert was carried through under great inconvenience.

## CURRENT SALES OF GAS PRODUCTS.

## Sulphate of Ammonia.

LIVERPOOL, Feb. 4.

Direct demand from consumers abroad has been rather poor this week, and, as is frequently the case, dealers have been postponing the covering of their requirements till later in the month; so that the tone of the market has hardly been so good. Home consumption, which is an important factor in the spring, has also been delayed by the inclement weather. The closing quotations are barely steady at £11 11s. 3d. to £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. per ton f.o.b. Liverpool, and £11 15s. to £11 16s. 3d. per ton f.o.b. Leith. There is still practically nothing doing for forward delivery; and although prompt value is reported as having been paid for March shipment, buyers decline to operate for the later months at the present level of prices.

## Nitrate of Soda.

The position is without change, and the quotations on spot are still given at 9s. 1½d. per cwt. for ordinary, and at 9s. 4½d. for 96 per cent.

## Tar Products.

LONDON, Feb. 7.

The markets for tar products have been steady throughout the past week. Pitch is very firm, and has slightly improved all round. Creosote is steady, and in some quarters better prices are reported to have been obtained. Benzol is steady, and distillers are not very eager to sell for forward delivery. Toluol and solvent naphtha are in good demand. The improvement in crude carbolic acid has been maintained, and Continental consumers are reported to have paid better prices.

The average values during the week were: Tar, 15s. to 19s. *ex works*. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. 6d. to 31s. 6d. f.a.s. Mersey ports, 30s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d.; 50-90 per cent., casks included, London, 7½d. to 7¾d.; North, 7½d. to 7¾d. Toluol, casks included, London, 10d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 4¾d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2½d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 11d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11½d. to 1s. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

## Sulphate of Ammonia.

There has not been nearly so much buying during the past week, although prices have been well maintained all round. To-day the principal London Gas Companies quote £11 12s. 6d. to £11 15s.; and outside makes upon Beckton terms are £11 6s. 3d. to £11 8s. 9d. In Hull, the ordinary makes are £11 12s. 6d.; but for the better qualities higher prices can be obtained. In Liverpool, £11 15s. is asked; and in Middlesbrough, the same price has also been quoted. In Leith, makers are practically out of the market for prompt delivery, and for forward are asking £11 16s. 3d. to £11 17s. 6d.

**Herne Bay Urban District Council and the Gas-Burner Bills.**—At the meeting of the Herne Bay Urban District Council last Wednesday, the Vice-Chairman (Mr. H. E. Ramsey) stated that he and the Chairman (Mr. N. Roden) had recently attended a conference of local authorities held at the Westminster Palace Hotel on the subject of the Gas Companies (Standard Burner) Bills; and that it had been resolved that these should be opposed, and that the local authorities within the areas affected should petition against them. At the same time, they were not precluded from negotiating and arranging terms with the particular companies operating in their districts. The resolutions passed at the conference were submitted and approved.



## COAL TRADE REPORTS.

### Northern Coal Trade.

There is now a larger production of coal both in Northumberland and Durham; and though the difficulty of working under the new Act is not entirely removed, the present output is fair, while the shipments on the large contracts are improving. In the steam coal trade, prices are firmer; and for best Northumbrian steams about 11s. 6d. per ton f.o.b. is quoted. Second-class steams are from 10s. to 10s. 3d. per ton; and steam smalls from 5s. 6d. to 6s. 6d. The collieries seem to be gradually starting; and a full output, for a short time at least, seems assured. In the gas coal trade, more of the collieries have restarted; and the production is larger, though not quite at its full extent. Gas coals vary a little more in price. From 11s. to 11s. 9d. per ton f.o.b., according to the quality, is now quoted for the usual classes; and "Wear" specials are priced up to 12s. There are not many contracts now in the market; but the market is more settled than it was, though the ideas of coalowners seem to be to quote more for forward supplies of coal than buyers have been accustomed to pay—the uncertainty as to what may be the additional cost of production under the new method of working, leading to the higher prices quoted. Coke is now a little more plentiful, but steady; and gas coke is somewhat easier at from 13s. 6d. to 13s. 9d. per ton f.o.b. in the Tyne or Wear.

### Scotch Coal Trade.

Trade during the week was quiet; shipping being greatly disorganized by the severe weather. In consequence, ell and splint were more plentiful, and prices were easier. There was a good demand for steam coal. The prices were: Ell, 10s. to 11s. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 305,137 tons—an increase of 4478 tons upon the previous week, and of 39,968 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,014,877 tons—an increase of 173,247 tons upon the corresponding period.

### Midland Gas-Coal Outlook.

Under this heading, a writer in the "Liverpool Post" last Tuesday made the following remarks: "It is at present very early to talk about renewal of contracts for gas coal; but this year the negotiations will possibly be commenced much earlier than usual. In fact, it is reported that the Salford Corporation have already asked, in an informal way, for quotations for twelve months from July next. There are also a number of inquiries in the market for summer deliveries on Continental account, for which quotations are being made at 1s. 6d. per ton advance on last year. Collieries, however, are not over-anxious to enter into contract arrangements at present, as the position for export business will to some extent be governed by the settlement of labour troubles in the North. It will be remembered that last year Tyneside collieries secured the bulk of business with the London waterside gas companies, and also the lion's share of Continental orders, on account of the low

prices accepted. Should their outputs be seriously affected, or sectional labour trouble be experienced, as seems likely, it is quite possible that a good tonnage will come back to the Midlands. The arrangement of contracts by the large London waterside gas companies is always looked on with great interest. The terms on which they renew are usually taken as a basis for the settlement of contracts in inland towns, as by the alternative methods of transport—by sea from the North-East Coast, direct by rail, or shipped *via* Hull from the North Midlands—they possess a bartering power over the inland towns. It is reported that gas-coal contracts have been renewed by Durham collieries at 2s. per ton advance; so that, as far as can be seen at present, everything points to collieries in the Midlands being able to obtain very substantial advances, and, though it is unsafe to prophesy, it is most likely that no contracts will be renewed at less than 1s. per ton advance. Last year renewals were made at 6d. and 9d. per ton reduction; and it was well known that some of the large tonnage contracts left no distinct margin of profit, so that an advance of only 1s. per ton will make a huge difference to colliery balance-sheets.

### Bristol Corporation and the Gas Company's Bill.

The Parliamentary Bills Committee of the Bristol City Council have issued their report upon the Bristol Gas Bill. They say it is proposed that the promoters shall be relieved of their obligation to furnish gas to premises having a supply of electrical energy, or of gas from an installation other than that of the promoters, unless the consumer or the intending consumer will agree to pay a minimum annual sum. The Committee consider that the effect of this provision would be that a supply of gas for (say) cooking or heating might be withheld from a person who made use of electrical energy for illuminating purposes, unless he agreed to pay an annual sum, unreasonable in amount, and exceeding the value of the gas consumed. The promoters also seek power to lay pipes in streets not dedicated to the public, without submitting to the Corporation plans of the proposed work, as they are required to do in the case of other streets, though the former streets would eventually have to be made good by the Corporation and adopted as highways, to be repaired by the inhabitants generally. The Committee are of opinion that some of the financial clauses of the Bill are objectionable, as tending to keep up the price of gas, and that many other clauses would injuriously affect the interests of the Corporation and the gas consumers. Under these circumstances, they have decided, subject to the usual sanction, to present a petition against the Bill, and to take the necessary steps to oppose it in Parliament, unless the promoters will consent to the insertion of such provisions as may appear necessary.

Mr. Francis Chalmers, the Manager of the St. Mary Church Gas-Works of the Torquay Town Council, has reported to the Gas Committee that the methane-hydrogen plant is practically complete, and promises to be a useful addition to the works.

## Do You List The "THERMO"?

### The "SALON."



THE PATENT "THERMO" FIREFRONT introduced a new principle (now generally adopted) into Gas-Fire Construction.

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### The Meaning of "Ground Floor."

At the Westminster County Court last Tuesday, several interesting points were raised in an action brought by the Metropolitan Water Board against a Mrs. Lever, of Pemberton Gardens, Upper Holloway, to recover water-rates. The dispute had extended over a considerable period; and the Board admitted that they could not recover the whole of the claim as first made. The defendant counterclaimed for the return of money paid by mistake. Under the Act of the New River Company, the charge for water supplied to cisterns more than 10 feet above the ground floor was higher than that levied when the water was supplied to a lower level; and it was disputed whether in the house in question the cisterns were more than the distance named above the ground floor. It was contended for the Board that this meant the ground; and that though in the premises in question the hall door was on a level with the pavement and the cisterns were not 10 feet above that, yet, the house being on a hill, the basement was, at the back of the house, on a level with the garden, and more than 10 feet below the cisterns, and that the higher charge would therefore be correct. With regard to the counterclaim, the Board contended that the Public Authorities Protection Act, which specified that actions against a public authority not arising from contract must be brought within six months, applied, and that they were not liable. Mr. Gover, for the defendant, contended (1) that the ground floor meant the floor on a level with the hall; (2) that the defendant's counterclaim was not properly an action, but a set-off, or defence; (3) that the Water Board were not in this case a public authority; (4) that if they were, they were not here acting as one, and that the claim arose by contractual relations as between one party and another. His Honour Judge Woodfall held that the words "ground floor" in the Act must be taken to have the generally accepted meaning of the phrase—viz., the "hall floor." He also held that the Board were a public authority, and were acting as one. After argument, judgment was entered for plaintiffs on the claim, with costs.

**Municipal Electricity not Wanted at Macclesfield.**—Some days ago, the Macclesfield Town Council further discussed the question of an electricity supply for the borough. The Gas Committee had made a recommendation that the Electric Lighting Order which the Corporation at present hold should be retained; and on the instruction of the Council, the Gas Engineer (Mr. William Newbigging) had prepared a report upon the matter, in which he said that a municipal undertaking would entail heavy loss. Discussion took place as to whether the Corporation should retain their Order or abandon it and let a private company supply electricity. Mr. Oldfield moved as an amendment that, in view of the large expenditure to which Macclesfield was already committed, and no demand for the supply of electricity in the borough having been made, the Council decline to exercise their powers of installing a system of electrical supply, but offer every facility for a company to come in and provide such a supply—the Corporation safeguarding the interests of the ratepayers in the usual way. The amendment was carried by 25 votes to 12.

### The Dangerous Chandelier Again.

The adjourned inquiry into the cause of death of Annie Pearce (16), who died as the result of burns received at a serious gas explosion at Lydney Park, Gloucestershire, the seat of Mr. Charles Bathurst, M.P., was held last Friday afternoon by Mr. H. Allen Armitage, the Deputy-Coroner. The fatality has already been referred to in the "JOURNAL" (see *ante*, pp. 58, 121). The evidence given by Ernest Bailey (the under-gardener), Rosina Smith (the cook), and Gertrude Jones (the kitchen-maid), all of whom were seriously injured, showed that on the 30th of December an escape of gas having been detected when the servants came downstairs, search was made for it, and it appeared to be in the housemaid's room. The cook suggested that perhaps the chandelier, which was low, had something to do with it, and she pushed it up slowly—the explosion immediately occurring. The place was at once in flames, and much damage was done to the woodwork. Mr. J. Lauder (the steward) said he had had the chandelier, which was one of the old-fashioned rising and falling pendants, examined by a plumber in the presence of the police. His theory was that, the chandelier having been left down extremely low during the whole of the night, gas had gradually escaped, and, the ceiling being high, had accumulated above the level of the door. Thus when the cook lifted the bracket—one jet of which was alight—the explosion was caused. The Jury returned a verdict that the girl died from shock to the system caused by injuries received through the gas explosion at Lydney Park; adding a rider to the effect that precaution should be taken to prevent such an accident happening again by doing away with the present chandelier. Mr. Lauder said this should be done.

**Westminster Public Lighting.**—The Westminster City Council, in view of the early termination of the present contracts for street lighting with the Gaslight and Coke Company (for low-pressure gas lighting on the 31st prox., and for high-pressure gas lighting on the 31st of December next), have appointed a Sub-Committee to consider the matter and obtain competitive tenders.

**Vertical Retorts at St. Helens.**—In proposing the adoption by the St. Helens Town Council of the minutes of the Gas Committee, Mr. Grace, the Deputy-Chairman, said they would see that there had been an increased output of 5½ million cubic feet of gas during the month of December; and it was thought wise to decide upon the erection of a further set of vertical retorts. He was sure the Committee and the ratepayers would be glad to know that the results of the brilliant genius of their Gas Engineer (Mr. Samuel Glover) had been received by the gas engineering world with a considerable amount of enthusiasm. They had recently had visits from gas engineers from Japan, America, and other countries to the gas-works to inspect the new installation; and from the experience they had of the working of the vertical retorts, they were looking forward to a considerable reduction of the cost of producing gas.



## Maintenance.

THIS has always been the chief ground upon which we have claimed supremacy for the "NEW DAVIS" SCREWLESS COOKER.

### A Customer Writes:

"ENCLOSED please find Cheque in settlement of your account for No. 109 'NEW DAVIS' Cooker. I must also add that I am very pleased with it, and find it answers your advertisement in every way."

ECONOMY, Cleanliness, Simplicity and Beauty of Design commend the "NEW DAVIS" as an ideal Consumer's Stove.

THE DAVIS GAS STOVE  
CO., LTD.,  
LUTON.



**Annfield Plain and District Gas Company.**—Satisfactory progress has been made with this Company's business, as is shown by the accounts. The receipts for last year were £5563; and the total expenditure on revenue account £3563—leaving a net profit of £2000. The general meeting will take place on the 16th inst., when a dividend at the rate of 5 per cent. will be proposed by the Board.

**Gas Poisoning Case at Brighton.**—On Saturday, the 29th ult., Mr. Coley Bromfield was found dead in the scullery of his house in Clarence Square, Brighton. His head was in a gas-stove, and the gas was fully turned on. Mrs. Bromfield went to bed at eleven o'clock the previous night, and some time afterwards her husband went to her room and said he had found some valuable papers, and was going downstairs to look them over. He did not return, and when Mrs. Bromfield awoke in the morning she detected a smell of gas. She went downstairs and found her husband lying dead. A doctor was sent for, and efforts were made to restore animation, but without success. At the inquest on Monday last week, Mrs. Bromfield stated that her husband had had financial troubles. The jury returned a verdict of "Suicide;" leaving the state of his mind an open question.

**Gas-Workers' Wages at Blackpool.**—Further reference was made at last Tuesday's meeting of the Blackpool Town Council to an agitation by the Corporation gas-workers for better pay and improved conditions of labour. Mr. Cartledge took exception to a resolution notifying the Gas-Workers' Union that this matter was now closed. The Corporation, he said, ought to try and keep on good terms with their employees. He proposed that the question should be further considered, as there was not enough information to put before the Committee. Mr. Ellis said that the agitation was likely to be prosecuted with warmth; and it was better for the Corporation to leave the matter open. In opposing the amendment, Alderman Ward stated that the men were well paid and content, if agitators would only keep away. They merely came to the town, he added, to disturb the men. The amendment to leave the matter open was carried by a large majority.

**South Staffordshire Mond Gas Power and Heating Company.**—The Directors of this Company report that in the year ended the 31st of December last the number of ordinary customers on the books increased from 84 to 96, and the number supplied from 80 to 90. They state that there have been continued improvements in the working of the plant and the recovery of bye-products. The quantity of gas sold to ordinary customers was 80 per cent. more than in 1908; and the average price realized shows an increase of 21 per cent. The profit on the revenue account is £860. In 1908, the loss was £4851; the difference in the two years being £5711. The Directors consider this progress very satisfactory; and they have no doubt that if trade had not been so depressed during the year, the result would have been still better. They express regret at the death of Dr. Ludwig Mond, F.R.S., who was Vice-Chairman of the Company from its formation. Mr. Robert L. Mond has accepted the vice-chairmanship of the Company. It is not intended to fill the vacancy on the Board; and the Directors suggest that their number should now be reduced.

**Corporate Ownership of Water-Works in America.**—In the course of an article on "Engineering in the United States in 1909" in the current issue of the "Engineer," the writer, dealing with the subject of water supply, says: "Corporate ownership of water supply is not regarded favourably in America, especially for large cities; and the City of Omaha has voted bonds for £1,300,000 for municipal ownership. The plant of the Company is valued at £1,220,000. San Francisco and Denver are also determined to have municipal ownership, in spite of powerful opposition on the part of the Companies and the financial concerns interested in the latter. . . . On the other hand, financial and political interests have made an attempt to induce the City of Philadelphia to sell its water-works, on the ground that better and cheaper service would be given. Certain local politicians have aided and abetted this idea by political mismanagement of the works; but the project was very quickly defeated."

**Public Lighting of Cardiff.**—At a special meeting of the Cardiff Electric Lighting and Tramways Committee, a letter was considered from the Cardiff Gas Company offering certain terms for improving the public lighting. The offer was to convert the 1232 flat-flame lamps to the incandescent system, at 15s. per lamp, spread over three years, and to reduce the charge by 3s. 7d. per lamp per annum; or, as an alternative, to supply entirely new lamps at £2 2s. each. For thirty special lamps, they offered to increase the power for £78 per annum for three years, as against the present cost of £120 a year. The Committee inspected several samples of lamps supplied them, and, having had reports from Mr. Harpur, the City Engineer, and Mr. Irwin, the Gas Inspector, the Chairman (Mr. J. W. Courtis) proposed, and Mr. Vivian seconded, that they submit to the Gas Company, as an alternative to their proposal, a certain lantern recommended by the City Engineer, and ask them to quote for that. This was agreed to. The Chairman remarked that they hoped in six months' time to have the whole of the street-lamps converted to the incandescent system.

**Leeds Gas Workers' Wages.**—The Leeds Gas Committee, reporting to the City Council an application of the employees for an increase of wages of 61. per shift, recommended that the matter be adjourned until the next monthly meeting, and that in the meantime the General Manager should obtain further information on the subject from other towns. Mr. Brassington complained of the delay which had taken place over this matter. He said it seemed to him that the Gas Committee were afraid of passing any definite resolution on the subject. The plan of instructing the General Manager to obtain information on the question was a most unsatisfactory manner of dealing with it. The Leeds Corporation surely ought not to be guided by what was done in other towns in a matter of this sort, because the conditions of other towns were different. The dispute ought to be settled by the Corporation on its merits. Mr. Badlay remarked that for nearly twenty years the men had not had a rise, except for a copper or two per shift. But the speeding-up of the work and the introduction of machinery had greatly changed the conditions of employment. On behalf of the Committee, it was pointed out that there had been no unnecessary delay; and the minutes were approved.

# THE "ST. MUNGO" RADIATOR

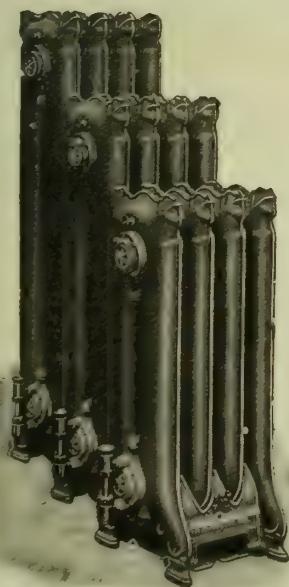
is constructed with  
BORED AND FACED JOINTS  
and  
STEEL PUSH NIPPLES.

All Joints between tubes are absolutely  
METAL TO METAL.

No Red Lead used.

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49, Queen Victoria Street, LONDON, E.C., and Gothic Works, FALKIRK.





### Salford and the Supply of Coke by Retail.

At last week's meeting of the Salford Town Council, the question of establishing yards in various parts of the borough for the sale of gas coke was discussed. Alderman Phillips, the Chairman of the Gas Committee, said the matter had been before them on several previous occasions. In 1893, the Council adopted a resolution with the object of increasing the retail sales of coke in the borough. Luries were engaged, and went through the streets to supply coke to the inhabitants; the scheme being in operation from December, 1893, to April of the following year. During this period, 339 tons were sold. The sales, however, gradually fell away; and as the cost of cartage came to £69, it was decided to discontinue the supply. Some 12,000 tons of coke were sold at the gas-works yearly in small quantities to people who generally took it away in waggons; so that it seemed as though sufficient facilities were already offered. Dealing with the cost of establishing yards as suggested, Alderman Phillips pointed out that it would be impossible to get a yard for less than £10 a year; and, of course, there would be additional expense for alterations. A man would have to be placed in charge of the depôt, and he could not be employed at less than 25s. a week. Then there would be the cartage of the coke. It was the opinion of the Gas Committee that the establishment of coke yards was an impracticable scheme; and it should not be forgotten that there were coal dealers having yards in different parts of the borough who did supply coke now. Still, if the Council desired the Gas Committee to spend £600 to £1000 a year in establishing such a scheme as suggested, they were prepared to go into the matter. No resolution was passed in regard to the subject.

**Gas Supply for a Derbyshire Village.**—The Matlock Gas Company contemplate the erection of gas-works at Chinley, a district that has developed considerably within the last few years. Negotiations are in progress with landowners for a site; and the scheme includes a supply of gas to the Chinley station of the Midland Railway Company. A meeting is to be held in the village with the object of interesting the residents in the project.

**Proposed Gas Supply for Woodhall Spa.**—The "Yorkshire Post" reports that at Thursday's meeting of the Woodhall Spa Urban Council, Mr. R. A. Came stated that Mr. T. Marsh, Gas Engineer, of Manchester, had expressed his willingness to find all the money to establish a gas supply for the place. He (Mr. Came) had informed Mr. Marsh that he thought the Council would give him all the assistance in their power, but that they would probably require him to enter into an agreement to sell the concern at a valuation on some future occasion, when the Council's financial position would allow them to purchase. The Clerk (Mr. J. E. Chatterton) said it would be a pity if the Council themselves could not have the benefit. Mr. Came replied that the venture would not pay for several years; and they were fortunate in finding someone to lay out the money. It was decided to invite Mr. Marsh to meet the Council on Thursday.

### Conviction of a Gas-Works Clerk.

At the Pontefract Quarter Sessions last Wednesday, George Hepworth, aged 29, recently employed as a clerk at the Pontefract Gas-Works, was charged on three indictments with embezzlement, falsification of accounts, and omission of material particulars from his books, with intent to defraud. Mr. Greene (who prosecuted) elected to proceed on the second count—falsification; and he stated that the evidence would be that the prisoner had been in the habit of receiving moneys from the collector of the slot meters, and had initialled the collector's book as the money was handed over. In the register of cash receipts, Hepworth, two days before the audit, had altered amounts; and when he was told that the Auditors had found certain errors, he absconded, and could not be found until he surrendered a month later. Mr. L. V. Whitaker, the Manager, bore out this statement, and said prisoner's wages were 28s. per week. In cross-examination by Mr. Mellor (who appeared for the defence), he admitted that he had on a few occasions borrowed money for his private needs from the strong-room where Hepworth placed it until it went to the bank; but he had always repaid the exact amount, and it was only a temporary loan. It was not true that he sometimes did not go to the bank because he was not in a fit state to sign the receipts. In answer to further questions, witness said he disagreed with the conclusions arrived at by a Special Sub-Committee of the Corporation, with regard to the administration of the gas-works. He believed the reflections cast upon himself were not justified, and that his own work and duties could not be better performed. In defence, the prisoner denied that he had misappropriated a single penny. He admitted having made the alterations, but without any felonious intent at all. He knew the audit was coming on; and he made the alterations because his book did not tally with the amount which had been handed over. Mr. Mellor commented in very strong terms upon the methods of book-keeping in use by the Pontefract Corporation. After an absence of over an hour, the Jury announced that they could not agree; and after a further attempt they brought in a verdict of "Not guilty." The verdict was received with some applause in court. Mr. Greene, however, said that his instructions were to proceed on the other counts; and on Friday the prisoner was found guilty of omissions from his books with intent to defraud. The Recorder (Mr. R. H. V. Wragge) remarked that the Corporation's book-keeping was admittedly not perfect; and but for the fact that they were simply perpetuating the system which had been in vogue with the old Gas Company, it would have been inexcusable. Of the remarkable series of omissions alleged against the prisoner, there was absolutely no attempt at any explanation. However bad a system might be, no man had a right to take advantage of it to become dishonest. But for the fact that the Corporation did not wish to press the case, he should have felt it his duty to pass a very heavy sentence. Taking everything into consideration, he could not do less than sentence the prisoner to six months' imprisonment in the second division. Mr. Mellor gave notice of appeal on a legal point as to the form in which the indictment had been drawn.

The RADIATOR among RADIATORS is the

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## Gas=Heated Steam=Radiator.

AN ATTESTATION.

LLANELLY GASLIGHT COMPANY.

19th January, 1910.

Gentlemen,

In reply to your enquiry as to the Gas Radiators supplied to this Company by you, I have no hesitation in saying that they are the best and most efficient working apparatus of this kind that we have had here. I am very pleased with them.

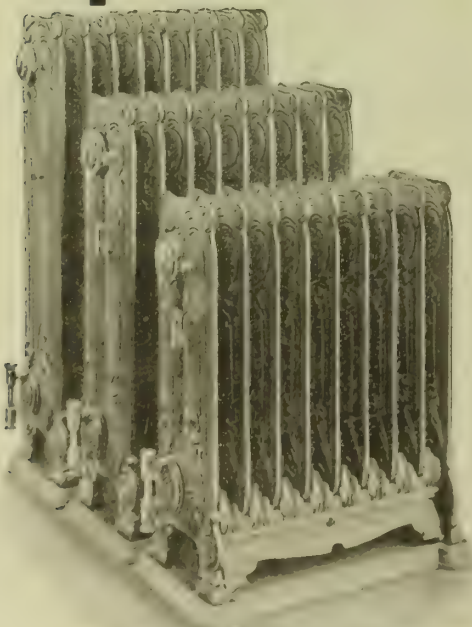
(signed) THOMAS ACLAND.

Manager and Secretary.

FULL PARTICULARS FROM

**Carron Company**  
INCORPORATED BY ROYAL CHARTER 1773

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**London's Old Water Service.**—During the excavations for the new County Hall on the Lambeth side of the Thames, there have been found several of the old wooden ducts which were in use before the introduction of the modern water-mains. They are in an excellent state of preservation, and are similar to those found in Fleet Street some time ago.

**Suicide by Gas at Manchester.**—A youth named Alfred Wilkinson, residing with his mother in Florence Street, Hightown, Manchester, was found dead in his bedroom last Thursday night, the apartment being full of gas. There was every indication that Wilkinson had deliberately turned on the gas, and had been suffocated by the fumes communicated to him in bed by means of an india-rubber tube fixed to the gas-bracket. At the inquest, when the usual verdict was returned, it was stated that Wilkinson had been out of work for some time, and had been depressed in consequence. He was 19 years of age.

**The Transfer of the Prestatyn Gas-Works.**—In connection with the taking over of the Prestatyn Gas-Works, upon the terms set forth by the Umpire after the recent arbitration, the Chairman of the Urban District Council (Mr. Parry Williams) last Saturday week entertained the members; and many congratulatory speeches were made. The Umpire's award, it may be remembered, fixed the purchase price at £14,170. The Council have arranged a loan from the Liverpool Corporation of £16,500, at 3 16s. 6d. per cent., and of £2800 for the costs of the Act from the London City and Midland Bank at 1 per cent. above Bank rate, with a maximum of 4 per cent.—the latter to be repaid in five years.

**Co-Partnership at Grantham.**—At the 71st half-yearly meeting of the Grantham Gas Company, the Directors reported that there was a balance of £3692 to the credit of the profit and loss account. Out of this sum they recommended that £2000 be applied in payment of the maximum dividend of 5 per cent. per annum on the consolidated stock; that a further sum of £500 be placed to the credit of the reserve fund; and that the balance of £1192 be carried forward to the next accounts. The Chairman (Mr. J. G. Thompson), in moving the adoption of the report, said they would agree with him that it was an entirely satisfactory one. They had been able to pay to the employees, under the co-partnership scheme, a bonus of £139 for the half year, and to carry forward a balance of £1192, which was very good, considering the reduction in the price of gas.

**Proposed Reconstruction of the Sowerby Bridge Gas-Works.**—At the monthly meeting of the Sowerby Bridge District Council last Wednesday, the minutes of a special meeting of the Gas Committee, called to further consider the report and plans presented by a Sub-Committee for the proposed extension and reconstruction of the gas-works, were submitted. The decisions of the Committee were: (1) That the new retort-house be put on the site where the present one is; (2) that mechanical stoking for the new retort-benches be adopted; and (3) that the plans as prepared be accepted as a basis for the new scheme. Mr. J. W. Whiteley moved the adoption of the minutes. Mr. Bates criticized the scheme, characterizing it as too big an undertaking to rush forward, as there would be no opportunity of speaking upon it until the Local Government Board inquiry. The motion was, however, carried; Mr. Bates being the only dissident.

**Birmingham Gas Committee's Visit to Manchester.**—Last Saturday week a visit to the Manchester Corporation Gas-Works was paid by members of the Birmingham Gas Committee and officials. Among the visitors were Sir Hallelwell Rogers (Chairman of the Gas Committee), Alderman Lloyd, Councillor Toller, Mr. W. Chaney (Engineer-in-Charge of the Nechells works), and Mr. W. Wastell, Assistant Secretary of the Gas Department. They were received by Alderman Gibson (Chairman of the Manchester Gas Committee), Alderman Jennison, Alderman Birkbeck, Councillors Kay, Meadowcroft, and Todd, Mr. F. A. Price (Superintendent), and Mr. J. G. Newbigging (Chief Engineer). From the Town Hall the party went to the gas-works at Rochdale Road, Bradford Road, and Gaythorn. The chief points of interest were the installation of inclined retorts at the Gaythorn works, the new telfer plant for the removal of coke at the Rochdale Road station, and the big gasholder that is being erected at the Bradford Road station. The visitors returned to the Town Hall, where luncheon was served in the Gas Committee's room. The Birmingham party were, it is stated, unstinting in their praise of the Manchester Gas-Works.

Messrs. John Wright and Co., of Essex Works, Birmingham, forward a copy of their latest "Eureka" booklet, which contains (in an attractive form) illustrated particulars of this well-known type of gas-cooker, as well as of the "Sun" boiler and other of the firm's specialities.

The Gas Committee of the Rotherham Town Council have decided to lodge objections to the Dinnington and District Gas Provisional Order, which is to authorize a supply of gas in various parishes, including Maltby, Bramley, and Wickersley. The Town Council also object to the Maltby Gas Bill.

The Paterson Carburetter Syndicate has been registered as a private company with a capital of £10,000, in £1 shares, to purchase or otherwise acquire a certain invention for improvements in or relating to hydrocarbon gas-producers; also to carry on the business of manufacturers and vendors of, and dealers in, carburetters of every description, gas and other engines, &c.

Last Friday week, there was a landslip along the North Road at Hythe, which fractured one of the gas-mains, and resulted in the Gas Company having to cut about 50 yards of main dead; but fortunately no consumers have been deprived of their supply. We learn from Mr. C. E. Rosevear, the Distribution Superintendent, that it is not intended to relay this main yet, "as the whole hill seems to be on the move."

The Liverpool City Council have confirmed a resolution of the Water Committee that the Lord Mayor be requested to invite the Prince of Wales to perform the opening ceremony of the works at Lake Vyrnwy on their completion; that the Committee be authorized to make the necessary arrangements for the ceremony, and for the attendance of the members of the Council on the occasion; and that the expenses in connection with the opening, and the attendance of members and any other persons invited by the Committee, be paid.

# THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

**WILLEY & CO., LTD., LONDON & EXETER.**

SHOW-ROOMS:

LONDON: 18, Adam Street, Adelphi, W.C.

DEVONPORT: 93, Fore Street.

AGENTS FOR SCOTLAND:

D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.



The Rochdale Corporation have decided to proceed with the construction of a new reservoir at Buersil; the estimated cost being £13,000.

From the G. J. Eveson Coal and Coke Company, Limited, of Edmund Street, Birmingham, we have received an attractively bound engagement tear-off diary for 1910. It is of a size which renders it eminently suitable for desk use.

The cause of a gas explosion at Ashton-under-Lyne is reported to have been an escape from the outlet-connection of a gas-meter, which had apparently been melted by a coke-fed stove that was alight in proximity to the cellar in which the meter was placed.

In the course of a discussion in the Wrexham Town Council with regard to the charges for electricity for places of entertainment, Mr. T. B. Taylor said the lighting of the streets of the town for the past few months had been a disgrace. It had been necessary sometimes to strike a match to find one's way home. Mr. Pickvance (the Electrical Engineer) remarked, however, that this was a most unfair statement to make.

In connection with a motion before the Wigan Borough Council—"That the Lighting Committee be instructed to substitute incandescent lights in the public lamps in Woodhouse Lane at once, in place of the present flat-flame burners," Alderman Ashton said incandescent lighting had been largely extended already; and the entire cost had to come out of the current rate. It was not possible to convert all the lights of the town to incandescents in the course of a couple of years. If they did so, they were going to have an extraordinarily big rate. They had had as many as 150 to 200 mantles broken in one night. On Dec. 28, they had 185 mantles destroyed in one night by the severe weather; and they had to be paid for out of revenue. The Lighting Sub-Committee had spent £1940 this year repairing lamps and putting in incandescents. It was, however, always understood that as soon as there was money incandescent lighting would be extended, not only to the Woodhouse Lane district, but to all the important thoroughfares of the town. Not only that, but where they had new lamps in new streets they were placing incandescent lights. In the course of a couple of years, they would not have a place in the town that was not lighted by incandescents.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

DRAUGHTSMAN. No. 5179.  
JUNIOR DRAUGHTSMAN. Firth Blakeley, Sons, and Co., Dewsbury.  
METER READER AND MAINTENANCE MAN (FOR CANADA). No. 5176.

### Situations Wanted.

ASSISTANT-ENGINEER. No. 5177.  
LEAD BURNER, &c. (SULPHATE PLANT). No. 5178.

### Plant, &c. (Second Hand), for Sale.

GASHOLDER, PURIFIERS, &c. Bideford Gas Company.  
GASHOLDERS, SCRUBBER, CONDENSER, STATION METER, EXHAUSTER, HYDRAULIC MAIN, PIPES, &c., &c. J. Harper and Co., Willenhall.  
PURIFIERS, &c. Tyldesley-with-Shakerley Gas Department. Tenders by March 1.  
PURIFIERS, SCRUBBERS, AND CONDENSERS. Edinburgh and Leith Gas Commissioners.  
SCRUBBERS, WASHER, STATION METER, &c. Stockport Gas Department.

### Plant, &c. (Second-Hand), Wanted.

PURIFIERS, &c. Lothian Coal Company.  
PURIFIERS, STATION METER, GOVERNOR, &c. H. Tobey, Malton, Yorks.

### Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. Feb. 15.  
HORNSEY GAS COMPANY. March 1.  
NORTH MIDDLESEX GAS COMPANY. Feb. 15.  
SOUTH ESSEX WATER COMPANY. March 1.  
SOUTHGATE GAS COMPANY. Feb. 15.

### Meetings.

BARNET GAS AND WATER COMPANY. Holborn Restaurant, Feb. 28, Three o'clock.  
BARNSTAPLE GAS COMPANY. Bridge Hall, Barnstaple, Feb. 19, Twelve o'clock.  
BRENTFORD GAS COMPANY. St. Ermin's Hotel, Feb. 11, 2.30 o'clock.  
BRIGHTON AND HOVE GAS COMPANY. London Office, Feb. 25, Two o'clock.  
BROMLEY AND CRAYS GAS COMPANY. Offices, Feb. 22, Six o'clock.  
CHICHESTER GAS COMPANY. Offices, Feb. 25, One o'clock.  
ENFIELD GAS COMPANY. Offices, Feb. 24, 5.30 o'clock.  
HORNSEY GAS COMPANY. London Office, Feb. 18, 3.30 o'clock.  
MITCHAM AND WIMBLEDON GAS COMPANY. Offices, Feb. 22, Three o'clock.  
NORTH MIDDLESEX GAS COMPANY. London Office, Feb. 23, 2.30 o'clock.  
RIDDINGS DISTRICT GAS COMPANY. London Office, Feb. 28, Four o'clock.  
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel, Feb. 18, Three o'clock.

### Gasholders (Telescoping).

ABERAVON GAS DEPARTMENT. Tenders by Feb. 14.  
BAKEWELL URBAN DISTRICT COUNCIL. Tenders by Feb. 23.

### General Stores.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
STOCKTON-ON-TEES CORPORATION. Tenders by Feb. 15.

### Meters.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Pipes, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
TYLDESLEY-WITH-SHAKERLEY GAS DEPARTMENT. Tenders by March 1.

### Retort Setting, &c.

TODMORDEN GAS DEPARTMENT.

### Sulphuric Acid.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

### Tar and Liquor.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 21.  
MANCHESTER GAS DEPARTMENT. Tenders by March 23.

### TENDERS FOR

#### Cookers.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.

#### Fire-Clay Goods.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 22.  
TODMORDEN GAS DEPARTMENT.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 347.

Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Oct. 14	p.c.				£ s. d.	£	Stk.	Nov. 11	p.c.				£ s. d.
1,474,000	Stk.	Oct. 14	5	Alliance & Dublin Ord.	86-88	..	5 13 8	4,940,000	Stk.	Nov. 11	5	Imperial Continental	175-177	..	4 10 5
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	1,235,000	Stk.	Aug. 12	3 1/2	Do. 3 1/2 p.c. Deb. Red.	94-96	..	3 12 11
200,000	5	Oct. 28	6 1/2	Bombay, Ltd.	5 1/2-6 1/2	..	5 6 1	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120-122	+1	4 18 4
40,000	5	"	6 1/2	Do. New, £4 paid.	4 1/2-4 1/2	..	5 6 8	561,000	Stk.	"	10	Liverpool United A.	227-229	..	4 7 4
50,000	10	Aug. 26	15	Bourne- to p.c.	28 1/2-29	..	5 3 5	718,100	"	"	7	Do. B.	167-169	..	4 2 10
311,810	10	"	7	mouth Gas B 7 p.c.	16 1/2-16 1/2	..	4 3 7	306,083	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
75,000	10	"	6	and Water Pref. 6 p.c.	15 1/2-15 1/2	..	3 16 2	250,000	100	Oct. 1	5	Malta & Mediterranean.	42-5	..	6 0 0
380,000	Stk.	Aug. 12	12 1/2	Brentford Consolidated	254-257	+1	4 17 3	560,000	100	"	5	Met. of 1/2 p.c. Deb.	99-102	..	4 18 0
300,000	"	"	9 1/2	Do. New	192-194	+1	4 17 11	250,000	100	"	4 1/2	Melbourne 1/2 p.c. Deb.	100-102	..	4 8 8
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	547,920	20	Nov. 11	3 1/2	Monte Video, Ltd.	123-131	+ 1/2	5 5 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 29	4 1/2	Newcastle & Gateshead Con.	107 1/2-108 1/2	+ 1/2	4 2 11
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218-221	..	4 19 7	518,795	Stk.	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	91-93	..	3 15 3
246,320	"	"	8	Do. A Ord. Stk.	154-157	..	5 1 1	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
460,000	2 1/2	Oct. 14	10	British	42 1/2-43 1/2	..	4 11 11	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	138-140	+1	5 14 4
169,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	119-121	+1	4 19 2	60,000	50	Sep. 10	8	Ottoman, Ltd.	6 1/2-6 1/2	..	5 6 6
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	89-91	+1	4 18 11	31,800	53	Aug. 26	13	Portsea Island A.	137-139	..	4 19 0
82,278	"	"	5 1/2	Do. C 5 p.c.	106-108	..	5 1 10	60,000	50	"	13	Do. B.	129-131	..	4 19 3
55,000	"	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	50	"	12	Do. C.	122-124	..	4 16 8
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14 1/2-14 1/2	..	4 14 11	114,800	50	"	10	Do. D and E.	102-104	..	4 16 2
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	93-100	..	4 0 0	398,490	5	Oct. 28	7	Primitiva Ord.	7 1/2-7 1/2	..	4 14 11
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	795,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5 1/2-5 1/2	+ 1/2	4 10 11
100,000	10	Nov. 2	6	Do. 4 1/2 p.c. Pref.	5 1/2-5 1/2	..	—	488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
50,000	50	Nov. 2	6 1/2	Do. 6 p.c. 1st Mort.	48-49	..	6 2 6	1,000,000	100	Oct. 14	8	River Plate Ord.	17-17 1/2	..	4 11 5
100,000	Stk.	Dec. 29	4	Do. 4 1/2 p.c. Deb. Stk.	80-82	..	5 9 9	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	+1	5 19 3
157,157	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108 1/2-110 1/2	..	4 10 6	250,000	10	Sep. 29	8	San Paulo, Ltd.	14 1/2-15 1/2	+ 1/2	5 4 11
1,493,280	Stk.	Aug. 26	5 1/2	Commercial 4 p.c. Stk.	109-111	..	4 13 8	65,500	10	"	6	Do. 6 p.c. Pref.	11 1/2-12 1/2	..	4 18 0
500,000	"	"	5	Do. 3 1/2 p.c. do.	105-107	+1	4 13 6	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50-51	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	209,984	"	"	10	Do. B.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 9	523,500	"	"	10	Do. C.	233-235	..	4 5 1
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	South African.	122-124	..	7 16 11
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	6,429,895	Stk.	Aug. 12	5 1/2	South Met., 4 p.c. Ord.	121-123	+ 1/2	4 6 8
143,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	104-105	..	5 0 0	1,895,445	"	Jan. 13	3	Do. 3 p.c. Deb.	81-83	..	3 12 5
486,090	10	Jan. 27	12	European, Ltd.	24-24 1/2	..	4 16 0	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	160-162	..	4 18 9
354,960	10	"	12	Do. £7 10s. paid.	18 1/2-18 1/2	..	4 16 0	605,000	Stk.	Aug. 12	5 1/2	Sth Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
15,141,545	Stk.	Aug. 12	4 1/2	Gas 4 p.c. Ord.	105 1/2-106 1/2	+ 1/2	4 7 7	60,000	"	"	5	Do. 5 p.c. Deb.	120-122	..	4 2 0
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	88 1/2-89 1/2	..	3 16 2	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
3,799,735	"	"	4	and 4 p.c. Con. Pref.	104-105	+ 1/2	3 16 2	502,310	Stk.	Nov. 11	6 1/2	Southampton Ord.	110-112	..	8 9 3
4,193,975	"	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Aug. 12	6 1/2	Tottenham A 5 p.c.	135-137	+1	5 0 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	95-97	+1	5 3 1	453,940	"	"	5 1/2	and B 3 1/2 p.c.	112-114	..	4 14 7
62,500	"	"	6 1/2	Do. do. 5 p.c.	119-121	+1	5 7 5	149,470	"	Dec. 29	4	Edmonton 4 p.c. Deb.	98-100	..	4 0 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17 1/2-18	..	6 2 3	182,380	10	Dec. 29	8	Tuscan, Ltd.	91-93	..	8 4 2
131,000	Stk.	Sep. 10	6 1/2	Iford A and C	144-146	..	4 9 0	149,900	"	Jan. 3	1	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,781	"	"	5	Do. B	108-110	..	4 10 11	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	112-114	..	7 9 9
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	Aug. 26	6 1/2	Wandsworth B 3 1/2 p.c.	142-144	+ 1/2	4 12 0
								79,416	"	Dec. 29	3	worth 3 p.c. Deb. Stk.	74-76	+1	3 18 11

Prices marked \* are "Ex div."



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For GAS PURIFICATION.

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PALMERSTON HOUSE,  
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Resists 4500° Fahr. Best for GAS-WORKS.

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GAS LIGHTING ENGINEERS AND CONTRACTORS,

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CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."

## LUX'S GAS PURIFYING MASS.

See Advertisement on p. 386.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

## AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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Twice as Rich as Bog Ore.

Gives no back Pressure.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

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AND

## CARBURINE FOR GAS ENRICHING.

ALSO

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FOR

AUTOMATIC GAS FLASHING SIGNS.

BLenheim Works, LONDON, W.

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Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carboic Acid, Sulphate of Ammonia, &c.

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## SPECIALLY prepared for Sulphate of

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Works: OLDBURY, WEDNESBURY, AND STAFFORD.

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Wires: "AUTOMATIC, MANCHESTER."

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BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

## OXIDE OF IRON.

(NATURAL.)

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PAINT FOR GAS-WORKS.

## BALE &amp; CHURCH,

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DUNDEE.

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Telephone: Central Manchester, 7002.

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Apply, THOMAS HORROCKS,

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carboic, Sulphate of Ammonia.

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GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

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## THE very best Patent Grids for Holding

Oxide Lightly.

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## JOHN E. WILLIAMS AND CO.,

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Contractors for Complete CARBONIZING  
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Speciality of Catering for the Smaller Gas Concerns.  
Prices Reasonable; quality and results the best. Satis-  
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**ASSISTANT-ENGINEER and Manager,**  
Excellent Qualifications, Works and Districts,  
SEEKS VACANCY in medium sized Works.  
Address No. 5177, care of Mr. King, 11, Bolt Court,  
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man used to Gas-holders and Gas Plant.  
Apply, stating Experience, and Salary required, to  
FIRTH BLAKELEY, SONS, AND CO., LIMITED, Gas Engi-  
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**DRAUGHTSMAN Wanted in a Con-**  
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Apply, by letter, stating Age, Experience, and Salary  
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**WANTED, a Meter Reader and Ma-**  
tenance Man for Gas-Works in Western  
Canada. Must be of Good Appearance and Address  
Starting Salary, \$55 per Month, with One Year's En-  
gagement and Transportation.  
Apply, by letter, with References and Testimonials,  
to No. 5176, care of Mr. King, 11, Bolt Court, FLEET  
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**WANTED, Four Good, Second-Hand**  
PURIFIERS, 10 feet Square, with Valve and  
Connections.  
Apply to the LOTHIAN COAL COMPANY, LIMITED,  
Newtongrange, MIDLOTHIAN.

**SECOND-HAND Plant wanted—**  
Two PURIFIERS, either 6 feet or 5 feet square.  
STATION METER for 2000 feet per hour.  
STATION GOVERNOR for 3000 feet per hour.  
VALVES and CONNECTIONS for above.  
The Plant must be in good, sound Condition.  
Address Mr. HENRY TOBEY, 19, The Mount, Malton  
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**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete  
to Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can be  
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FIRTH BLAKELEYS, Thornhill, DEWSBURY.

#### GAS PLANT FOR SALE.

**FOUR** Cast-Iron Purifiers 8 ft. by 4 ft.  
by 3 ft. 6 in. deep, with Covers and Two Layers  
of Wood Grids. Centre-Valve, 6-inch Con-  
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SCRUBBER, vertical, 16 ft. to 18 ft. high by 2 ft.  
6 in. to 2 ft. 9 in. diameter complete, fitted with  
new Elm Grids.  
CONDENSER with Vertical Pipes.  
Round STATION METER, with 6 Dial Index.  
Capacity 3000 Cubic Feet per hour. New Drum.  
In First Class Order. Complete with Bye-Pass  
and all necessary Valves coupled to 6-inch. Main.  
Also Two 6-inch Bye-Pass PLUG COCKS (new  
Three Years ago) for Two extra Purifiers.  
EXHAUSTER for same, Belt Driven.  
HYDRAULIC MAIN, ASCENSION PIPES, and  
Six Tange's Patent MOUTHPIECES, all com-  
plete with Connecting Pipes, with all details.  
Two GASHOLDERS One with Standards, 15 ft.  
diameter by 12 ft. high approx.; one with  
Ashmore and Pease Chain balanced 13 ft. by  
15 ft. approx.  
Only just covered work.  
Address: JOHN HARRER AND CO., LIMITED, Albion  
Works, Willemsdahl, STAFFS.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

#### BIDEFORD GAS AND COKE COMPANY, LIMITED.

**OLD Material for Sale:**  
10,000 feet HOLDER and Four CAST-IRON  
PILLARS.  
Four CAST-IRON PURIFIERS, and SHEET-  
IRON COVERS, each 11 ft. 6 in. by 11 ft. 6 in.  
by 4 ft., with Inlet and Outlet Pipes and Cockey's  
Valve.  
All above ground. To be taken as now standing at  
the Gas-Works, BIDEFORD.  
W. D. JOCE,  
Secretary.

#### COUNTY BOROUGH OF STOCKPORT. (GAS DEPARTMENT.)

##### FIRST-CLASS SECOND-HAND PLANT.

**THE** Committee have for Sale the fol-  
lowing PLANT, together with all Accessories,  
&c., for which they are prepared to receive OFFERS:  
Two TOWER SCRUBBERS, 30 feet high by 10 feet  
diameter, with 16-inch Connections.  
One STATION METER, capacity 40,000 Cubic Feet  
per hour, with 16-inch Connections.  
One Kirkham, Fulett, and Chandler's "STAN-  
DARD" WASHER, capacity 800,000 Cubic  
Feet per Day, with 16-inch Connections.  
The Plant may be inspected and further Information  
obtained by Applying to Mr. S. Meunier, Engineer and  
Manager, Gas-Works, Portwood Stockport.  
Offers, endorsed "Second-Hand Plant," to be sent to  
the Chairman, Gas Committee, Town Clerk's Office,  
Town Hall, Stockport.

Town Hall, Stockport.  
Feb. 2, 1910.

ROBERT HYDE,  
Town Clerk.

#### EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

##### FIRST-CLASS SECOND-HAND PLANT.

**THE** Commissioners have for Sale the  
following PLANT, together with all Accessories,  
&c., for which they are prepared to receive OFFERS.  
Two Sets of WATER-LUTE PURIFIERS, 24 feet  
by 19 feet.  
One Set of WATER-LUTE PURIFIERS, 27 ft.  
6 in. by 24 ft.  
Two TOWER SCRUBBERS, each 60 feet High by  
13 feet Diameter.  
One Battery of WROUGHT-IRON ANNULAR  
CONDENSERS, 31 ft. 6 in. high. Inner Tube,  
22 inches Diameter.  
Detailed Specifications and Drawings can be supplied  
to Persons contemplating the Purchase of this Plant,  
and references given to other Works where similar Plant  
has been transferred.  
For further Particulars and full Information, Apply  
to the undersigned.

Calton Hill, Edinburgh,  
Jan. 21, 1910.

W. R. HERRING,  
General Manager.

#### URBAN DISTRICT COUNCIL OF TYLDESLEY WITH-SHAKERLEY.

##### SECOND-HAND PURIFIERS.

**THE** Gas Committee have for Disposal  
Two Water-Lute PURIFIERS, 18 ft. square by  
5 ft. deep, with 18-inch Connections and Lifting Gear.  
Tenders, endorsed "Purifiers," to be delivered to  
W. J. Matthews, Esq., Clerk to the Council, Tyldesley,  
on or before March 1, 1910.  
The Purifiers may be viewed, and further Particulars  
obtained, on Application to  
H. R. S. WILLIAMS,  
Gas and Water Manager.  
Gas-Works, Tyldesley.

#### BOROUGH OF BARROW-IN-FURNESS.

**THE** Corporation are prepared to re-  
ceive TENDERS for the Purchase of Surplus  
GAS TAR and OIL-GAS TAR, produced at their Gas-  
Works from the 1st day of April next to the 31st day  
of March, 1911, delivered into the Purchaser's Tank-  
Waggons at the Gas-Works Siding.

Any further Information may be had on Application  
to the Manager of the Gas-Works.  
Sealed Tenders, addressed to the Chairman of the  
Gas and Water Committee, and endorsed "Tender for  
Tar," to be delivered at the Town Clerk's Office on or  
before Tuesday, the 22nd day of February, 1910.  
The highest or any Tender not necessarily accepted.

By order,  
L. HEWLETT,  
Town Clerk.  
Town Hall, Barrow-in-Furness.

**THE** Corporation are prepared to re-  
ceive TENDERS for the Supply of FIRE-  
BRICKS, CAST-IRON PIPES, WROUGHT-IRON  
TUBES and FITTINGS, BRASS COCKS, GAS-  
METERS, GAS-COOKERS, OIL, LIME, IRON-  
MONGERY, and SULPHURIC ACID, as may be re-  
quired from the 1st day of April next to the 31st day  
of March, 1911.

Sealed Tenders, on Forms to be obtained at the Office  
of the Manager of the Gas and Water Works, addressed  
to the Chairman of the Gas and Water Committee, and  
endorsed "Tender for Stores," to be delivered at the  
Town Clerk's Office on or before Tuesday, the 22nd of  
February, 1910.

The lowest or any Tender not necessarily accepted.  
By order,  
L. HEWLETT,  
Town Clerk.  
Town Hall, Barrow-in-Furness.

**THE** Haworth Urban District Council  
are prepared to receive TENDERS for the Pur-  
chase of their Surplus TAR and LIQUOR for the Year  
ending March 31, 1911.  
Tenders to be sent to me, endorsed "Tender for Tar  
and Liquor," not later than Feb. 21.  
WILLIAM ROBERTSHAW,  
Clerk.  
Burlington Chambers,  
North Street, Keighley.

#### BAKEWELL URBAN DISTRICT COUNCIL.

**TENDERS** for the Telescoping of a  
GASHOLDER are invited.  
Particulars and Specifications may be obtained, and  
Plans Inspected, on Application to the Gas Manager,  
T. W. Triplady, Bakewell.  
Sealed Tenders, endorsed "Gasholder," must be sent  
to the undersigned not later than Feb. 23, 1910.  
The Council do not bind themselves to accept the  
lowest or any Tender.  
V. R. COCKERTON,  
Clerk to the Council.  
Bakewell.

#### TODMORDEN CORPORATION.

##### (GAS DEPARTMENT.)

**THE** Gas Committee of the above Cor-  
poration are prepared to receive TENDERS for  
the RETORT SETTING, together with the Supply of  
RETORTS, FIRE-BRICKS, &c., required at their Gas-  
Works, Millwood, Todmorden, during the Year ending  
Dec. 31, 1910.  
Full Particulars and Form of Tender may be had on  
Application to the undersigned.  
HENRY TALBOT,  
Engineer and Manager.  
Gas-Works, Todmorden,  
Jan. 31, 1910.

#### URBAN DISTRICT COUNCIL OF TYLDESLEY WITH-SHAKERLEY.

##### 6-INCH MAIN PIPES.

**THE** Gas Committee are prepared to  
receive TENDERS for the Supply of about 1000  
Yards of 6-inch PIPE, to be delivered during June or  
July, either on the Chaddock Lane Siding of the  
Tyldesley Coal Company, or at the Astley Wharf on the  
Bridgwater Canal.  
Tenders, endorsed "Pipes," to be delivered to W. J.  
Matthews, Esq., Clerk to the Council, Tyldesley, on or  
before March 1, 1910.  
Any further Information on Application to  
H. R. S. WILLIAMS,  
Gas and Water Manager.  
Gas-Works, Tyldesley.

#### BOROUGH OF ABERAVON.

**THE** Gas Committee invite Tenders for  
TELESCOPING a GASHOLDER, by the Addi-  
tion of an Outer Lift 82 feet Diameter, together with  
the necessary Guide Framing, &c.  
Plans and Specification of the work may be seen at  
the office of the undersigned.  
Tenders, addressed to M. Tennant, Esq., Town Clerk,  
and endorsed, "Tender for Telescoping Gasholder," to  
be received not later than Feb. 14, 1910.  
The lowest or any Tender will not necessarily be  
accepted.  
A. J. BOND,  
Engineer and Manager.  
Gas-Works Office,  
Aberavon, Port Talbot,  
Feb. 1, 1910.

#### BOROUGH OF STOCKTON-ON-TEES.

##### ANNUAL SUPPLIES.

**THE** District Fund, Gas, and Electricity  
Committees of the Stockton-on-Tees Corporation  
invite TENDERS for the Several ARTICLES and  
STORES required by them for the Year ending the 31st  
of March, 1911.  
Forms of Tender, Conditions of Contract, and all In-  
formation, may be obtained of the Borough Surveyor,  
Gas Manager, and Electrical Engineer.  
Persons desirous of Tendering should State the  
Articles they desire to Offer.

Tenders, endorsed "Stores," and also marked for the  
particular Committee for which they are intended, on  
Printed Forms only, to be delivered to me not later  
than the 15th of February, 1910.

The lowest or any Tender not necessarily accepted,  
and no Guarantee will be given as to quantity required.  
By order,  
ARTHUR B. CROSBY,  
Town Clerk.  
Stockton-on-Tees,  
January, 1910.

#### MANCHESTER CORPORATION GAS-WORKS.

##### TO TAR DISTILLERS AND OTHERS.

**THE** Gas Committee of the Corporation  
of Manchester are prepared to receive TENDERS  
for the Purchase and Removal, on the Sliding-Scale  
Basis, of the COAL GAS TAR to be produced at their  
Bradford Road Station during a period of One, Two, or  
Three Years, commencing at noon on the 31st of March,  
1910.

Full Particulars and Tender Form may be obtained  
on written Application to Mr. Fredk. A. Price, Superin-  
tendent of the Department.

Sealed Tenders, addressed to the Chairman of the  
Gas Committee and endorsed "Tender for Coal-Gas  
Tar, Bradford Road," must be delivered at the Offices  
of the Gas Department, Town Hall, Manchester,  
before Ten a.m. on Wednesday, the 23rd day of March,  
1910.

The Committee do not bind themselves to accept any  
Tender, and reserve the right to divide any Offer as they  
may deem advisable.

By order,  
WM. HENRY TALBOT,  
Town Clerk.  
Town Hall, Manchester,  
Feb. 4, 1910.



**BRENTFORD GAS COMPANY.**

**NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 11th of February next, at Half-past Two o'clock precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office in compliance with the Company's Acts of Parliament.**

By order,

WILLIAM MANN,

Secretary.

Office, Brentford,  
Jan. 25, 1910.**SOUTH SUBURBAN GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 18th day of February, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect Two Directors and One Auditor in the place of those retiring by rotation; and for General Purposes.**

The TRANSFER BOOKS WILL BE CLOSED from the 4th day of February, until after the Meeting.

By order of the Board,

CHARLES M. OHREN,

Secretary.

Offices and Works:

Lower Sydenham, S.E.,

Feb. 1, 1910.

**NORTH MIDDLESEX GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Wednesday, the 23rd day of February inst., at Half-past Two o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1909; to declare Dividends; to elect a Director and an Auditor; and for other Purposes.**

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 10th to the 23rd of February, both days inclusive.

ERNEST L. BURTON,

Secretary.

Secretary's Office: 5, Great Winchester Street,  
Old Broad Street, London, E.C.,  
Feb. 4, 1910.**BARNSTAPLE GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 19th day of February, 1910, at Twelve o'clock noon, to receive the Report of the Directors and the Accounts for the Year ended the 31st day of December last; to declare Dividends; to elect a Director and an Auditor; and to transact any other Ordinary Business of the Company.**

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th of February, 1910, inclusive.

By order,

F. L. SCHOFIELD,

Secretary.

Offices: 15, Cross Street, Barnstaple,  
Jan. 17, 1910.**CITY OF CHICHESTER GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of the above Company will be held at the Offices of the Company, at the Gas-Works, Chichester, on Friday, the 25th day of February, 1910, at One o'clock in the Afternoon precisely, to receive the report of the Directors and the Accounts for the Half Year ended the 31st of December, 1909; to declare a Dividend; to elect a Director and an Auditor; and to Transact the General Business of the Company.**

The TRANSFER BOOKS WILL BE CLOSED from the 12th to the 25th of February, both inclusive.

By order of the Board,

VICTOR V. VICK,

Secretary.

Offices: Gas-Works, Chichester,  
Feb. 1, 1910.**MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.**

(INCORPORATED BY ACTS OF PARLIAMENT, 1867 AND 1907.)

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Western Road, Mitcham, in the County of Surrey, on Tuesday, the 22nd day of February, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of Accounts for the Half Year ended the 31st day of December last; to declare a Dividend; to elect two Directors and an Auditor in place of those retiring by rotation; and for General Business.**

The TRANSFER BOOKS WILL BE CLOSED from the 7th inst. until after the Meeting.

NOTICE IS HEREBY FURTHER GIVEN, that an EXTRA-ORDINARY GENERAL MEETING of the Proprietors of this Company will be held immediately after the Ordinary Meeting, for the purpose of authorizing the Creation and Issue, on or after the 1st of July next, of £50,000 CONSOLIDATED ORDINARY STOCK, and the Issue of DEBENTURE BONDS to the extent of £30,000, in accordance with the provisions of Sections 9 and 19 of the Company's Act, 1907.

By order of the Directors,

BENJAMIN GREEN,

Secretary.

Offices and Works:

Western Road, Mitcham,

Feb. 1, 1910.

**BRIGHTON AND HOVE GENERAL GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, the 25th of February, 1910, at Two o'clock p.m., precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1909; to declare Dividends; to elect Two Directors; to appoint a Special Auditor; and for other Purposes.**

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 12th to the 25th of February, both days inclusive.

ERNEST L. BURTON,

Secretary.

5, Great Winchester Street,  
Old Broad Street, London, E.C.,  
Feb. 7, 1910.**HORNSEY GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 18th day of February, 1910, at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st of December last; to declare Dividends; elect Two Directors and an Auditor; and to transact the Business of an Ordinary General Meeting.**

The TRANSFER BOOKS WILL BE CLOSED from the 4th to the 18th of February, both days inclusive.

By order of the Board,

WILLIAM E. ROBERTS,

Secretary.

Offices: 63, Chancery Lane, W.C.,  
Feb. 3, 1910.**ENFIELD GAS COMPANY.**

**NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Sydney Road, Enfield, on Thursday, the 24th day of February inst., at Five-Thirty o'clock in the Afternoon precisely, to receive the report of the Directors and the accounts of the Company for the Half Year ended the 31st of December last; to declare a Dividend; elect Directors, Chairman, and an Auditor; and to Transact the General Business of the Company.**

The TRANSFER BOOKS WILL BE CLOSED from the 11th to the 24th of February, both inclusive.

By order,

CHAS. W. OFFORD,

General Manager and Secretary.

Enfield, Feb. 1, 1910.

**BROMLEY AND CRAYS GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Offices, 156, High Street, Bromley, Kent, on Tuesday, the 22nd day of February, 1910, at Six o'clock p.m. precisely, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; to determine the Amount of the Auditors' Remuneration; to elect Three Directors and an Auditor, on retirements by rotation; and to Transact generally the Business of a General Meeting.**

The TRANSFER BOOKS WILL BE CLOSED from the 7th of February to the 22nd of February, both days inclusive.

By order of the Board,

HENRY W. AMOS,

Secretary.

Offices: 156, High Street,  
Bromley, Kent, Feb. 5, 1910.**BARNET DISTRICT GAS AND WATER COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Holborn Restaurant, 218, High Holborn, London, W.C., on Monday, the 28th day of February, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last; to declare a Dividend; to elect Directors and an Auditor, in the place of those retiring by rotation; and to Transact the General Business of the Company.**

The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th of February, both inclusive.

By order of the Board,

ERNEST W. DREW,

Secretary.

Offices: 6 & 7, Queen Street,  
Cheapside, London, Feb. 4, 1910.**RIDDINGS DISTRICT GAS COMPANY.**

**NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, Nos. 6 & 7, Queen Street, Cheapside, in the City of London, on Monday, the 28th day of February, 1910, at Four o'clock in the Afternoon, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last; to declare a Dividend; to elect a Director and an Auditor; and to Transact the General Business of the Company.**

The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th inst., both inclusive.

By order of the Board,

ERNEST W. DREW,

Secretary.

Offices: 6 & 7, Queen Street,  
Cheapside, London, Feb. 4, 1910.**SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.**

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

**NORTH MIDDLESEX GAS COMPANY.**

NEW ISSUE OF £7500 FIVE PER CENT. PREFERENCE STOCK.

**MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 15, at Two o'clock, in Lots.**

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

**SOUTHGATE AND DISTRICT GAS COMPANY.**

NEW ISSUE OF £5000 FIVE PER CENT. PREFERENCE STOCK,

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By order of the Directors of the

**HORNSEY GAS COMPANY.**

NEW ISSUE OF £5000 CONSOLIDATED STOCK, £6500 FIVE PER CENT. PREFERENCE STOCK,

AND

£3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.**

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

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**SOUTH ESSEX WATER-WORKS COMPANY.**

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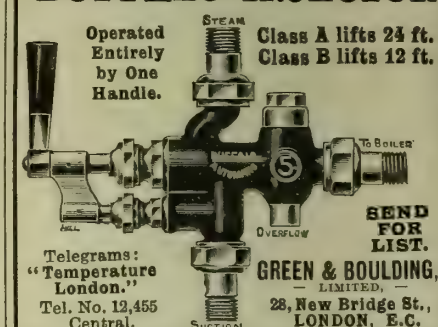
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### LAMPS.

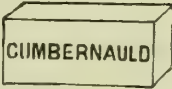
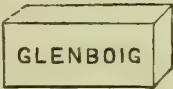
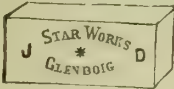
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

# THE GLENBOIG UNION FIRE-CLAY CO., LTD.

## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,  
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.				PHYSICAL RESULTS.			
	Raw.	Fired.		Density ..	..	..	2.65
Silica, free ..	3.03	3.49		Volume weight ..	..	..	1.90
Silica, combined ..	43.20	49.77		Porosity ..	..	..	15.4 %
Alumina ..	36.55	42.10		Linear shrinkage at 100° C. ..	..	..	3.70%
Ferric oxide ..	1.80	2.08		" " " 1050° C. ..	..	..	4.76%
Titanic oxide ..	1.30	1.50		" " " Total ..	..	..	8.46%
Lime ..	trace	trace		Volume shrinkage at 100° C. ..	..	..	10.7 %
Magnesia ..	trace	trace		" " " 1050° C. ..	..	..	12.6 %
Alkaline oxides ..	trace	trace		" " " Total ..	..	..	23.3 %
Sulphates as trioxides ..	0.92	1.06		Plasticity ..	..	..	20.0 %
Loss on Ignition ..	13.20	..		Fire Stability ..	..	..	1850° C. equiv. to 3362° F.
	100.00	100.00					

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. -I am, yours faithfully,

(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

JOHN T. NORMAN.



**A FACT!**

COKE is selling at . . . 11s. 8d. a Ton  
COALEXLD is selling at . 20s. 0d. a Ton  
**IN THE SAME TOWN.**

**DATA GIVEN.**

**COALEXLD LTD., LANCASTER.**

**RETORTS**

Of our Manufacture

**STOP WASTE AND LEAKAGE**

They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.

**Top Quality FIRE-BRICKS, QUARRIES, &c.**

*High Grade Silica Bricks and Blocks for Combustion Chambers and Special Work.*

**WILLIAMSON, CLIFF, LTD., STAMFORD.**

**CLARKS****"GASCOLITE"**

(Registered Trade Mark.)

**GREASE REMOVER****For CLEANING GAS STOVES**

still leads for being the

**Finest**

**Quickest**

**Simplest**

**Cheapest**

method for dealing with  
this perplexing problem.

Although only introduced 2 years ago, we number amongst our

**REGULAR CUSTOMERS**

The **LARGEST** to the **SMALLEST** GAS COMPANIES in  
**UNITED KINGDOM.**

*Full Particulars from Sole Proprietors:—*

**CLARKS  
LEAD & COLOUR WORKS CO.**

**Gas Company  
Specialists,**

**READING.**

Use only our Pure Tinned or Untinned Compo and Lead Gas Pipes  
Manufactured at our OWN Works.

Established 1832.

Workmanship and Materials  
of the Highest  
Quality.

**PECKETT'S****LOCOMOTIVES.**

Built to any  
Specification or Gauge.

**PECKETT & SONS,**  
ATLAS LOCOMOTIVE WORKS, BRISTOL.

**GAS COAL AND CANNEL.****WILSON CARTER & PEARSON,**

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Gas, Steam, and other Fuel for Home and Export.

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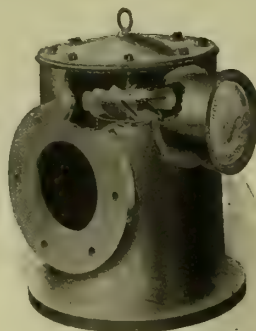
Chief Offices: **50, NEW STREET, BIRMINGHAM.**

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**SPECIAL ROTARY  
METER.**

For Coke Oven Gas.

For Blast Furnace Gas.

For FOUL GAS.

Particulars on application to—

**T. G. MARSH,**

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**S. S. STOTT & CO.,**

**ENGINEERS,**

**HASLINGDEN, nr. MANCHESTER.**

**LIME & OXIDE ELEVATORS & CONVEYORS.**

COAL AND COKE STORAGE PLANTS.

**Coal and Coke Elevators and Conveyors.**

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

**HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.**

**BEST & LLOYD, LTD.,  
BIRMINGHAM.**

BEST'S

TRADE

MARK.



SURPRISE.

**SPECIAL NOTICE.**

See that every Pendant  
bears our Trade Mark (as  
above) stamped upon the  
balance weights!!!

MAKERS OF THE PATENT

**"SURPRISE"**  
**GAS PENDANT.**





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THE GASHOLDERS AND OTHER OUTSIDE PLANT IT IS FALSE ECONOMY TO USE A CHEAP PAINT WHICH LOSES COLOUR AND DOES NOT PROTECT THE IRON FROM CHEMICAL FUMES.

### "SHELL BRAND" (Pure) PAINTS

POSSESS ALL THE PROPERTIES WHICH CHEAP PAINTS LACK.

Prices and particulars on application.

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Possilpark, Glasgow.



## AN EPOCH IN GAS MANUFACTURE.

### THE VERTICAL GAS RETORT SYNDICATE,

(DESSAU SYSTEM),

LTD.,

17, VICTORIA STREET,

WESTMINSTER, S.W.

See Full Page Advertisement, p. I., Nov. 30.

# COAL TAR PRODUCTS.

**Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbohc Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia up to 20.75 per cent. Nitrogen.**

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: **ORDNANCE WHARF,**

**709, OLD KENT ROAD, LONDON, S.E.**

**EAST GREENWICH, LONDON, S.E.**

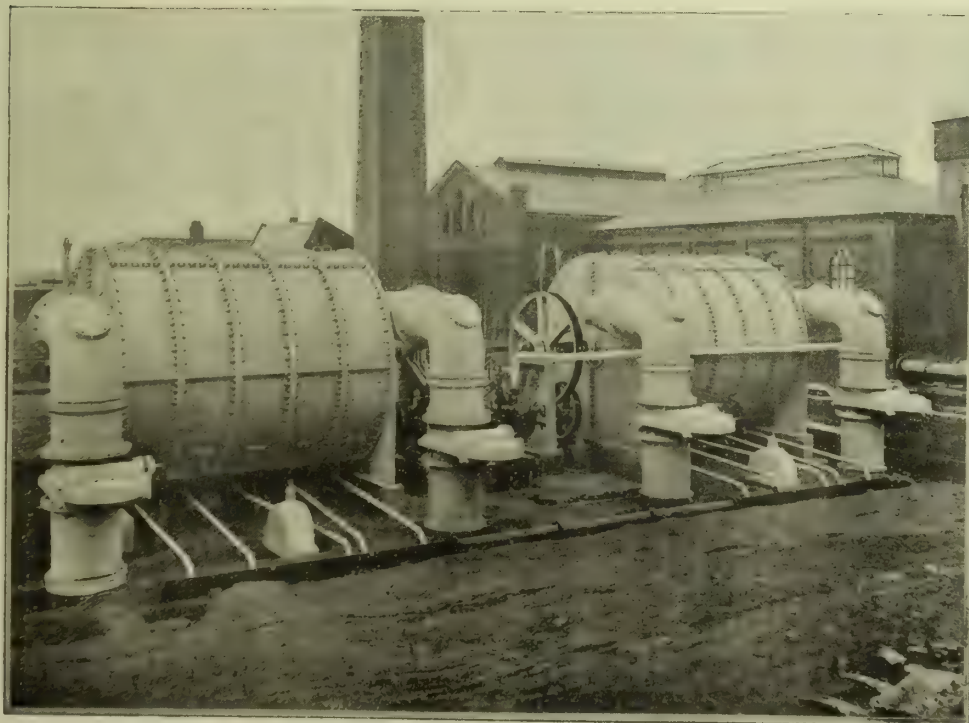
Telegraphic Address: "METROGAS, LONDON."

# THE WHESOE FOUNDRY CO., LTD.,

Works: **DARLINGTON.**

LARGE AREA  
OF WASHING  
SURFACE.

REMOVAL OF  
THE WHOLE  
OF THE  
AMMONIA  
AND A LARGE  
PERCENTAGE  
OF  
CO. AND SH-



SLIP OF GAS  
IMPOSSIBLE  
OWING TO  
OUR PATENT  
TELESCOPIO  
SLIDING JOINT  
BUNDLES  
EASILY  
ACCESSIBLE  
FOR  
CLEANING.

"Whessoe" Twin Rotary Washer-Scrubber (Patent No. 24,110 of 1903). Combined capacity 3,000,000 cub. ft. per diem, as supplied to The Walker and Wallsend Gas Company, Newcastle-on-Tyne.

London Office: **106, CANNON STREET, E.C.**



THE SILICA FIRE-BRICK COMPANY,  
 OUGHTIBRIDGE.  
**RADIATE MORE HEAT**  
 BY USING  
**SILCO BRICK RETORTS.**

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

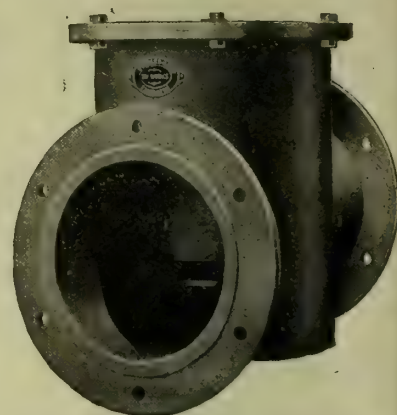


**PEEBLES & CO., LTD.,**

Tay Works, EDINBURGH.

**PATENT**  
**DISTRICT GOVERNOR**  
 FOR  
 Ordinary or High Pressure.

PILLAR BOX contains Air-Pressure Holder  
 for Loading the Governor from a distance  
 also Recording Gauge and Inlet and Outlet  
 Pressure Gauges.



**LARGE MERCURIAL GOVERNOR.**  
*From a Photo. of 24 in. Size.*  
 May be Loaded by Weights or Air  
 Pressure from a Distance.

**Preliminary Announcement.**

**CLAYTON, SON & CO.**  
 LTD.,  
**LEEDS.**

HAVE BEEN APPOINTED SOLE MAKERS OF THE

**K. & A. WATER-GAS PLANTS.**  
**HIGHEST RESULTS GUARANTEED.**

**A Number of Installations now Working.**

**KRAMERS & AARTS PATENTS.**



# Welsbach

## LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

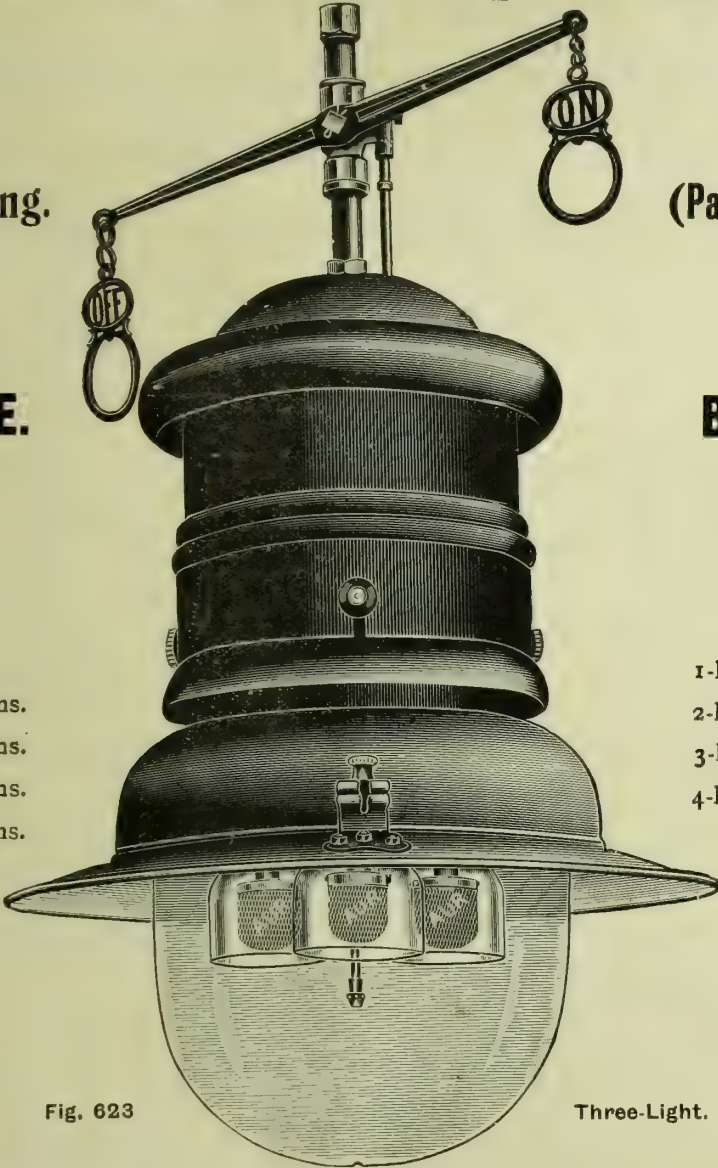


Fig. 623

Three-Light.

Height over all.

- 1-light . . . 1 ft. 8 ins.
- 2-light . . . 2 ft. 4 ins.
- 3-light . . . 2 ft. 4 ins.
- 4-light . . . 2 ft. 7 ins.

Width over all.

- 1-light . . . 1 ft. 1 in.
- 2-light . . . 1 ft. 5 ins.
- 3-light . . . 1 ft. 5 ins.
- 4-light . . . 1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,  
Welsbach House, 344-354, Gray's Inn Road, London, W.C.





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**STOURBRIDGE, ENGLAND.**  
 MANUFACTURERS OF

**FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.**  
**GLAZED BRICKS AND PORCELAIN BATHS.**



**Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.**

Construction of

**Entire Gas-Works & Coke Oven Plants,**  
**Retort Furnaces,**

**Furnaces for Chamber Settings**      **New Coke Ovens**  
 (Patent),      (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

The Outcome of a Practical Gas Engineer's Life Experience.

**THE CENTENARY**      **PETROL GAS**  
**TURBINE GENERATOR.**

FOR  
**Lighting, Cooking, Heating**

FOR  
 Villages,  
 Mansions,  
 Farm Steadings,  
 Churches, Schools,  
 Railway Stations,  
 County Lighting Districts.

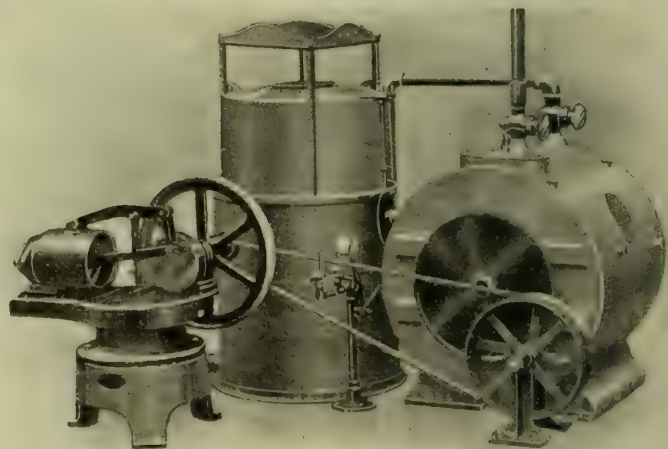
Plants from 100 cub. ft. per hour up to  
 50,000 cub. ft. per hour for Gas Works.

**THE CENTENARY GAS CO. (Dept. M.)**

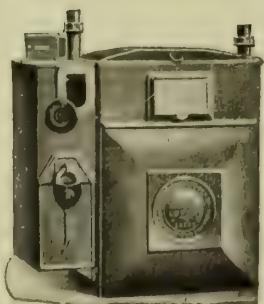
**WILLIAM KEY, Engineer.**

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11, QUEEN VICTORIA STREET,  
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**NON-EXPLOSIVE and ECONOMICAL.**



SLOT METER.

**SLOT**  
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STATION METERS,

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DRY METER.

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## LEEDS.

RETORT BUILDERS ON THE

## INCLINED, HORIZONTAL, OR VERTICAL SYSTEM.

Contractors to the Vertical Gas Retort Syndicate,  
Ltd., for all BRICKWORK in the

### DESSAU VERTICAL RETORT INSTALLATIONS.

See Certified Results of the first Installation on this System  
in England erected at The Ayres Quay Gas-Works, Sunderland.

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IMMEDIATE DELIVERY FROM STOCK.

UNBREAKABLE.

EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls.

Size, 16 x 12 x 8 ft. deep.

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MADE FROM FLANGED PLATES 4 FT. SQUARE.

ANY CAPACITY IN MULTIPLES

OF 4 FT. LENGTH, WIDTH, OR DEPTH.

HUMPHREYS & GLASGOW'S CARBURETTED  
WATER-GAS PLANTS.

Aggregate capacity of Plants supplied,  
228,600,000 cubic feet daily.

# "RAPID" MANUAL AND POWER CHARGING MACHINES.

SIMPLE AND INEXPENSIVE.



"RAPID" MANUAL CHARGER AND SCOOP CARRIAGE WORKING AT  
BRENTWOOD GAS-WORKS, ESSEX.

INCREASED  
YIELD OF GAS  
and  
REDUCTION  
OF FUEL  
CONSUMPTION.

WRITE FOR PARTICULARS

to

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Gas Engineers,

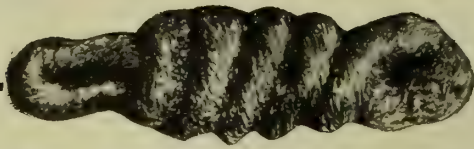
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Also for name of Works where you  
can see Machines in operation.





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Is sent out in Skeins all ready for use.  
Every Skein of equal weight and length.  
The Lead Wool Joint is built up evenly all the way through.  
Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33 $\frac{1}{3}$  per cent. less.

**THE LEAD WOOL CO., LTD., SNODLAND, KENT.**

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SOLE MAKERS:

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### PREPAYMENT GAS METER Fitted with **COLSON'S** STRONG CASH BOX.

THE STRONGEST AND  
BEST PREVENTIVE AGAINST  
THEFTS  
FROM SLOT METERS.

SIMON SQUARE WORKS,  
**EDINBURGH.**  
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WELDLESS STEEL SPIGOT AND FAUCET TUBES, FLANGED TUBES, SCREWED AND SOCKETTED TUBES, TUBULAR LAMP POSTS, &c., are **Unbreakable**, cost Nothing to Maintain, and are altogether more reliable and Durable than Iron.

They are FAR cheaper and more economical in the long run, and a source of great satisfaction to all users.

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Works: LANDORE, S. WALES. Branch Offices at MANCHESTER and NEWCASTLE.

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**Aug. Klönne**  
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— 2000 Workmen. —  
**CHAMBER-  
FURNACES.**  
In point of efficiency, cost of  
production and results:  
**BEST FURNACES in the WORLD!**

**DRAKES  
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# CONTINUOUS CARBONIZATION

**GLOVER-WEST  
PATENTS.**

IN



**VERTICAL  
RETORTS**

*Description and  
Particulars of Tests  
will be forwarded  
on request.*

## COST OF LABOUR

REDUCED TO

**2  $\frac{3}{4}$  d.** PER TON OF COAL CARBONIZED.

See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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# THE JOURNAL OF GAS LIGHTING

## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2440.]

LONDON, FEBRUARY 15, 1910.

[62ND YEAR. PRICE 6d.

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OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

**GOODMAN SAFETY GAS-MAIN STOPPERS,** for Shutting off Gas in Mains temporarily during Alterations and Repairs.  
**GAS-LEAK INDICATORS,** With all Latest Improvements.  
Short's Improved and Ansell Clock Form.  
For GROUND USE, FLUSH BOXES, &c. For PURIFIER BLOW-OFF VALVES.

**"NUGEPE"**

For Ammonia Joints.

**GAS PLANT CEMENT**

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Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

**LUX'S**  
**Gas Purifying Material**

is now used in many Gas-Works throughout Scotland with gratifying success.

**FRIEDRICH LUX**  
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Sole Agent for Scotland:

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Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

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ANY PATTERN MADE INTERCHANGEABLE WITH THE PART NOW IN USE.

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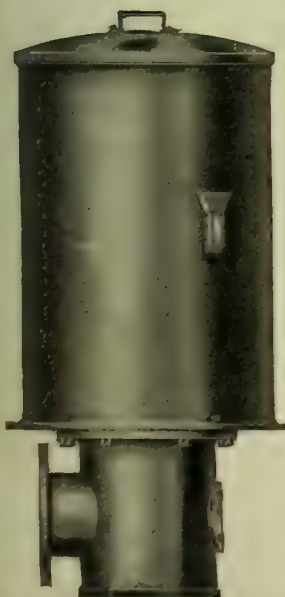
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

**A. G. CLOAKE,**  
54, HOLBORN VIADUCT, LONDON, E.C.

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## RETORT HOUSE GOVERNORS.

THESE Governors are made to prevent fluctuation in the Pressure or Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.

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EDINBURGH. LONDON. GLASGOW. LEEDS.





To Gas Companies and Corporation Gas-Works.  
**GAS STOVE RENEWAL PLANT.**  
**SAVE YOUR COOKERS.**

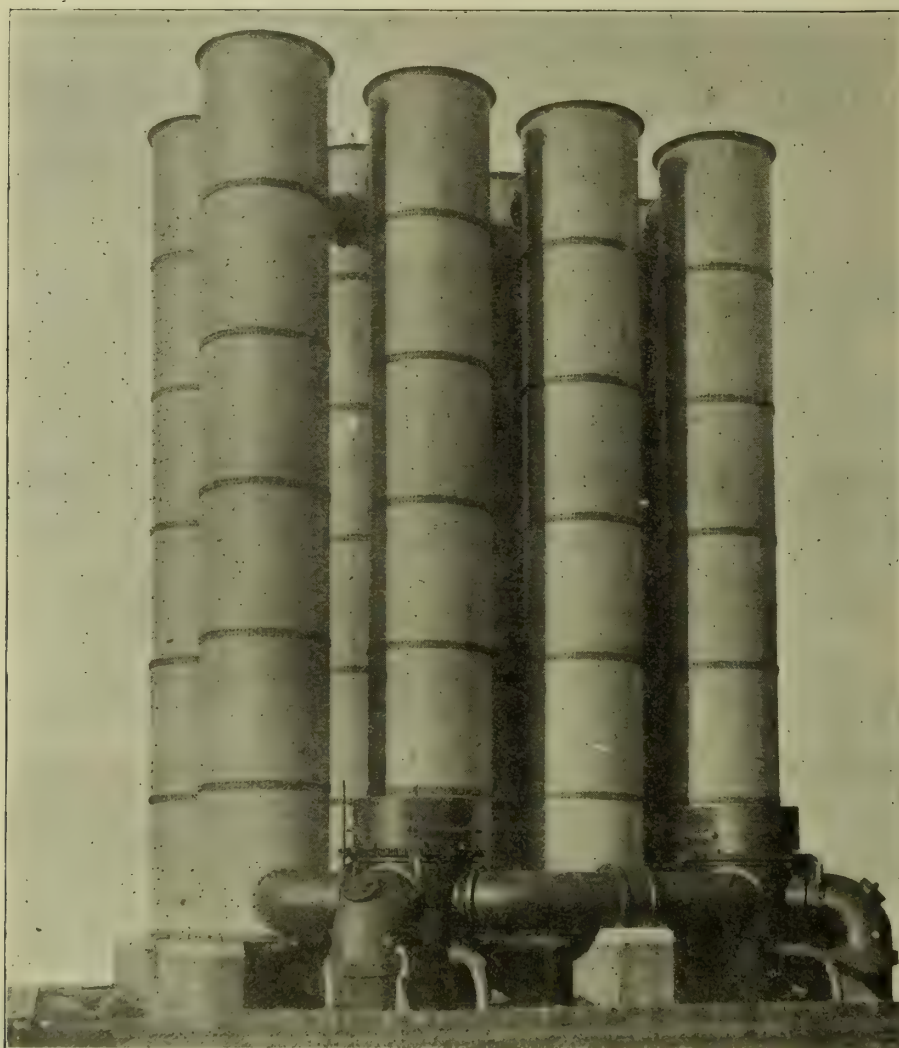
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**No Experienced Labour Required.**

After the Grease is removed, Stoves can be Cleaned and Polished  
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**KETTERING, ENGLAND.**



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**AT THE**

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**Newport, Mon.**

THOS. CANNING, Esq., A.M.I.C.E.  
 Engineer.

**BY**

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**JOSEPH EVANS & SONS,** **CULWELL WORKS,**  
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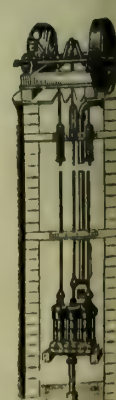
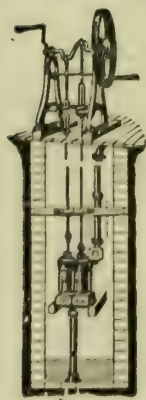
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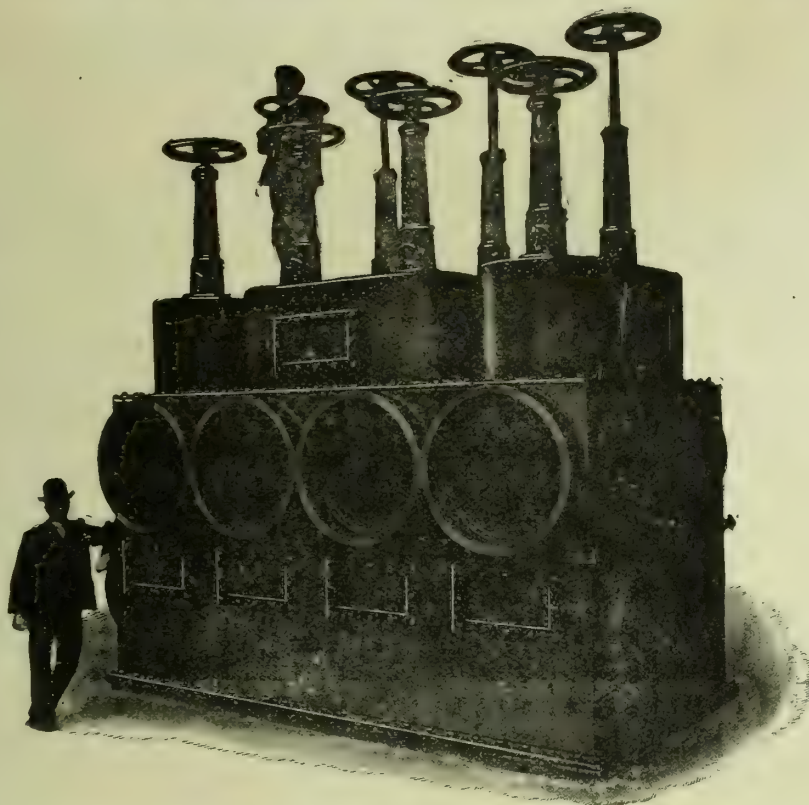
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OF EVERY  
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ATLAS METER WORKS,

PARK STREET, OLDHAM.

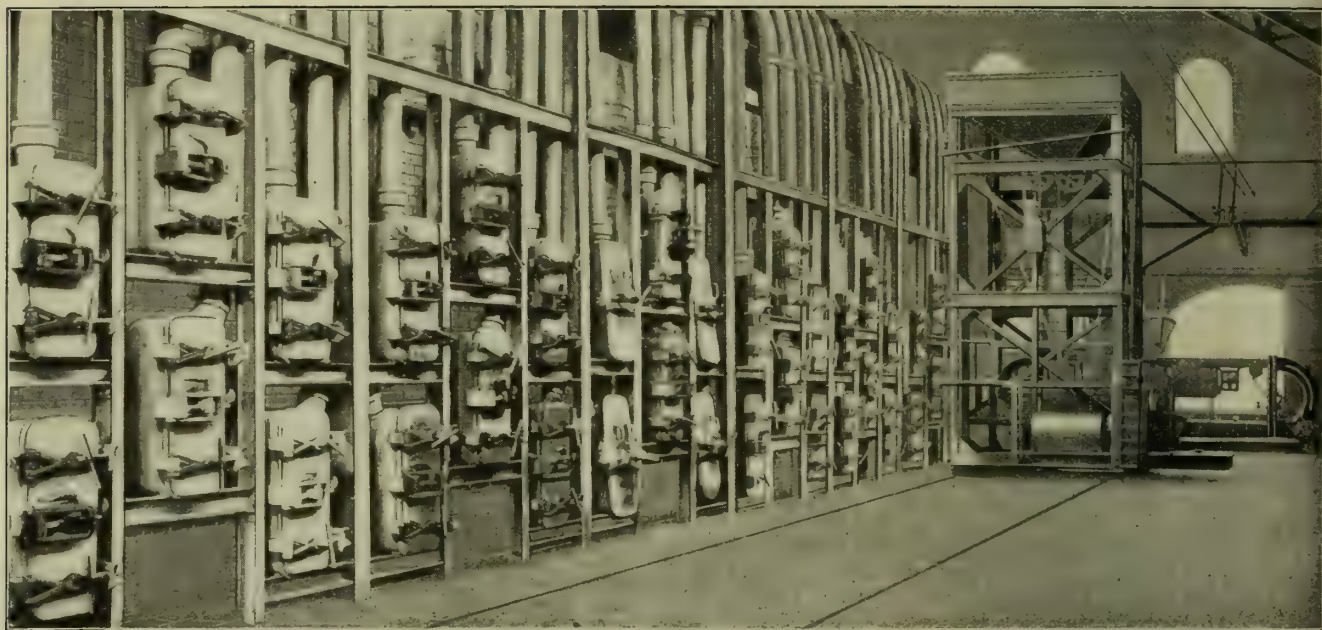
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**"NEW CENTURY" PATTERN  
PATENT COIN PREPAYMENT GAS-METER  
FITTED WITH  
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ENSURES ABSOLUTE SECURITY AGAINST THEFT.**

Particulars on Application.



**GLOVER'S PATENT**  
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**SPECIAL ADVANTAGES:—**

**21 CWT. CHARGES** or larger if required.

**GAS RESULTS,** 13,600 cub. ft. of 14·5 c.p. gas per Ton of coal carbonized.

**COKE,** GREY, DENSE, and MASSIVE, suitable for many metallurgical purposes and for malting.

**OPERATING COSTS** considerably lowered owing to greatly reduced number of operations.

**ADAPTABLE TO EXISTING REGENERATORS.**

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The **ORIGINAL** Inverted Burners and Mantles

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combined with  
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BURNERS are used and  
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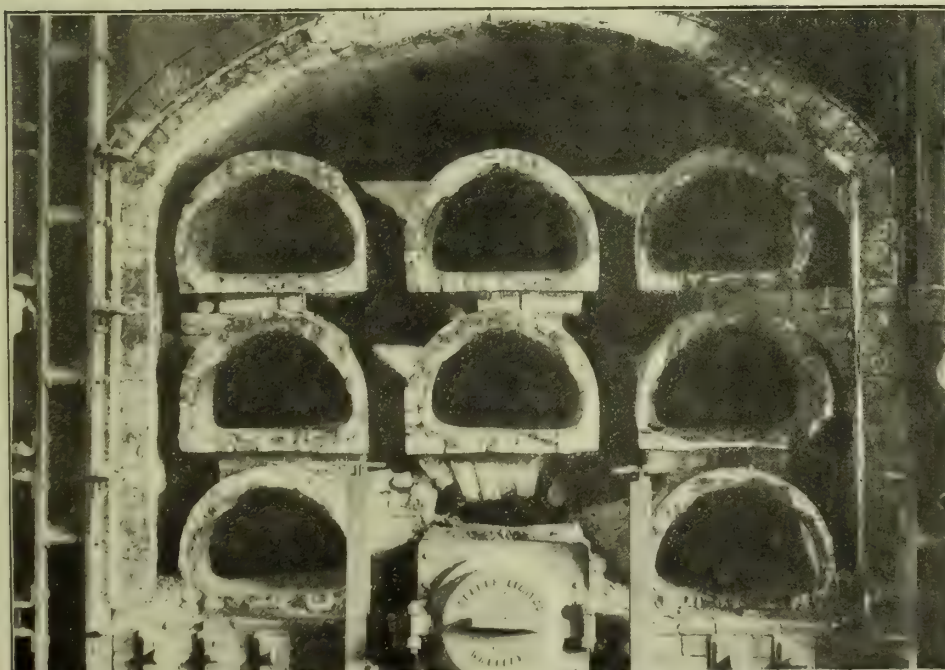
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All our Retorts  
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Horizontal,  
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Bricks, Tiles,  
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*Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.*



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English Representative of HENRY HILL & CO., LIMITED, Alexandrinenstrasse, 11, Berlin, S.W., who will advise on the selection of Mantles for all special purposes, whether Gas, Petrol, Petroleum or Acetylene.

Upright or Inverted. For Street Lighting, for Railways, for Shopkeepers, and Manufactories, wherever there is need for Mantles that are superior in all respects.

Hill Mantles are entirely distinct from others. The fabric is patented, the impregnation is of special character.

The Inverted Burner has met with great success, but it has by no means

**KILLED the UPRIGHT.**

THE

# LUCAS LIGHT'S LONG LIFE

is proof of this.

The Lucas Light was the first and original self-intensive high-power lamp, and its steady sale to-day proves its value.

200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

No high pressure required.

SIMPLE. BRILLIANT. RELIABLE.

The "Lucas" is the best lamp for Public Halls, Factories, Workshops, Streets, Railway Stations, &c., and the prices compare favourably with those of any similar type of lamp.

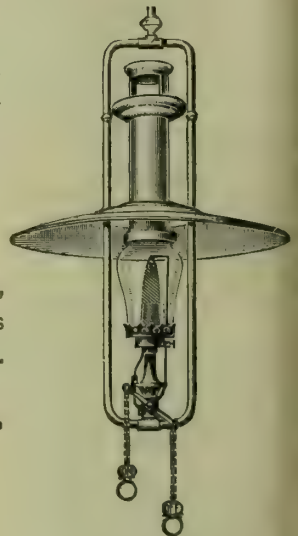
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MOFFAT'S LTD.,

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It is without a doubt the Process "par excellence."

1. The Stoves are thoroughly Scoured Inside and Outside, every Crack, Crevice, and Ornamental Part being cleaned perfectly.
2. It does this in less than half the time of existing methods.
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4. The work is easier and healthier for the Men.
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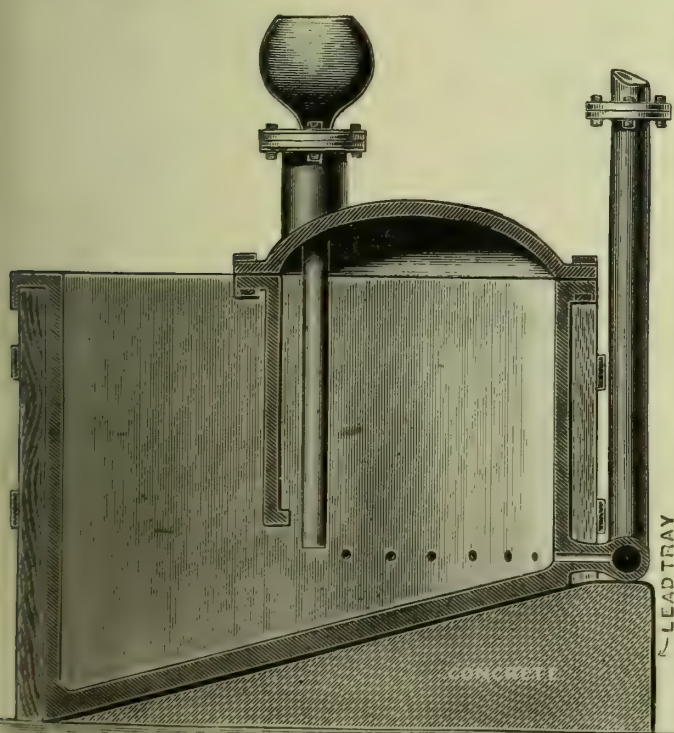
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Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

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2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity.
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

## BIGGS, WALL & CO.

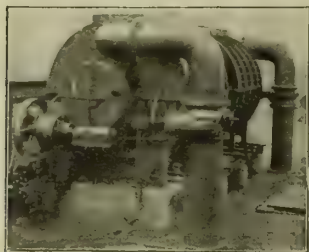
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Section showing Williams' and Fenner's Patent Outside Cracker Pipe  
as fitted to our Solid Lead Plate Saturator.

Telegrams: "RAGOUT LONDON." Telephone: 273 CENTRAL.



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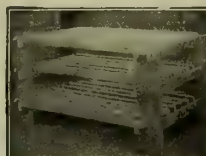


WASHER-SCRUBBER.

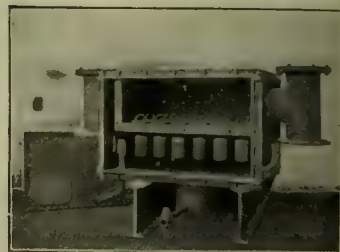
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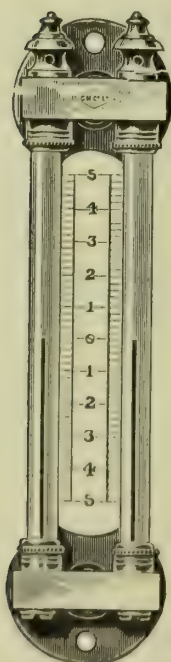
{ Hydrated Oxide of Iron for Gas Purification, and of different Strengths to suit conditions of Purification  
Sulphuric Acid (free from Arsenic) for Sulphate of Ammonia Manufacture, Recovered Sulphur, and  
Prussiates of Soda, Spent Oxide bought on Sulphur and Cyanide Contents, Tar and Gas Liquor purchased. See our Advertisement last week.

# THE GAS METER CO., LTD.,

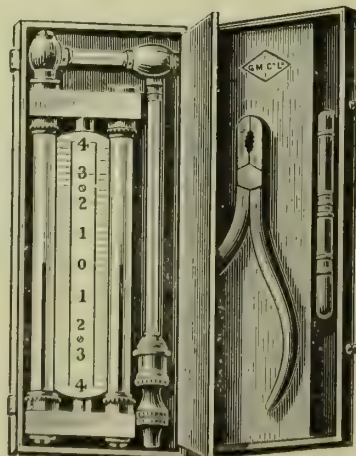
Manufacturers of

Wet & Dry Gas-Meters, Automatic Meters, Station Meters, Governors, Main Taps, Lamp Taps.

GAUGES, &c.



No. 1.



Inspector's Pocket Gauge.

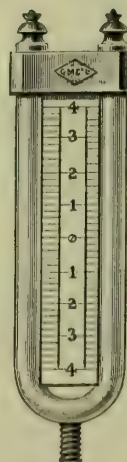
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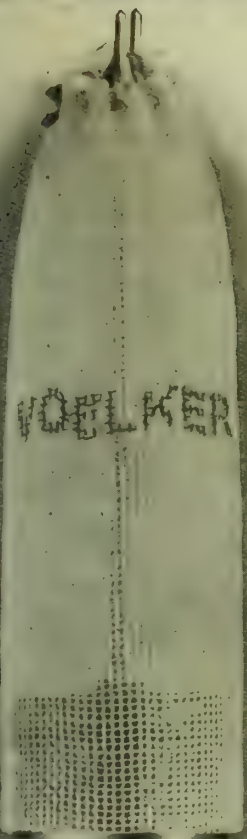
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gives universal satisfaction

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**CARBURETTED WATER-GAS PLANT.**

**MAXIMUM EFFICIENCY GUARANTEED.**

**Inspection of Working Plants Invited.**

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Are now Manufacturing

**VERTICAL, INCLINED, HORIZONTAL, & SEGMENTAL  
RETORTS**

Of a "SPECIAL B.B. QUALITY" which cannot be excelled.



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Agram, Croatia . . .	200,000	Flensburg, Sleswig . . .	300,000	Port Elizabeth, S.A. . .	400,000
Alkmaar, Holland . . .	400,000	Forst, Brandenburg . . .	300,000	Portsmouth . . .	1,000,000
Allenstein, Germany . . .	200,000	Frankenthal, Germany . . .	175,000	Posen, Germany . . .	450,000
Antwerp, Belgium . . .	1,500,000	G. L. & C. Co. Beckton . . .	2,250,000	Posen (2nd) . . .	700,000
Antwerp (2nd) . . .	1,000,000	G. L. & C. Co., „ (2nd) . . .	10,750,000	Prague, Austria . . .	140,000
Ashford . . .	250,000	G. L. & C. Co., Bromley . . .	3,750,000	Preston . . .	1,400,000
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Aylesbury . . .	150,000	G. L. & C. Co., „ (2nd) . . .	750,000	Redhill . . .	275,000
Barmen-Rittershausen . . .	500,000	G. L. & C. Co., Kensal Green . . .	2,250,000	Redhill (2nd) . . .	300,000
Barrow . . .	300,000	G. L. & C. Co., Nine Elms . . .	2,750,000	Reichenberg, Bohemia . . .	200,000
Bath . . .	1,000,000	Gablonz, Austria . . .	140,000	Reichenberg (2nd) . . .	200,000
Belfast . . .	1,700,000	Gelsenkirchen, Westphalia . . .	175,000	Revel, Russia . . .	350,000
Belfast (2nd) . . .	4,500,000	Gelsenkirchen (2nd) . . .	350,000	Rhymney Valley . . .	175,000
Benrath, Germany . . .	125,000	Geneva, Switz. . .	500,000	Romford . . .	300,000
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Berlin-Rixdorf . . .	650,000	Göteborg, Sweden . . .	300,000	Rotterdam, Holland . . .	850,000
Berlin-Rixdorf (2nd) . . .	700,000	Göteborg (2nd) . . .	600,000	Rotterdam (2nd) . . .	1,500,000
Berlin-Tegel . . .	3,500,000	Graudenz, Prussia . . .	200,000	Rotterdam (3rd) . . .	750,000
Berlin-Tegel (2nd) . . .	6,350,000	Guildford . . .	350,000	Rotterdam (4th) . . .	750,000
Bilston . . .	375,000	Guildford (2nd) . . .	200,000	Rotterdam (5th) . . .	600,000
Birmingham . . .	1,500,000	Haarlem, Holland . . .	850,000	St. Albans . . .	700,000
Bishop's Stortford . . .	200,000	Hamburg, Germany . . .	1,750,000	St. Gallen, Switz. . .	225,000
Bochum, Westphalia . . .	530,000	Hampton Court . . .	500,000	St. Gallen (2nd) . . .	225,000
Bognor . . .	100,000	Hampton Court (2nd) . . .	600,000	St. Joseph, Mo. . .	750,000
Bordentown, N.J. . .	125,000	Hartlepool . . .	750,000	San Paulo, Brazil . . .	700,000
Bournemouth . . .	1,000,000	Hebden Bridge . . .	200,000	Santiago de Cuba . . .	400,000
Bournemouth (2nd) . . .	500,000	Heidelberg, Germany . . .	200,000	Scarborough . . .	800,000
Bremen, Germany . . .	550,000	Holyoke, Mass. . .	600,000	Schwelm, Westphalia . . .	100,000
Bremen (2nd) . . .	950,000	Hong Kong . . .	450,000	Shanghai . . .	225,000
Bremen (3rd) . . .	850,000	Hull . . .	1,500,000	Shanghai (2nd) . . .	225,000
Brentford . . .	1,200,000	Ilford . . .	650,000	Shanghai (3rd) . . .	1,600,000
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Bridgwater . . .	200,000	Ipswich . . .	750,000	Southampton (2nd) . . .	500,000
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Brieg, Silesia . . .	100,000	Kiel (2nd) . . .	880,000	Southport . . .	750,000
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Brighton (2nd) . . .	1,850,000	Lausanne, Switz. . .	250,000	South Shields . . .	650,000
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Bruges, Belgium . . .	200,000	Lea Bridge . . .	350,000	Staines . . .	600,000
Brussels-Anderlecht . . .	350,000	Lea Bridge (2nd) . . .	350,000	Stettin, Germany . . .	880,000
Brussels-Anderlecht (2nd) . . .	350,000	Lea Bridge (3rd) . . .	400,000	Stockholm . . .	1,500,000
Brussels-Forest . . .	1,000,000	Lea Bridge (4th) . . .	1,000,000	Stockholm (2nd) . . .	1,750,000
Brussels-Koekelberg . . .	1,000,000	Leeuwarden, Holland . . .	400,000	Stockport . . .	600,000
Brussels-St. Gilles . . .	1,000,000	Leiden, Holland . . .	500,000	Stockport (2nd) . . .	600,000
Brussels-St. Josse . . .	1,000,000	Leiden (2nd) . . .	575,000	Stockport (3rd) . . .	400,000
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Brussels-Ville . . .	750,000	Lemberg, Galicia . . .	260,000	Swansea . . .	750,000
Brussels-Ville (2nd) . . .	750,000	Lemberg (2nd) . . .	500,000	Swansea (2nd) . . .	1,000,000
Brussels-Ville (3rd) . . .	1,500,000	Liège, Belgium . . .	1,000,000	Swansea (3rd) . . .	450,000
Brussels-Ville (4th) . . .	350,000	Liège (2nd) . . .	750,000	Swindon . . .	300,000
Bucarest, Roumania . . .	1,100,000	Lincoln . . .	500,000	Sydney-Harbour . . .	500,000
Budapest, Hungary . . .	50,000	Liverpool . . .	3,500,000	Sydney-Harbour (2nd) . . .	500,000
Budapest (2nd) . . .	1,750,000	Liverpool (2nd) . . .	4,500,000	Sydney-Mortlake . . .	500,000
Carlisle . . .	600,000	Longton . . .	600,000	Sydney-Mortlake (2nd) . . .	500,000
Carlsruhe, Germany . . .	500,000	Louvain, Belgium . . .	800,000	Syracuse, N.Y. . .	850,000
Chigwell . . .	350,000	Lübeck, Germany . . .	400,000	Taunton . . .	225,000
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Commercial (2nd) . . .	850,000	Maidenhead . . .	225,000	The Hague (2nd) . . .	500,000
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Croydon . . .	1,250,000	Merthyr Tydfil . . .	300,000	Utrecht (2nd) . . .	1,000,000
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Croydon (3rd) . . .	625,000	Namur, Belgium . . .	175,000	Vienna . . .	3,500,000
Croydon (4th) . . .	550,000	Nelson . . .	400,000	Vienna (2nd) . . .	2,500,000
Debreczin, Hungary . . .	100,000	Newburgh, N.Y. . .	600,000	Waltham . . .	400,000
Deventer, Holland . . .	150,000	New York . . .	5,200,000	Wandsworth & Putney . . .	1,800,000
Deventer (2nd) . . .	200,000	Nietheroy, Brazil . . .	250,000	Watford . . .	300,000
Dorking . . .	150,000	North Middlesex . . .	150,000	Watford (2nd) . . .	350,000
Dublin . . .	2,000,000	North Middlesex (2nd) . . .	200,000	Wellington, N.Z. . .	350,000
Dublin (2nd) . . .	2,000,000	North Middlesex (3rd) . . .	75,000	West Bromwich . . .	550,000
Dublin (3rd) . . .	650,000	Norwich . . .	1,000,000	West Ham . . .	1,500,000
Dundee . . .	1,500,000	Norwich (2nd) . . .	300,000	West Ham (2nd) . . .	800,000
Dunedin, N.Z. . .	150,000	Norwich (3rd) . . .	500,000	Weston-super-Mare . . .	350,000
Dunedin, N.Z. (2nd) . . .	275,000	Nottingham . . .	1,000,000	Weston (2nd) . . .	350,000
Durham . . .	200,000	Nottingham (2nd) . . .	1,000,000	Wexford, Ireland . . .	100,000
Düsseldorf, Germany . . .	1,000,000	Nuneaton . . .	125,000	Wiesbaden, Germany . . .	850,000
Eastbourne . . .	1,250,000	Oberhausen, Germany . . .	175,000	Winchester . . .	225,000
Edinburgh . . .	2,000,000	Oldenburg, Germany . . .	200,000	Winchester (2nd) . . .	125,000
Epsom . . .	225,000	Ostend, Belgium . . .	100,000	Wolverhampton . . .	1,500,000
Epsom (2nd) . . .	300,000	Ostend (2nd) . . .	200,000	Zwolle, Holland . . .	200,000
Falmouth . . .	150,000	Perth, W.A. . .	125,000	Zwolle (2nd) . . .	200,000

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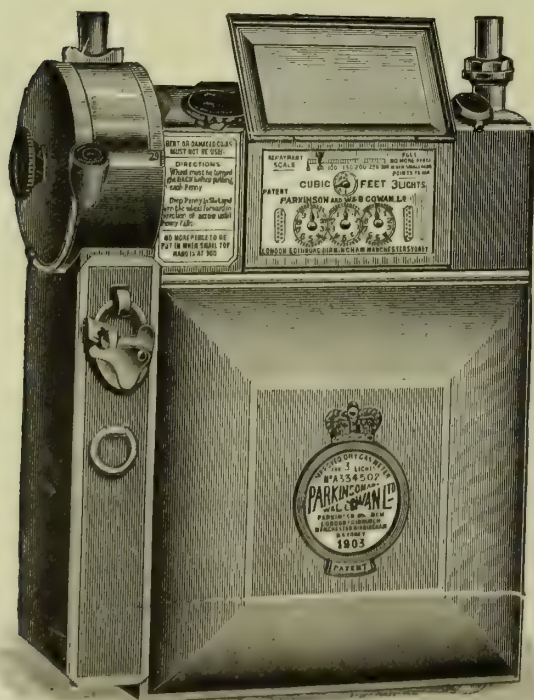
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2440.—TUESDAY, FEBRUARY 15, 1910.

## EDITORIAL NOTES—GAS, &c.

### The Commercial Pressure of the Times.

"THE half year has been progressive rather than eventful." These words were employed by Mr. Charles Carpenter in the early part of his address from the chair at the crowded meeting of the proprietors of the South Metropolitan Gas Company last Wednesday; and they correctly and pithily sum up the period's history of the gas industry. At the same time, the fact does not detract from the interesting story that the Chairman had to lay before the proprietors, who by-the-by, with great enthusiasm, showed their confidence in the successor to Sir George Livesey at the helm of the undertaking by re-establishing him in office on his retirement by rotation. In these times of competition, labour unrest at the producing sources of the primary raw material required in the industries, with innovation constantly bursting out in unexpected places, there cannot be progress in the gas industry without work, and work that is both actively offensive and defensive. There can be no gainsaying that, in all commercial work, the pressure has increased, and still increases. Examples of the multifarious matters that have to occupy the direction of a gas undertaking in these days, and the indications of an imperative alertness approaching to a perpetual strain on the part of those in fiduciary positions, are presented throughout the address. The fact that an excellent increase in the consumption of gas was obtained in the past half year by the Company does not mean that there can be any relaxation in any one particular on the part of the outdoor staff or on the part of those who have to exercise their brains to keep the wheels from clogging, to keep them active, and to utilize them to fresh useful effect. These are times when it is easier to lose ground in some districts than to open up fresh; and there has to be constant watchfulness to ensure that what is won in one quarter is not lost in another. Therefore to simultaneously retain and to increase mean constant effort and application.

It was interesting to hear from the Chairman that the percentage increase (4·12) in the consumption of gas on the large business done by the Company represents in volume sufficient gas to supply towns which individually are generally regarded as representative and substantial—such as Middlesbrough, Ipswich, Eastbourne, Hastings, York, &c. The volume and the illustration forcibly appeal, while the percentage figure of 4·12 may to the lay mind seem mean on account of its proximity to a cipher. It is a point that has often been made before in our columns; and it would be, we believe, an advantage, giving as it would do a better public view of the life and fecundity in the gas industry, if, when percentage increases are named, the volumes they represent were also quoted. The administrations of the electrical industry endeavour to create a public impression by talking of their increases in terms of 8-candle power lamps connected—rolling up in the calculation not only lighting but power supply, and the little fringe of consumption that they have in other directions. That is absurd. We cannot follow them in that direction with the innumerable connections of the gas industry; and what is more we have no wish to. But the product of the calculation may be of a kind that makes a public impression.

While on the subject of the gas business, the Chairman could not refrain from reference to that quixotic project that has been planted and is struggling to take root in the Company's district, known as the Fixed Price Light Company, through whose beneficent agency the working man householder is to receive, at a fixed price per lamp per week, the supposititious privilege of low-power electric

lamps, and the landlords of the property are to have a hand in the conferment of this blessing by collecting (if they can) the lamp-rents with their house rents. We commented quite recently in our "Electric Supply Memoranda" on this queer project, which has been put forward with all gravity by the electrical world, and over which the big drum has been loudly beaten by the daily press. Mr. Carpenter carries information a step further than the newspapers, and reports the degree of success attained to the present by the Fixed Price Company, which success is an indication of the extent of the attractiveness of the idea to the working-class population of South London. Never before has the outdoor staff of the South Metropolitan Gas Company been organized to the height of perfection now obtaining, and through the process of decentralization and the establishment of local offices and centres, the outdoor department has—the same as in other gas-supply territories where the system is in vogue—become a fairly reliable channel of information as to all matters transpiring that affects the business of the Company. The information is that the success so far of the Fixed Light Company is measured by the fitting up of one house, and that the show-house itself! What else could be expected from a scheme without, as indicated by us on a previous occasion, a single side of attractiveness to it for the working-class householder?

Really we cannot conceive of any body of sane business men putting the scheme forward as a feasible one. In working class houses, nothing will gain ground by supplanting the existing that does not unquestionably present greater economy, greater convenience, and greater efficiency. When (if ever) the electricians come to know the working class householder better, they will find that his position and his means compulsorily cause him to be a most exacting person in the matter of his patronage. Landlords know this better than the electricians; and the latter will have some difficulty in obtaining the co-operation of the former in their little ruse for attempting an uncommercial raid into the preserves of the gas industry. The landlords have before them the ghastly and monitive illustration of the model workmen's dwellings, in the South Metropolitan district, which were fitted for electric light, and could not find tenants until the buildings were piped, at a higher cost than would have been the case in the first place, for gas. With such a caution before them, the landlords of South London will not be parties to their own undoing by making their houses unattractive to present or prospective tenants. We should like to see the results of the treaties of the Fixed Light Company with landlords in this matter. However, it is easy to understand that a proposal of this kind—lauded, blessed, and exaggerated as it has been by the daily press—may have caused a little trepidation in the minds of a few gas shareholders whose knowledge is not equal to any critical examination of the project. Any passing alarm that may have been felt in a few instances has been turned to amusement.

The commercial pressure does not end with the sale of gas. It extends to coal purchase and transit, and to the sale of the secondary products. The forces of industrial change and strife in other quarters than the gas industry bear upon the fortunes of the latter, in common with the remainder of the country. The cost to the whole country of putting into operation the Coal Mines Regulations (Eight Hours) Act has been a tremendous one, through the commotion and disorganization to which it has given rise in the coal-fields. The private feelings to-day of those members of the Government who fathered the principle of hour-restriction for adult labour, and piloted the measure that decreed its application to the coal mines of the country—those Ministers who ridiculed and rejected the warnings of responsible expert knowledge—can be well imagined. In



every particular warnings have materialized, the dislocation of conditions has been fulfilled, and the acerbity of the relationships between coal masters and men has been increased. For these things, the Act is alone responsible. The buyers of coal in the industry—the southern ones more especially—have had to stock very heavily, and have had to closely watch the trend of events. There has been difficulty, too, in getting coal from the North that is properly picked and cleaned; and so the South Metropolitan Company—the same thing undoubtedly applies to other concerns—have had to do the best they can with the coal delivered. The Company have not done badly in the half year, with an average production of 11,762 cubic feet per ton; and there is a prospect of something better still, when the whole of the carbonization comes under the new mode of working. Then, perhaps, the Chairman will be able to withdraw the statement of which he made use twelve months ago: “While the average quality of gas which we are able to supply by our present method of manufacture is about 16·4 candles, the average we should supply, if we knew how to do it, would be 14·4 candles. Unfortunately, we do not know how to do it.” The illuminating power of the Company’s gas shows recession, but admittedly not much. According to the official returns, the average during the week ending Jan. 8 was 15·75 candles, and during the week ending Jan. 15 15·78 candles, with an advance of about  $\frac{1}{4}$  candle for the week ending Jan. 22. It is, however, clear that the Company are on the high road to obtaining greater advantage than hitherto from their liberty in respect of their illuminating power standard.

But, unfortunately, while the Company are gaining economic benefit through carbonization, they, with other concerns using the Thames, are menaced with a maximum due of 3d. per ton of coal (representing to the Company an increased cost of about £15,000 a year upon coal alone), through the operation of the Port of London Act, 1908. This is naturally a matter that has to be, and will be, very seriously opposed, as under their circumstances grossly unfair to the Company. But it all goes to show how new conditions that are intended to be improvements in certain respects do not always come into operation without inflicting hardship in some quarters. One point more; and this in reference to residuals. The Company have commenced cultivating a local demand for the sale of coke in small quantities, packed in 28-lb. lots in paper bags; and an encouraging beginning has been effected with a business of 200 tons per week. Looking round, it is patent on all sides that pressure of commercial conditions, on the industry’s administrators and executive officers, was never greater than to-day; and nothing but the best service can suffice.

### The Standard and the Practice.

THE movement of the Scottish gas undertakings to a lower illuminating power standard for their gas, slowly continues; but the reduction of standard only makes more pronounced the mistaken veneration of the gas authorities for the heavy grades of gas. In the Gas Provisional Orders reviewed to-day, there are four gas undertakings—three of them under the direction of local authorities—seeking the lowering of their prescribed illuminating power to 14 candles. They are the Dunblane Gas Company, and the Falkirk, the Glasgow, and the Kirkcaldy Corporations. Glasgow is noteworthy, as the last dropping of the standard was to 16 candles; and it is proposed to come down to the now commonly accepted level of 14 candles, which in this matter will put Glasgow in line with Edinburgh. We do not think the gas authorities of Scotland who have in recent times applied, or are now applying, for the lowering of the illuminating power standard have been, or are, actuated by a mere idle whim, nor that they intend the newly-acquired authority to remain a dead-letter. But it is a singular fact that, whereas, according to the last Board of Trade statistics, there are 36 Scotch undertakings (out of 58 making returns) with a prescribed standard of illuminating power of 14 candles, the illuminating power of the gas actually supplied by these concerns ranges between 16·25 candles and (say) 28 candles—the majority being above 20 candles. We cannot explain the reason for this, in face of all scientific teachings and proofs that such gas is most unsuitable for use in all modern applications, and that it consequently impedes rather than aids the realization of the highest efficiencies.

The point was well put by Mr. Laurence Fletcher, the Managing-Director of the Welsbach Company, in the paper

he lately contributed to the Western Section of the Scottish Junior Gas Association. When incandescent lighting was in its infancy, not so much was known as now about the most appropriate conditions for obtaining the highest flame temperature from gas. Many jogged along in the mistaken belief that high illuminating power gas was best for use in incandescent burners; and partly through the persistence of this belief, incandescent gas lighting was hampered in its progress. The hampering still continues throughout Scotland. And Mr. Fletcher gives in his instructive paper a simple explanation of the reason why the policy has a disparaging effect. Gas rich in heavy hydrocarbons requires a large volume of air for its complete combustion; whereas an ideal gas for a bunsen burner is a mixture only needing  $4\frac{1}{2}$  volumes of air to 1 volume of gas for complete combustion, instead of (say) 6 volumes for 16 or 17 candle power coal gas. There is no insuperable difficulty in the way of making a bunsen burner that will give a good efficiency with high illuminating power gas. But, as Mr. Fletcher puts it, even with such a burner, we are placing a heavy load on the jet of sluggish gas as it issues from the bunsen tube; and, unless the burner is kept in an ideal condition, the chances are that a sufficient volume of air will not be drawn in to produce a good bunsen flame—resulting in the breakdown of the flame, a much lower flame temperature, and carbon deposit on the mantle. An ideal bunsen burner gas has, Mr. Fletcher told the Scotch juniors, an illuminating power of 12 to 14 candles. What is good for obtaining a high flame temperature in incandescent lighting is good for obtaining an excellent efficiency from gas-fires and cooking-stoves, and for realizing the best duty from a gas-engine. Why do the gas authorities of Scotland obstinately persist in blocking the way to the enjoyment of the highest efficiencies from gas when utilized in the modes approved by science? We do not know; and we fail to see whence could come an explanation that would, in these times, be accepted as satisfactory.

### Calorimetric Conditions.

THE paper that Mr. P. C. Balcon read on Saturday last, before the Midland Junior Gas Engineering Association, on “Gas-Works Calorimetry” is useful, not so much in respect of any new information that it contains as for the emphasis that it lays on certain matters relating to the subject, and the clear indication that the author gives, from his own experience, that calorimetry has a right to claim, and must have for the sake of scientific accuracy, necessary precision of condition in its conduct, just in the same way as photometry. This point should not be, though it often is, overlooked. In some gas-works, testing for calorific value is conducted in the most slipshod fashion; and the results are neither just to the gas nor creditable to the observer. And yet, if properly conducted by an experienced man, whose experience will lead him to avoid error, and whose desire for accuracy will cause him to see that all the conditions are right, the calorimeter is, as a measure of gas value, much to be preferred to the photometer with all its loopholes for error, not excluding the personal element that enters so largely into both procedure and readings. Towards the end of the paper, the author dealt with certain of the conditions that are necessary for securing scientific accuracy in calorimetry; and, among his points, he insists on the necessity for maintaining the temperatures of the water at a fairly equable level—a temperature at as near as possible that of the atmosphere. This was a point that was made in the report of a Committee of the American Gas Institute who were deputed to consider the general subject, and whose report was dealt with in the “JOURNAL” for the 1st inst. The Committee showed that, with any considerable divergencies between room temperatures and water temperatures, there would be considerable errors. If the water temperature is within 5° of the temperature of the atmosphere of the room, the readings should be within 1 B.Th.U. of the true heating value of the gas, provided, of course, that everything else is right. This is merely an example of a necessary condition to accuracy.

It has before been remarked in these columns that one argument in favour of the calorific power test is that it is the one that is best representative of the purposes to which the bulk of town gas is now applied. And that reason is by no means a solitary one. As Mr. Balcon rightly says, the calorific value of gas is easier to maintain than illuminating power, given fairly constant composition. Carbon dioxide occasions less trouble with calorific power than with illuminating power. Above a certain gas production from the coal



carbonized, illuminating power drops very rapidly, while the calorific power exhibits only a slow decline. These are points that have had conclusive proof on the large scale in the results of working with the Dessau vertical retorts in Germany and with the heavy-charge chamber settings. Though everything is favourable to a calorific power, as opposed to an illuminating power, standard test, we must, as a point of equity, ask all who have the best interests of the industry at heart not, directly or indirectly, to favour the dual penalty test. In his paper we have Mr. Balcon saying that the limits which have been put in the Act of the Gaslight and Coke Company with regard to calorific value, give little cause for apprehension and for the outcry against the double penalty. We want to give those—and they are not the friends of the gas industry—who desire a double penalty standard as little support for it as possible from within the industry itself. There is no apprehension that the Gaslight Company will not keep clear of penalty in relation to calorific power. But a double penalty-valuation for any one commodity is indefensible, and repugnant to comfortable and economical working; and it ought not, and must not, be accepted in any submissive spirit as an inevitable condition. Beyond this there is no desire to see the voluntarily agreed standard of the Gaslight and Coke Company, with all its conditional embroidery (necessitated by the refusal of the Company to accept the standard proposed by the County Council without relaxation), become as it were standardized by further application. As a standard without the conditions, it is altogether too high; and with conditions, it would be well to have a little more freedom. Mr. Balcon described certain of the best known types of calorimeters, and made practical comments upon them. Professor Boys will no doubt note the criticisms as to suggested disadvantages in certain details of the instrument bearing his name.

### Hopes of Peace—Asking for Repeal.

A FEELING of relief has gone through the country that the miners of, at all events, one of the two great coal-producing counties in the North have, on a ballot, voted against a strike, proposed with a view of destroying the agreement arrived at by their leaders with the coalowners, and consequently the three-shift system. In Northumberland, there are no less than 77 collieries; and from these the numbers voting have been substantial. The majority decision, of course, has given anything but satisfaction in the disaffected areas, where the voluntarily idle workmen, to the number of 10,000, announce, through their leaders, their intention of making themselves martyrs to the cause by still holding out. A ballot in Durham has not yet been taken; but it is confidently expected that it will end in the same vote for a peaceful solution of difficulties, instead of one for recourse being had to the arbitrament of war, which could only result in a trial of endurance, in which the victors would, in the result, naturally gain most. The outcome of the Northumberland vote will, of course, influence that in Durham. The miners are shrewd enough to know that there is some amount of truth in the ancient aphorism that "United we Stand; Divided we Fall." And Durham without Northumberland, or *vice versa*, in such a matter is unthinkable. We should be glad to feel that these ballots were going to end the long train of disputes that have arisen since the Act came into force; but we cannot do so while the Act remains. It is, however, a curious reflection upon the measure that, conceived and born in the interests of the miners, it should have been the cause of so many, and so considerable, grievances on their part. The dogma of the Trades Unions will not necessarily stand the test of practical laws and needs; nor is it likely that policy framed by limited knowledge—knowledge so limited that it is not equal to making an analytical examination of the reasons for, and the effects of, the policy—will be the best, unless it be so by pure chance. There is a growing recognition among the men that the Act is not to them all they expected it would be; and there have been mass meetings at which there has positively been a call for repeal. At the meeting of the River Tyne Commission the other day, it was urged that there ought to be an amendment of the Act; and at the Great Western Railway Company's meeting, the Chairman (Viscount Churchill) spoke of a strong feeling in the Welsh district in favour of repeal. Coalowners and men, industries generally, railway and shipping companies, and the public are all suffering from the Act. The

German owners, too, are effectively competing with us from the Westphalian coal-fields while there is so much disturbance at home. It is their opportunity. On all grounds and for all reasons—economic and peaceful—the pernicious thing should be, as early as possible, ruled from the Statute book.

### From Our Australian Friends.

Judging from the bulk of manuscript delivered just as this issue of the "JOURNAL" was being prepared for press, the proceedings at the annual meeting of the Victorian Gas Association, held under the presidency of Mr. P. C. Holmes Hunt, Engineer of the Metropolitan Gas Company of Melbourne, were plethoric in character. Unfortunately, owing to the delivery of the report having been somewhat delayed by the postal authorities, we cannot publish the full account in this issue, but must rest satisfied with the general matter, and the most important part of the proceedings (the presidential address); deferring the papers and discussions for publication in our next issue. Comments, for the same reason as that mentioned above, must also be postponed.

### Belfast and Its Gas Undertaking.

A definite step in advance was taken towards the end of last year in the much debated question of the proposed gas-works extensions at Belfast, by the selection by the Gas Committee of experts to advise them on the matter. The Engineers chosen were Mr. Charles Hunt and Mr. W. R. Herring; and they were to be assisted in their task by members of two local firms of Contractors. The question of the extensions had previously been many times discussed in the Council and out of it; and wide differences of opinion manifested themselves with reference to the site that should be utilized for the erection of such works as might be deemed to be necessary. The Corporation therefore adopted the wisest course when they resolved to procure such assistance as they have now obtained. After full investigation and consideration of the points that were remitted to them, Messrs. Hunt and Herring have submitted a report to the Gas Committee which we publish practically in its entirety in another portion of to-day's issue. This deals fully with the seven questions on which the Committee were desirous of having opinions expressed; and the conclusions arrived at will do much to help the Council out of the difficulty in which they have hitherto felt themselves placed in connection with the matter. Briefly, the report is to the effect that urgent need exists for making provision to meet future demands for gas; the operations, even with the present consumption, being "carried on with very considerable difficulty and some danger, owing to the extremely congested condition of the works," while "the operatives are subjected to conditions which at the present day are looked upon as both unnecessary and undesirable in the operations of gas manufacture." Further, the holder accommodation is much below what is considered safe; and "it would not be possible to carry on the gas supply of Belfast with so little storage, but for the large production of carburetted water gas." In arriving at the provision which they consider should be made for the future, the reporters set forth calculations which show that between the earliest date at which new works can be completed (1914) and 1928, an additional output may be expected which would ultimately call for a further productive capacity of some 10 million cubic feet per day. This is including the extra quality of coal gas which would have to be made in order to reduce the production of carburetted water gas to 25 per cent. of the total, as has been determined by the Committee. Another thing which they point out should be kept in view is the fact that it will doubtless be more advantageous to eventually transfer the whole of the manufacturing operations to a new site than to attempt to modernize the existing works by reconstruction. Therefore they recommend a large site, and that "a commencement be made as soon as possible by the provision of works capable of producing not less than 5 million cubic feet per diem of coal gas, and the transfer of 25 per cent. of carburetted water-gas plant; to be increased in coal-gas sections of 5 million feet, with its proportion of carburetted water-gas plant, as required." Of eight suggested sites, Messrs. Herring and Hunt have no hesitation in recommending the adoption, as being eminently suitable for gas-works purposes, of one at Twin Island. The reasons for the rejection of the Ormeau Park site, which has been so much supported and condemned, are clearly stated.



### Labour in Parliament.

The Labour Party have been holding their annual conference at Newport (Mon.); but nothing has transpired thereat that has startled the country, or put any fresh complexion upon the policy of the party. It was clear that the members met in a considerably chastened spirit; for the General Election has whittled down their representation in the House of Commons. But though the size of the party is smaller, the Chairman of the Conference (Mr. Keir Hardie, M.P.) asserts that it will constitute a more potent force than ever in the House. This can only be through the equality in strength of the two major bodies, which, the Labour Party thinks, will enable them to act in a dictatorial capacity, in carrying on the agitation for special labour legislation, and in warring against capital. The Government have been cautioned from Newport that they are not to rely upon the support of the party, who are going to pursue a course of independence, wholly unfettered by alliances of any kind. The House of Lords has been found very useful in its time in connection with Imperial and domestic affairs, as well as Private Bill legislation; but the Labour Party declares that it is an anachronism, and wants to see it abolished, or as Mr. Keir Hardie picturesquely puts it, "swept into oblivion." The conference, however, refused to go so far as to vote against a second chamber of any description; but there was discontent with the outlines of the Liberal policy in dealing with the Lords. The most commonsense thing done at the conference was the rejection of a proposition to interpolate the words "and Socialist" into the title of the party. The Government will, through the conference, have learned with something approaching dismay of all that is expected of them by labour's parliamentary "representatives;" and there is no doubt they will find the party somewhat tyrannical in their demands and acts in the coming session. Among other things, the Government are expected to deal with the real causes of unemployment on the lines of the Labour Party's "Right to Work Bill," which demands the formation of a Ministry of Labour and the establishment of a 48 hours' maximum working week.

### And Compulsory Levies.

Before the ordinary proceedings of the annual gathering, there was a special conference for the purpose of discussing what is doubtless a question of the very first importance to the Labour Members—that is the situation which has been created by the decision of the House of Lords in the Osborne case. This judgment, it will be remembered, was to the effect that the Amalgamated Society of Railway Servants were wrong in their contention that certain of their rules were legal which had reference to the formation of a fund for the support of Members of Parliament. Under these circumstances, it became necessary to decide upon the course to be adopted. The conference which was accordingly held for this purpose took place in private; but at its close an official statement was issued, which showed that one generally expected decision, and another which was just as generally unexpected, were arrived at. The gathering was presided over by Mr. D. J. Shackleton, M.P., who remarked that, not only did the Osborne decision touch the Labour Party as they had known it politically for the last nine years, but it also affected seriously the entire Trade Union movement. He urged that nothing less than a complete restoration to the position as it existed before the decision could be at all satisfactory to the Trade Union and the Labour movement. As an appropriate sequel to this declaration, Mr. Keir Hardie, M.P., moved the first resolution, which declared for an alteration in the definition of a Trade Union, so as to allow such bodies "to engage in the political activities they have pursued since 1868 up to the present time, provided that their members agree, and that such activities are specified in the Union's rules as part of their declared objects, as has been the case hitherto." This, which was the expected resolution, was carried unanimously. The decision of the meeting which was unexpected was that which resulted in the withdrawal of a resolution that all the affiliated organizations should "take immediate steps to form branches for the collection of voluntary contributions to a Parliamentary Election and Maintenance Fund." The withdrawal of this resolution seems at first sight a strange step, for voluntary contributions would doubtless have accomplished much of what the Labour Members desire. It has, however, been suggested as a reason that the Labour Party would be in a stronger position to secure immediate legislation without voluntary levies than with them.

### GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 457.)

IF "all is well that ends well," then last week's business on the Stock Exchange may be pronounced good. The opening day was far from promising. Markets were irregular, and for the most part weaker—Rails being in that category. But Home Government lines were better after their shake-down the week before. Tuesday brought signs of improvement; and all the leading markets were stronger, though not active. The excitable speculative quarters were, of course, keenly alive; but they are outside our purview. On Wednesday, business became more brisk, and the general tone was quite favourable. Consols and Rails advanced; and the Foreign Market was calm and confident. On Thursday, the cheerfulness and the increased activity were well maintained, and further steady advances in value were made—the cheapness of money affording an agreeable fillip. Friday was almost as good; but the Consols Market yielded somewhat, in view of impending new issues. Rails, however, continued to go ahead; and the Foreign Market was strong. The general attitude of affairs on Saturday was quite good. Consols were steady, but no higher; and the other chief departments were strong. In the Money Market, the supply was superabundantly plentiful, and short loans were on easy terms. Discount rates eased away; but they rallied before the close. The Bank of England rate was lowered to 3 per cent. on Thursday; and Berlin reduced the next day. Business in the Gas Market was not as active as of late, though some of the less frequently noticed issues were dealt in, and the bulk of it was in the premier Company. The general tendency was very firm, and a good many quotations advanced; none receded. In Gaslight and Coke, the ordinary was fairly active and quite firm. Transactions ranged from 105½ to 106½ *cum div.*, and 103½ to 104½ *ex div.*—a rise of ½. In the secured issues, the maximum made 89½ and 89¾ *cum div.* and 87½ *ex div.*; the preference 104½ and 105½ *cum div.* and 103¼ *ex div.*; and the debenture from 82½ to 82¾. South Metropolitan was very quiet at from 121½ to 123 *cum div.* and 120¾ *ex div.*—a rise of ¾. The debenture made 81½—a rise of 1. In Commercials, there was only one deal—111 for the 4 per cent. Among the Suburban and Provincial group, Brentford old realized 255½ and 257 (a rise of 2), Ilford "A" 146½ and 146½ (a rise of 1), South Suburban 120¼ (a rise of 2), and Liverpool "B" 167 and 168. In the Continental companies, Imperial had only three transactions, at from 175 free to 176½; ditto debenture made 94½; and European fully-paid 24¾. Among the undertakings of the remoter world, Bombay old changed hands at from 51½ to 61½ (a rise of 10), Buenos Ayres at from 147½ to 147½, Monte Video at 12¾ and 13, Primitiva at from 7½ to 7½, ditto preference at from 5½ to 5½, River Plate at 17¼ and 17¾, and San Paulo debenture at 51.

### ELECTRICITY SUPPLY MEMORANDA.

The Slow Pace in Power Supply—The Poor and the Rich Shareholder—"The Times" Controversy—A Trade Circular on Costs—More Fusing Reports—A Disregard of Dangers.

IT is some time now since we have had anything to say about the use of electricity for power purposes. But references to the subject in the electrical press indicate that the pace of adoption is not fast enough, and there is great lamentation over the fact. In an editorial in the "Industrial Supplement" of the "Electrician," the writer excuses himself for being, on the one hand, satisfied at what has been done, and, on the other, for "a certain feeling of despair that sometimes comes over us at the magnitude of the task before us." "It may also account for the two mutually destructive qualities of optimism and pessimism which are at times apparent in one and the same article from our pen." This recalls a little criticism made in the "Memoranda" awhile ago. But that is not the burden of the editorial under review. It is that there must be combination for the common good in this matter of power supply, if something magnificent is really to accrue. We will only quote a couple more sentences from the article. It is remarked that, "though the progress that is being made towards universal adoption of electric power for general purposes is satisfactory, yet we are none the less impatient that more should be done in this direction." Naturally! Then "it has been stated that only 11 per cent. of the total power used in this country is electrical; so that if this percentage is to be increased at anything like a reasonable rate, more energetic measures must be taken to develop the power supply side of the business, and the general public must be persuaded, cajoled, and even forced to become electrified." If we properly appreciate what is meant by "power" in this connection, it is not the "general public" who may require it, but the industries; and to get them to adopt it, we should resort to persuasion only, and leave out the cajoling and the forcing. These are methods that have no good and lasting effect.

Turning aside from the editorial in question, and looking elsewhere at current news. The power business is the mainstay, or is intended to be, of the Yorkshire Electric Power Company. In 1908, the profit of the undertaking, which has been running several years, was, after paying debenture interest, only £718; while last year it was £2665. This sum is to be carried forward; and the



hopes of the ordinary shareholders are again deferred. But worse than this, another obstacle to placing them in a dividend-receiving capacity is due to the increasing business. The present capital expenditure cannot meet the additional business; and some fresh generating plant has to be put down. It is therefore proposed to raise the necessary capital by the issue of preference shares, and so, as the "Electrical Times" puts it, "there will be another charge to meet before the ordinary shares have a look in." By the irony of fate, or an unpardonable joke on the part of the printer, directly facing the editorial comment on the foregoing matter, there is an announcement that the National Gas-Engine Company are paying for the past year a 20 per cent. dividend, in addition to which they are placing £10,000 to reserve (making it £100,000), and are carrying forward £9943. The Company see scope for an extension of their business by building engines of considerably greater powers than those they at present produce. There is a demand for such engines; and so works are to be erected to turn out the mammoth types up to 3000-horse power. To meet the cost of doing this, an issue of 50,000 each of preference and ordinary shares is to be made. The pictures when contrasted are striking and instructive.

In the last two issues of the "JOURNAL," reference has been editorially made to the controversy that has been proceeding in "The Times," mainly between one of that paper's partizan contributors and Mr. Hanbury Thomas, of Sheffield. In another part of the present issue, there is reproduced a very singular piece of writing by the "Contributor," which no intelligent individual will accept as being, either in substance or argument, any adequate reply to Mr. Hanbury Thomas. The "Contributor," it is clear, is driven into a tight corner; and can only resort to platitudes and evasion. The absurdity of his opening paragraph regarding cost is so pronounced that we will refrain from comment upon it. Many Sheffield consumers, who know more about the matter than "Contributor," will disagree with his deduction that they "could well afford to pay 5d. per unit, and still spend no more than they would on gas." "Contributor" considers, moreover, that it is obviously unfair to compare the cost of lamp renewals with mantle renewals when the latter are carried out under a maintenance scheme. He seems to suggest that under a maintenance scheme the mantles are "nursed." But the fact is the Gas Company only pay periodical visits under a maintenance system, so that the "nursing" is of a somewhat intermittent kind. "If a tungsten lamp is 'nursed,'" "Contributor" writes, "it will burn for 3000 hours (say, three years), and costs 2s. 9d. This is equivalent to the cost of mantle renewals at Sheffield for three years with mantles at 3½d." In general use, tungsten lamps are not "nursed," any more than are mantles, and they do not last anything like 3000 hours under ordinary conditions; so that we cannot see the force of the argument of "Contributor." He also tries to dispose of the question of ventilation and atmospheric contamination in a few sentences; but it is a subject that will not admit of such summary treatment. In all points raised in the controversy, the extensive and practical experience of the Sheffield Gas Company wins.

Curiously just as "Contributor's" poverty-stricken reply is under notice, we receive from a correspondent a copy of a circular by the Jandus Arc Lamp and Electric Company, Limited. They are the makers of a regenerative electric flame arc lamp, which, of course, the circular makes out, knocks all other systems of electric lighting completely out of the field in the matter of cost per 1000 candle-power-hours. We have not observed that anyone has gone into ecstasies over this light, though according to the circular, its cost for current and carbons—0.43d.—is about half that of any other flame arc lamp, basing calculations on the mean hemispherical candle power. But what we are more interested in than anything else in the table given in the circular are the figures as to electric metallic filament lamps and high-pressure gas lighting. Adopting the low and unusual (except for street lighting) price of 2d. per unit for the current used by the metallic filament lamps, it is calculated that the cost of current and lamp renewals would work out to 3.3d. per 1000-candle-hours. We are not going to compare high-pressure gas lighting with metallic filament lamps. The comparison would be unfair; but any way the figures for high-pressure gas lighting are open to our criticism. It is first observed that the Jandus Company kindly work out the cost per 1000 candle-hours for gas and renewals under the high-pressure system at 1.8d. And this is effected by the effrontery of assuming that the consumption of gas is 53 cubic feet of gas per 1000-candle-hours. Now what does this mean? That the efficiency of the high-pressure system of gas lighting is under 20 candles per cubic foot of gas consumed—an efficiency that can be readily obtained by inverted gas-lamps at ordinary pressures. It is a long span between the efficiency now derivable from high-pressure gas lighting and the day of the 30-candle-per-cubic-foot efficiency; and there never was a time when anybody but a lunatic would have thought it necessary, with the incandescent system, to raise the pressure of gas in order to obtain an efficiency of below 20 candles per cubic foot. However, taking the 53 cubic feet that Jandus thinks necessary per 1000 candle-hours, the cost of gas, at 2s. 6d. per 1000 cubic feet, works out at 1.59d., and to this is added 0.21d. for mantle and chimney renewals—making 1.80d. Supposing we bring calculation up to date, and take the high-pressure inverted gas-lamp, giving an efficiency of 60 candles per cubic foot of gas. Then we find that 17 cubic feet will suffice for the 1000 candle-hours; and 17 cubic feet at 2s. 6d. works out to 0.50d. This added to mantle and chimney renewals, representing (according to Jandus) 0.21d., makes 0.71d. per 1000 candle-hours,

Therefore Jandus is rodd. out in the computation, through either not being up to date or deliberately misleading. We fear for the Company's honesty in this matter of high-pressure gas lighting; and the cause of our fear is the ascribed efficiency of something under 20 candles per cubic foot of gas.

Of course, it will be said the reports are erroneous, and that the newspaper reporters have been dreaming again. Hospitals containing sick and injured and buildings containing art collections are among the least desirable places for outbreaks of fire. A paragraph in one of the morning papers last Friday week stated that, owing to the fusing of an electric light wire, a fire occurred the previous day at the London Hospital; but, fortunately, it was discovered in time to restrict it to the store-room and basement. Then concern was occasioned in the West-end last Wednesday through an alarm of fire at Hertford House, where the priceless treasures of art bequeathed to the nation by Sir Richard Wallace are located. The discovery was made by a constable, who observed "a flickering" at a certain point. It was found that there had been a fusion or short-circuiting of electric wires in the boiler-house, and this had set alight some woodwork adjoining. But prompt action extinguished the fire before it could assume any considerable dimensions. Everybody will be glad the fires in both instances had not obtained such hold as to be beyond suppression in this way; but the incidents supply curious looking pendants to the legend "Electricity is the Safest Illuminant." That the authorities in whom reposes the protection of the Wallace Collection do not altogether believe in the legend, is attested by the fact that there is in existence an elaborate set of instructions for the attendants as to how to act in case of electric fusion. Sand is to be thrown upon the burning place if the current is still on; but a separate series of switch-room instructions indicates measures to be taken for switching off the current. It is directed that the switches that control the mains near the fire are to be turned off at once; and diagrams show each subdivision of the building, with, opposite, the number of the switch controlling that part of the installation. Instructions are also given as to the turning off of the main-switch, with the caution that this measure is to be resorted to only in the last extremity, as the act will place the entire building in darkness. Further, the location of the switches is given, so that, should the electrician or engineer not be upon the premises, action can be intelligently and decisively taken without delay. It is stated that the electric wires were only wood-cased at the part where the outbreak occurred; and anxious persons are already urging upon the Office of Works to complete the metal casing of the wires.

These instances show that, in what may surely be regarded as good installations, serious risks exist; but there are others that are produced by carelessness, ignorance, and the inconvenience of adopting safeguards. Electricity lends itself to this sort of thing. Nothing can be seen; the current is odourless. There is no flame, unless a self-generated one. Everything tempts to look upon the system as being absolutely safe, and precautions are not respected. Mr. W. R. Walton, Assoc. M. Inst. E.E., writes on this subject in the "Manchester Guardian." His experience shows that many risks are due to disregard of the most obvious dangers. He gives two examples. In a warehouse a fuse-board had been enclosed in the usual asbestos-lined box; but at the time of Mr. Walton's visit, the box had been removed, and loose inflammable goods were piled upon the floor to within a few inches of the unprotected fuses. A "short" on either of the circuits fused at that point, or on the board itself, would probably have caused another electrical fire in a building in which over 300 persons were employed. In a theatre a switch-board and a gas-meter were dangerously close neighbours, though an inexpensive fireproof partition could easily have been provided effectually to separate them. There are, of course, classes of risks in which the user is more or less helpless. He does not usually know whether the workmanship or material employed is what it should be.

**Informal Meeting of Scottish Gas Managers.**—We learn that this meeting, of which Mr. W. B. McLusky, of Perth, is the Convener, will be held at the Windsor Hotel, Glasgow, on Wednesday, the 6th of April, under the presidency of Mr. J. Ballantyne, of Hamilton.

**Society of British Gas Industries.**—As already notified in the "JOURNAL," the annual general meeting of the Society will be held at the Waldorf Hotel on the 24th inst. We learn from the Secretary (Mr. Arthur L. Griffith) that the proceedings will be opened at five o'clock, when the general business will be disposed of under the chairmanship of Mr. Thomas Newbigging, the retiring President. At the close of this, he will induct his successor, Mr. J. H. Balfour Browne, K.C., who at six o'clock will deliver his Presidential Address. Subsequently the members and guests will assemble at an informal dinner.

**Dehydrating Liquids, Tar, Etc.**—The Paris Gas Company have taken out a patent for apparatus for the above-named purpose. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the apparatus consists of an oil-bath containing a serpentine coil leading into an expansion chamber containing baffle-plates. The oil, tar, or other liquid to be treated is fed into the coil, where it becomes heated to a temperature above the boiling-point of water before being discharged on to the baffle-plates. The steam generated is carried away to a condenser by means of one pipe, while the dehydrated liquid flows away by another.



## THE CASE FOR THE STANDARD BURNER BILL.

[COMMUNICATED—CONTINUED FROM PAGE 350.]

THE illuminating duty obtainable from gas varies with the burner used; and at the standard rate of consumption it is, or should be, higher with the standard testing burner than with any other burner which the consumer may use. Thus the duty obtainable even with the "London" argand burner No. 1 is higher than with any flat-flame burner. If the standard argand affords a duty of 16 candles per 5 cubic feet of gas consumed, the gas is said to have an illuminating power of 16 candles, and a flat-flame burner will give a light of  $16-x$  candles per 5 cubic feet of gas consumed. If, on the other hand, the standard argand obtains a light of only 14 candles from the gas, the latter is said to have an illuminating power of 14 candles, and with that gas a flat-flame burner may be expected to give a light of  $14-x$  candles. That is to say,  $x$  should have a constant value for all qualities of gas if the illuminating power of the gas ascertained by the standard argand bears a definite constant relation to the illuminating duty obtainable from flat-flame burners. The standard argand which affords as nearly as may be such a constant difference for a wide range of quality of the gas, obviously best indicates the relative values of gases of different illuminating power to the consumer who uses flat-flame burners. The value of  $x$  will depend on the particular type of flat-flame burner which the consumer elects to use; but, provided the type is not inherently bad, it should only be necessary to vary slightly the size of burner of a particular type according to the variations in the specific gravity and quality of the gas to ensure  $x$  being a constant for each type of flat-flame burner. If  $x$  is not practically a constant, there will be good ground for suspecting that the standard argand used in determining the illuminating power of the gas is not doing equal justice to all qualities of the gas employed.

How does the "London" argand No. 1 burner stand such a test of its fitness for use as a standard burner? If the illuminating power of gas is ascertained by consumption at the rate of 5 cubic feet per hour in the "London" argand No. 1, tests of the duty obtainable from various flat-flame burners show that when the illuminating power of the gas is reduced from 16 to 14 candles, that duty becomes reduced approximately as follows:—

No. 6 Bray's fishtail or union-jet burner	1·6 candles
" 5 Sugg's table-top burner . . . .	1·5   "
" 5 Peebles governor burner . . . .	1·6   "

If the difference between the illuminating power of the gas and its illuminating duty in each type of flat-flame burner were a constant,  $=x$  candles, the reduction would in this case be 2 candles instead of the 1·5 and 1·6 candles shown by the tests. That is to say, if  $x$  candles is the difference between the illuminating power of the gas and the duty in a flat-flame burner when the illuminating power of the gas is 16 candles, the difference is only  $(x-0·5)$  candles (or less by half a candle) when the illuminating power of the gas is 14 candles. The inference to be drawn from these figures is that the "London" argand No. 1 burner is, as compared with flat-flame burners, relatively unfair to the poorer qualities of gas. It exaggerates any reduction there is in the quality of the gas.

Dr. Ashby's contention, based on certain figures published by Mr. Dibdin, that "when gas of a lower illuminating power is burned in a flat-flame burner a greater quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas," has thus been shown to be untenable. If the illuminating power of the gas is ascertained, as in Mr. Dibdin's tests, by means of the "London" argand No. 1 burner, the converse proposition is in fact true—viz., that (to follow Dr. Ashby's phraseology) when gas of a lower illuminating power is burned in a flat-flame burner a smaller quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas.

The unfairness of the "London" argand No. 1 burner as a standard for assessing the relative values of different qualities of gas for flat-flame lighting having thus been demonstrated, it is now desirable to indicate how the "Metropolitan" argand burner No. 2 compares with it in this respect. As to the flat-flame burner, some progress in design has been made since the date of Mr. Dibdin's paper, and many gas companies have distributed gratis to their consumers large numbers of flat-flame burners of more efficient types than then existed. Perhaps the best of these burners is the Bray's "5 Ft.  $\frac{1}{2}$ ," which is now prescribed by the Metropolitan Gas Referees as the burner to be used in the flat-flame testings which are made for information in the official testing places in London under the provisions of section 5 (1) iii. of the London Gas Act, 1905. The burner thus prescribed must be "of the best available pattern," and it has been prescribed accordingly in the Metropolis for testing gas which has been required to have an illuminating power of 16 candles, as well as gas of 14-candle power; while it is common knowledge that in some districts of the Metropolis the gas supplied is wholly coal gas and in other districts a mixture of coal gas and carburetted water gas. This burner may, therefore, be regarded as behaving satisfactorily with gases varying considerably in candle power and in

composition. It is cheap, durable, economical of gas, and eminently practicable for use by the consumer.

A series of very many comparisons of the results of testings of gas of varying qualities with the "Metropolitan" argand burner No. 2 and this flat-flame burner shows that there is virtually a constant difference between the results with the two burners, even though the quality of the gas is varied greatly. Thus, if  $x$  candles is the difference between the illuminating power of the gas and the light obtainable in the flat-flame burner at a fixed consumption of 5 cubic feet of gas per hour when the gas used is coal gas of an illuminating power of 17 candles, the difference will be  $(x+0·08)$  candles when the gas used is coal gas of 15 candles illuminating power. That is to say, the results obtained with the flat-flame burner rise and fall almost absolutely coincidentally with the rise and fall of the illuminating power of the gas as ascertained by means of the "Metropolitan" argand burner No. 2.

The difference  $(x+0·08)$  candles, or 0·08 candle over a range of two candles in the illuminating power of the gas, has been arrived at from the results of testings of neat coal gas. Since, however, Dr. Ashby has directed attention to the fact that a mixture of coal gas and water gas is supplied by a number of gas undertakings, it may be advisable to give the corresponding figure for a mixture of coal gas and carburetted water gas such as is supplied to many parts of London. If  $x$  candles is the difference between the illuminating power of the gas and the light obtainable in the flat-flame burner when the mixed gas used has an illuminating power of 16 candles, the difference will be  $(x+0·18)$  candles when the gas used is mixed gas of an illuminating power of 14 candles. The increase of 0·18 candle in the difference between the illuminating power and the flat-flame lighting value, though greater than with neat coal gas, is practically negligible in comparison with the drop of two whole candles in the illuminating power of the gas. It may, therefore, be concluded that with both coal gas and mixed gas the results of testings of the illuminating power of gas with the "Metropolitan" argand burner No. 2 directly correspond with the variations which will ensue in the light obtainable from a flat-flame burner when the illuminating power of the gas is varied. Consequently, from the standpoint of the consumer who uses flat-flame burners, the "Metropolitan" argand burner No. 2 is the proper standard burner for testing the illuminating power of the gas with which he is supplied. Local authorities will best consult the consumers' interests by supporting the present Bill, which provides for the "Metropolitan" argand burner No. 2 being substituted for the "London" argand burner No. 1 and any other standard burners which do not give results corresponding with the lighting value of the gas in flat-flame burners.

The figures given above for the relation between the illuminating power of gas and its lighting value in flat-flame burners are derived from curves drawn on a diagram on which the results of many hundreds of comparisons have been plotted out. They are not, therefore, based on one or two testings only, but on the mean results of a large number. In regard to the pattern of flat-flame burner used, it may be observed that the same results are obtainable with other efficient patterns—e.g., Bray's No. 4 union-jet regulator with No. 7 slit economizer cap gives practically identical figures. There are, however, only a few burners which can be used for both 16 and 14 candle power gas with equally good results, without alteration of the size of the burner; but provided the right size is used for each quality of gas, almost every well-known type of flat-flame burner will afford correspondingly good efficiency with both qualities of gas. That is to say any falling off in the light obtainable from a given quantity of gas with flat-flame burners will be no greater than the reduction in the illuminating power of the gas. Moreover, since the people who are now using flat-flame burners are almost all of the rapidly disappearing class of consumers who entirely disregard the lighting efficiency of the gas-burners they have, it may safely be predicted that any reduction made at any time in the illuminating power of the gas supplied may forthwith be more than balanced by changing the flat-flame burners in use for others of higher efficiency—which better burners every gas company nowadays is prepared to supply and fit at a nominal cost, often even gratis.

It has thus been shown that, even if the introduction of the "Metropolitan" argand burner No. 2, in place of a more antiquated standard burner at present prescribed for testing the illuminating power of the gas supplied in a district, may admit of the illuminating power of the gas being reduced to a slight extent below that to which the consumers have been accustomed, yet even those consumers who continue to use flat-flame burners will suffer no real injury thereby. It has not, moreover, been alleged by Dr. Ashby, or by any spokesman or section of the bodies that are contemplating opposition to the Bill, that, if incidentally its provisions admit of a small reduction in the illuminating power of the gas supply, the consumers who use incandescent burners will suffer the smallest injury thereby. Hence it may be fairly accepted as an established fact that in granting to the promoting companies the measure of justice for which they ask—viz., the right to have the illuminating power of the gas they supply tested by the burner which is most suitable for obtaining from the gas the greatest amount of light—Parliament will not be inflicting the smallest injury on any consumer of gas for lighting purposes.



No injustice or injury will be done to the user of either incandescent or flat-flame burners by this somewhat belated act of justice to the gas companies.

The first three grounds of opposition to the Bill, which are indeed the only ones really relevant to its provisions, have now been dealt with at length; and it only remains to discuss briefly the remaining five points which one or two of the opponents of the measure apparently desire to raise merely because the fact that the promoting companies are coming to Parliament affords them the semblance of an excuse.

The fourth point, which is the first and most important of the five irrelevant issues raised by opponents of the Bill, is to the effect that, having regard to the general use of incandescent burners for lighting and to the extended employment of gas for heating and power purposes, for all of which uses the illuminating power of the gas is of no moment, whereas its calorific power is of importance, a standard calorific power of the gas should be fixed, and provisions for the making of testings of calorific power should be included in the Bill.

It is necessary to recall to mind the fact that the present Bill does not provide for any reduction in the prescribed illuminating power of the gas supplied by any of the promoting companies, and therefore it does not raise the question of the quality of that gas, which, moreover, varies very considerably in different towns according to local practice and requirements. The Bill merely provides for the general adoption of a uniform and equitable method of ascertaining the illuminating power of the gas, which method embodies the fundamental principle underlying the testing provisions of the precedential Acts of 1868 and 1905, and affords, as has been demonstrated, the best criterion of the relative value of the different qualities of gas to the consumer. This method, involving, as it does, the adoption of the "Metropolitan" argand burner No. 2 as the standard testing-burner, has in fact, since the passing of the London Gas Act, 1905, been prescribed by Parliament in the Acts or Provisional Orders of over seventy gas undertakings.

In no case has Parliament imposed any condition as to the calorific power of the gas supplied when authorizing, either directly or indirectly, the use of this burner for statutory testings of illuminating power. The only gas undertaking in the United Kingdom which is required by Act of Parliament to supply gas conforming to a prescribed standard of calorific power, is the Gaslight and Coke Company. The statutory testings of the illuminating power of the gas supplied by this Company were carried out with the "Metropolitan" argand burner No. 2 for four whole years prior to the prescription of a standard of calorific power. The legislative act which called for the employment of this standard testing burner in the case of this Company had not the slightest relation to, or connection with, the subsequent legislative act which imposed a standard of calorific power. There is absolutely no precedent for raising the question of the imposition of such a standard in connection with provisions for the legalization of the use of the "Metropolitan" argand burner No. 2; and it is highly improbable that a Parliamentary Committee will so far disregard precedent as to concur in the question being raised on the present Bill. One gas company only in the whole country have so far, in return for definite concessions in no way connected with the method by which the illuminating power of their gas is tested, accepted the imposition by Parliament of a standard of calorific power. The local authorities concerned in the present Bill cannot hope that the promoting companies will accept a standard of calorific power except in return for similar concessions, for none of which are they now asking Parliament.

The history of gas legislation in the United Kingdom indicates that the Metropolitan gas undertakings have always been subject to more onerous standards of quality and methods of testing than provincial undertakings; yet so far a standard of calorific power has been applied to only one of the Metropolitan Gas Companies, and this took place four years after, and quite independently of, the imposition of the "Metropolitan" argand burner No. 2 for testing the illuminating power of the gas. The local authorities who contemplate opposition to the present Bill should bear in mind that no concession was required of the Metropolitan Gas Companies in return for the legislative authority to have their gas tested by means of the "Metropolitan" argand burner No. 2. It is inconceivable that those familiar with parliamentary practice in gas legislation that Parliament will expect or require provincial gas companies to make concessions in regard to quality or testing which the Metropolitan Companies have not made. There can be no question of a *quid pro quo* in respect of the provisions of the present Bill, since none has been taken of the many and more important gas undertakings which have already secured these provisions in their respective Acts and Orders.

When any of the companies promoting the Bill come to Parliament for a reduction of the prescribed illuminating power of the gas they supply, it will be time enough for the local authority concerned to ask for the imposition of a standard of calorific power. But even then Parliament will probably be satisfied that a provincial gas company is entitled to the same consideration as the Metropolitan Companies—viz., that there shall be a period of four years or more during which the authority shall be empowered to make testings of the calorific power of the gas supplied with a view to securing information thereon, and that no standard of calorific power shall be fixed until after such a period has elapsed. It is reasonable that provincial gas undertakings should be allowed at least as long a probationary period of testings for calorific power

as the Metropolitan Gas Companies, in order that they too may learn to what average value they work, and the extent of the fluctuations therefrom with the methods of manufacture and the raw material which they use. No advantage would accrue to any consumer if, through inadvertence or ignorance, a standard of calorific power were fixed for any company, to comply with which would entail scrapping a large part of its manufacturing plant, revolutionizing its methods of working, and seeking coal for carbonization from fresh sources of supply at enhanced prices. Yet at the present time there is scarcely a gas undertaking outside the Metropolis which is in a position to work to a standard of calorific power without serious risk of being forced thereby to one or all of these measures. The consumer would suffer severely from the consequent increase in the price of gas. A local authority which has at heart the interests of gas consumers should proceed cautiously in asking for a standard of calorific power of the gas supplied. Until a gas undertaking obtains parliamentary sanction for a reduction in the prescribed illuminating power, there can be no appreciable reduction in the calorific power of the gas supplied. It will be time enough when such sanction is sought to attempt to secure authority for the making of calorimetric testings for information, with a view, after a sufficient lapse of time, to the prescription of a standard of calorific power.

The author may remark here, for the information of those who may, through lack of proper advice, be fearful that a fall of illuminating power will necessarily involve diminution of the calorific power of the gas, that the results of a very large number of testings show that the net calorific power of 18-candle power coal gas is not merely no higher than that of 15-candle power coal gas, but actually about one unit per cubic foot lower. With mixed coal gas and carburetted water gas, a fall of one candle in illuminating power may be attended by a loss of as much as 3 calories in calorific power; but this loss is for most heating purposes more than counterbalanced by the higher flame temperature of the mixed gas as compared with neat coal gas. If Dr. Ashby had included in his report to the Reading Town Council on the Bill [see "JOURNAL," Vol. CVIII., p. 688] further particulars of Mr. Dibdin's researches in 1900, he could have added that Mr. Dibdin arrived at the conclusion that a mixture of one volume of coal gas with three volumes of carburetted water gas was more efficient by 7 per cent. for incandescent lighting than neat coal gas. Since incandescent lighting is only one branch of heating by gas, it may be concluded generally that additions of carburetted water gas, such as are made to coal gas in many gas-works, have really no deteriorating influence on the practical heating value of the gas, even though the theoretical calorific power may be slightly reduced. It will, however, be time enough to discuss these matters in detail when a Bill is before Parliament which provides for a reduction in the prescribed illuminating power of the gas supplied, or for the imposition of testings of calorific power. It is premature to consider them in connection with the present Bill, which is concerned with neither of these things.

The fifth point raised by one or other section of the forces opposing the Bill—viz., that as the consumption of gas does not now to such an extent as formerly take place in the evening hours, the testing of gas for quality should be permitted at other times instead of, as at present, only in the evening—is really subsidiary to the attempt to secure the prescription of a standard calorific power for the gas supplied, since the daytime consumption of gas is mainly for heating purposes. There can be no object in extending the time during which testings for illuminating power may be made, seeing that the consumption of gas in burners with which its illuminating power is of importance is rapidly diminishing and will soon become almost *nil*. The point may be raised when a Bill providing for testings of calorific power comes before Parliament. It is premature to discuss it now.

The sixth point raised is that a limitation should be imposed as to the pressure at which gas may be supplied. It is not clear whether this proposal (which emanates from Cambridge) is that there should be a *minimum* or a *maximum* limit to the pressure at which gas may be supplied. A minimum limit is imposed on the Metropolitan Gas Companies; but it is in practice never approached, and testings of pressure are falling into abeyance in the Metropolis. The imposition of a maximum limit would be so highly detrimental to all users of gas for heating purposes, including lighting by incandescence, that it cannot be regarded as a serious proposition.

The seventh point—viz., that sulphur restriction clauses should be re-enacted—has absolutely no relation to the object of the present Bill. It means that Parliament should now be asked to reverse all the legislation of the present century in regard to the purity of public gas supplies. Such an issue can only be raised in a Bill promoted primarily, if not solely, for this object.

The eighth point—viz., that the testing apparatus and method of testing should be those prescribed from time to time in the Notification of the Metropolitan Gas Referees—must have been raised in ignorance of the immense difference in the conditions of testing of gas in London and in most provincial towns. The prescriptions of the Gas Referees are made in view of the fact that a large number of testing-places are maintained in London, and daily testings are made in each by a permanent staff of gas examiners, many of whom are almost wholly occupied thereby. How many of the local authorities concerned in the present Bill are prepared to incur the expense of daily testings? Such an expense can only be justified where the consumption of gas is on a relatively enormous scale. Many of the prescriptions of the Gas Referees are



wholly inapplicable to testings made at intervals of a week or thereabouts. The provisions of the London Gas Act, 1905, to the effect that the burner prescribed for testing the illuminating power shall be the most suitable for obtaining from the gas the greatest amount of light, and that the Gas Referees shall prescribe the standard burner accordingly, are in fact covered by the power which the present Bill reserves to the Board of Trade to approve the use of another standard burner in place of the "Metropolitan" argand burner No. 2. There is no doubt that if the Gas Referees (who are appointed by the Board of Trade) subsequently prescribed another standard burner instead of the latter, the Board of Trade would, if approached, approve its use also by any of the promoting companies, under the power which the Bill proposes to confer on it. No other change which the Gas Referees may find it their duty—whether in consequence of fresh legislation for the Metropolitan Gas Companies or otherwise—to make from time to time in their prescriptions can fairly be made forthwith applicable to provincial gas undertakings, which are not protected by the provisions embodied in the numerous Gas Acts which apply to the Metropolis and to the Metropolis alone. Metropolitan gas legislation and gas testing stand apart from provincial gas legislation and testing. The special testing provisions of the Metropolis cannot be detached from its special gas legislation.

The grounds of opposition to the Bill, so far as they have been disclosed, have now been pretty fully reviewed and disposed of; but other points may arise, and it may be useful to summarize the points made in favour of the Bill being allowed to pass unopposed. The author, therefore, proposes, with the Editor's permission, to revert to the subject in a brief article in a subsequent issue of the "JOURNAL."

## SCOTCH GAS PROVISIONAL ORDERS.

THERE are five Scotch Provisional Orders to be dealt with; and this will complete the review of the projected gas legislation for the first session of the new Parliament.

The Dunblane Gas Company, Limited, are asking for additional capital—proposing that it shall not exceed £16,000, consisting of £6000 ordinary share capital ("A") already raised, and further ordinary share capital ("B") of £3000, to be issued to the holders of the "A" shares according to their respective holdings, and £7000 of additional capital. The maximum dividends are placed at 10 per cent. on the "A" capital, 7 per cent. on the additional capital, and 5 per cent. on the "B" capital. Borrowing powers are sought equal to one-third of the issued capital, including the "B" capital. Land and works powers are followed by a number of clauses of the ordinary type, including that referring to prepayment meter supply. The standard contemplated for the illuminating power of the gas is 14 candles, tested by the "Metropolitan" No. 2 burner. As to a standard price, the suggestion is 5s., with the sliding-scale working on ordinary lines. Provision is made for special purposes and reserve funds. [*Parliamentary Agent: Mr. John Kennedy.*]

The Falkirk Corporation are seeking further borrowing powers for their gas undertaking, to an amount not exceeding £55,000. The Corporation also desire to reduce the illuminating power of the gas supplied by them, and propose a standard on the customary lines of 14 candles, tested by the "Metropolitan" No. 2 burner. "Unless daily tests are made by the gas examiner, the method of reporting periodical tests shall be such as to carry forward the average of the previous tests in the following manner—viz., the test made on any one occasion shall be added to the tests made on the two previous occasions, and the average of the three shall be reported as being the illuminating power so ascertained." Sanction is sought for the making of differential charges as between gas used for private lighting and gas used for other purposes. Accompanying is the 10 and 15 per cent. discounts clause. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

There is a very substantial draft Provisional Order, lodged by the Glasgow Corporation with the view of consolidating and amending their Gas Acts from 1869 to 1909, and to assemble all the provisions worth retaining (with additions) in the one Order. We need not review the draft Order with any completeness, having regard to the fact that in many respects the clauses are merely reintroductions or of ordinary character. In connection with the manufacturing powers, the Corporation ask to be allowed to produce, store, and supply non-illuminating gas, to which gas the sections referring to price, discounts, pressure, and quality are not to apply. A proviso to the enabling power prohibits the Corporation from laying down mains and pipes for the supply of non-illuminating gas, within any burgh outside the city, except with the consent of the Council of such burgh. Authorization is sought for the supply of fittings and apparatus required for the use of such gas. Several clauses allude to road crossings for railways. Additional land powers are sought, to the extent of 30 acres, with purchase by agreement only. The maximum price of gas is entered at 4s. 7d.; and sanction is asked to the charging of differential rates as between gas used for private lighting and gas consumed for other purposes. Within the supplementary supply district, authorization is desired for the charging of rates higher than those charged in the city supply district, with power to vary the higher rates in different parts of the supplementary

supply district, but not to exceed the maximum price. It is proposed to take power to allow discounts in consideration of prompt payment, not exceeding in any case 5 per cent. The standard illuminating power of gas, it is intended to reduce to 14 candles, tested by the "Metropolitan" argand burner No. 2. In pursuance of their several Gas Acts, the Corporation have been authorized to borrow various sums of money amounting in the whole to £3,972,268, of which £3,072,268 is applicable to the gas undertaking. Therefore it is proposed that it shall be enacted that the borrowing of the £3,072,268 "shall be deemed to have been authorized by, and for the purposes of, this Order." The remaining money clauses of the Order have no general interest. The schedules to the Order are extensive—dealing with railways and bridges, defining the gas-supply district and the lands on which the Corporation may manufacture and store gas and residual products, and treating of several other matters. [*Parliamentary Agents: Messrs. Martin and Co.*]

A draft Order by the Kirkcaldy Corporation contemplates an extension of the municipal and police boundaries, the construction of electric tramways, an extension of the area of electricity supply, and the granting of certain powers relating to the gas-works. Land is scheduled for works purposes, and powers are inserted for its utilization. The Corporation are seeking to set themselves outside section 41 of the Burghs Gas Supply (Scotland) Act, 1876, in regard to surplus gas revenue, by proposing that it be enacted: "(1) If and whenever, after providing for the depreciation and renewal fund and other charges mentioned in the said section, there shall be remaining any surplus on account of the revenue of the gas undertaking, the Corporation may carry such surplus, or part thereof, as they see fit, to the Burgh General Assessment. (2) The Corporation may fix the charge for gas consumed for public purposes at such price as they see fit." Consistent with other promoters, a standard illuminating power of 14 candles is desired to be prescribed, with the "Metropolitan" argand No. 2 as the test-burner. The fittings clause makes it imperative upon the Corporation to adjust their charges therefor so as to recoup expenditure. Regarding the gas loans, it is proposed to extend the period of repayment by substituting "one-fiftieth" for "one-fortieth," in the application to the undertaking of the Burghs Gas Supply (Scotland) Act, 1876. Again, in the application of section 48 (sinking fund) of the Burgh Police (Scotland) Act, 1903, to moneys borrowed by the Corporation under the Burghs Gas Supply (Scotland) Act, the section shall be read as if for the words "not exceeding thirty years from the date of borrowing," there were substituted "in the case of moneys borrowed to pay the purchase price of the gas-works not exceeding fifty years from the second year after the Corporation commences to supply gas, and in the case of borrowings to meet the cost of any extensions or improvements not exceeding fifty years from the date of borrowing." [*Town Clerk: Mr. Wm. L. Macindoe.*]

In an Order promoted by the Wishaw Corporation, an extension of the burgh boundaries is proposed; and for the annexed areas, authorization is desired to the supply of gas. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

## Using an Exhauster for Boosting Town's Mains.

In small gas-works the introduction of automatic lighting and extinguishing apparatus by pressure has in the past been looked upon as unworkable, because of the inability to create the extra pressure wave in the mains. This has now been got over in an ingenious manner in the public lighting of the Kennoway (Fife) district. Mr. J. J. Scott, the Manager of the local Gas Company, was called upon by the local authorities to erect 66 street lamps; and Alder and Mackay's apparatus was specified to light and extinguish them. The excess pressure at his command was only 5-10ths; and this was found to be too little. To get out of the difficulty, he arranged to bring the exhauster into use as a booster; and a connection was taken from the outlet of the exhauster to the town main, and another from the holder to the inlet of the exhauster. Between these two pipes is placed a 3-inch excess bye-pass governor; and this, with a catch purifier on the pipe leading to the town main, completes the arrangement. To operate it, the man in charge simply opens a valve leading to the town main, and closes the one between the exhauster and the washer—thus forcing the make of gas direct to the town. If the make of gas at the time is not sufficient to feed the exhauster, the valve on the pipe leading from the holder is opened a little, to keep up the supply of gas. A few revolutions of the exhauster is sufficient to raise the pressure in the mains to 5 or 6 inches, or more if necessary; but the excess bye-pass governor can always be loaded just to give the desired pressure. Suppose 5 inches is required, the governor is loaded accordingly; and though the exhauster may pass more gas than is necessary, it simply returns through the bye-pass governor, and thereby a steady 5-inch pressure is maintained on the mains. The arrangement has been in operation for three months, and is a thorough success, and much more satisfactory than loading the holder, as has in some cases been done.

At the monthly meeting of the Richmond Town Council last Tuesday, the Water Committee expressed regret at the sudden death, on the 19th ult., of Mr. Joseph Quick, their Consulting Engineer in the matter of the Petersham filter-beds, and stated that they had formally appointed Mr. W. G. Peirce, the Corporation Water Engineer, as Engineer for the completion of the work.



## THE GAS-HEATING RESEARCH COMMITTEE AND ITS WORK.

WE are asked by the Gas-Heating Research Committee of the Leeds University to publish the following correspondence.

*The University, Leeds, Feb. 10, 1910.*

SIR,—The publication of the report of the Committee on Gas-Heating Research has led to a considerable amount of inquiry and correspondence from various gentlemen interested, in one way or another, in the investigation. At the last meeting of the Research Committee, it was decided that I should write a letter to the Technical Press, explaining the attitude which the Committee desire to take up in regard to this matter.

In the first place, the Committee think that the results of the experiments made under their guidance should not be communicated to anyone before they are published by the Council of the Institution.

In the second place, the Committee desire to respond as far as possible to any inquiries which may be made with regard to the work already published. To this end, Mr. E. W. Smith (the Research Chemist) will be authorized to answer letters and to receive visits. The Committee are also of opinion that Mr. Smith may accept invitations to visit works, since they regard it as of great importance that he should be as conversant as possible with the views and experience of practical men. The amount of time devoted to these purposes will, of course, be limited, as the experimental work makes continuous demand upon Mr. Smith's time and energies.

May I say, as an official of the University, that we have always welcomed visitors to our buildings, and have shown them freely everything likely to interest them.

ARTHUR SMITHELLS,

Chairman of the Gas-Heating Research Committee.

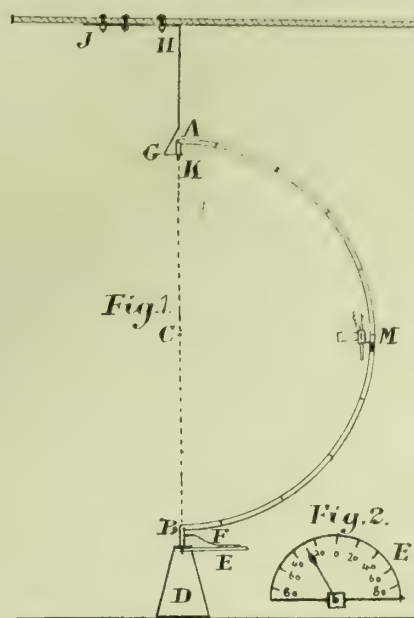
SIR,—The Gas-Heating Research Committee have of late received numerous inquiries from instrument makers and gas-stove manufacturers for fuller details of the Committee's method of measuring radiant heat.

As a slight modification in the mechanical arrangement of the method has been made since the report was published, the Committee think it desirable that the improvement which ensures greater accuracy of manipulation and a considerable saving of time, should be communicated to the Technical Journals.

It will be remembered that the method was divided into two parts: (i) That in which the radiometer was used for determining the number of calories of radiant heat falling on the face of the radiometer at a point 34.4 inches from the front of the stove. (ii) The second part consisted in taking thermopile readings over the surface of the hemisphere of 34.4 inches radius, having its centre at the centre of the surface of the fuel.

These readings were taken at certain points, as described in the Gas-Heating Research Committee's report in the Institution's Journal, 1909.

The modification does not in any way alter the method as outlined above, but relates to the means by which the thermopile may be brought to the desired points. This can be seen from figs. 1 and 2.



A piece of  $\frac{3}{4}$ -inch round, mild steel is bent in the form of a semicircle, of 36 inches radius, with two bent ends K and B, turned to  $\frac{1}{2}$  inch, as rests at G and D (fig. 1).

This semicircular iron bar revolves round the axis K B. If the centre of the surface of the fuel of the stove is at C, then the centre thermopile reading is at M; the centre of the thermopile being 34.4 inches from C.

The radius of the iron semicircle being 36 inches, the half circumference is  $113\frac{1}{2}$  in. This, divided by nine, will make each division  $12\frac{1}{2}$  inches.

These should be marked off above and below the centre point M, and will be at 20°, 40°, 60°, and 80° above and below the line C M (fig. 1).

The angles at which the readings should be taken to the right and left of the stove may be obtained by the indicator E. This rests rigid on the base D (fig. 1), and a pointer F—seen in section in fig. 1 and in plan in fig. 2—attached to the revolving semicircle at B (fig. 1), marks off the angle required on E (fig. 2.)

The fittings J H G (fig. 1) are made of 2-inch by  $\frac{1}{2}$ -inch mild steel, as is also the plate surmounting the base box D.

Anyone adopting this apparatus would make these according to the special condition of his room.

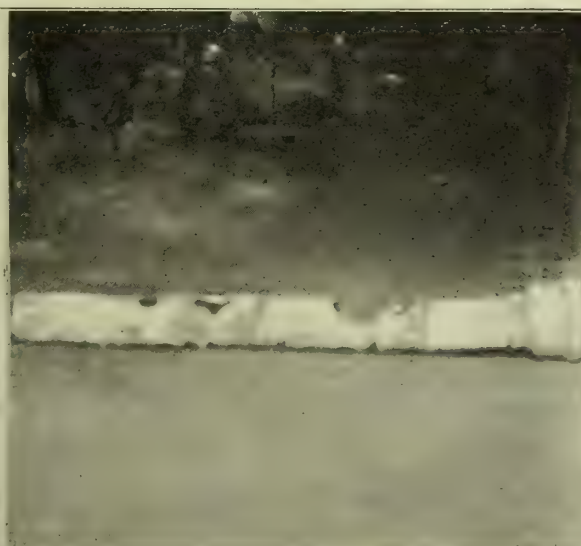
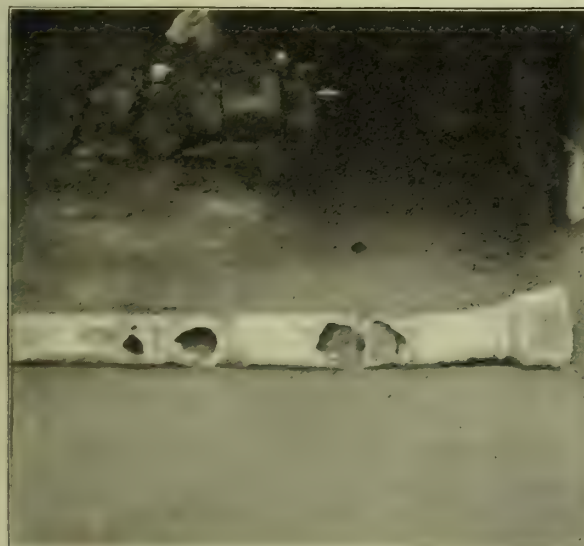
E. W. SMITH,

Research Chemist to the Gas-Heating Research Committee.

## DANGEROUS VAGRANT ELECTRIC CURRENTS.

### Fusion of a 4-inch Gas-Main.

THE accompanying photographs show side and top views of a 4-inch cast-iron main pipe which was removed from the north



be—to describe the position mildly—in imminent risk of damage. On opening the ground, it was found that a feeder electric cable belonging to the Calcutta Tramways Company had fused three large holes in the main, one of which had left practically nothing

but the lower part of the pipe, which became fractured. The gaping wound can be seen in the right-hand side photograph, for taking which the two pieces of pipe were laid close together on the ground.



## DESSAU VERTICAL RETORT-SETTINGS.

New Model for 1910.

WE have received particulars of the new pattern of vertical retort-setting which the Dessau Vertical Retort Company are introducing this year. It is substantially the same as the pattern of Dessau setting with eighteen retorts which has been in use at the Mariendorf works in Berlin of the Imperial Continental Gas Association for a considerable time, and on the working of which a report has

already been given in the "JOURNAL." This report formed an appendix to a paper by Mr. E. Körting, of Berlin, on "Modern Methods of Carbonization," and related to an efficiency trial, extending over 105 hours, which was carried out on the setting by the Instructional and Experimental Gas-Works of the German Association of Gas and Water Engineers (see *ante*, pp. 27 and 96).



Fig. 1.—The Coal-Charging Waggon over the Upper Retort Mouthpieces.

The new pattern of setting embodies several important changes in addition to the increase in the number of retorts. There are eighteen retorts arranged in three rows in each setting, instead of twelve retorts in two rows in the old type of Dessau setting. The three retorts in a line from back to front of the setting are, however, worked together so far as charging and discharging are concerned, as if they were one unit. The charging of the three retorts is effected simultaneously by the special charging waggon which is shown in position above the upper mouthpieces of the retorts in fig. 1. The discharging of the three retorts is effected simultaneously by the lower retort doors being mounted on the same shaft, the turning of which opens and closes the three doors at one operation. The shaft is turned by hydraulic power from a central position, so that the work of discharging the retorts consists only in opening and closing a cock. The arrangement is shown in action in fig. 2. The upper mouthpieces of the retorts are connected directly with one another and to a common gas-exit pipe which slopes down to the retorts. This arrangement presents the advantage that any thick tar or pitch depositing in the pipes, runs back into the retorts and is there gasified. The horizontal pipes and pitch pans need to be cleansed only once in from eight to fourteen days. The coke discharged from the series of three retorts coupled together is received and removed by a trough conveyor, as in the case of separate retorts. The producer and the regenerator are similar to those of the earlier pattern of Dessau setting. The producer has a step-grate, so that with ordinary coal it is quite unnecessary to introduce temporary or intermediate grate-bars for clinkering. It is anticipated that the

new setting will have a longer life than the earlier pattern. At Mariendorf, it has already had five months continuous working, and has given entire satisfaction. There are at work or under construction 33 of the new pattern setting—equal to a total productive capacity of about 8,650,000 cubic feet of gas per diem.

Some figures are given of the performance of the new pattern setting—mainly based on the results of the trial at Mariendorf conducted by the Instructional and Experimental Works of the German Association. A few of the round figures now supplied may, however, be quoted by way of supplementing the results that have already been given from that report in the pages of the "JOURNAL" (see *ante*, p. 27).

The make of gas per setting per diem amounts to about 261,200 cubic feet, and the make per ton of coal carbonized to 13,430 cubic feet. The calorific power of the gas is about 543 B.Th.U. per cubic foot. The fuel consumption in the retort-furnaces amounts to 11.8 per cent. of the weight of the coal carbonized, or to 20 lbs. of coke per 1000 cubic feet of gas made. Since three retorts are coupled together, the weight of coal per charge per unit amounts to nearly  $1\frac{1}{2}$  tons, which means that there is an economy of labour as compared with the former setting in the ratio of 2:5. For the most unfavourable case—namely, when English coal is carbonized and twelve hours are required for working-off the charge, steam being admitted—there are required six men per 24 hours to attend to ten settings, giving an output of about 2,330,000 cubic feet of gas per diem. The men work in two shifts of eight hours, two being required to attend to the retorts and one for clinkering the producers. The labour required, therefore, is one man for about





Fig. 2.—The Discharge of Coke from the Retorts into the Trough Conveyor.

388,300 cubic feet of gas made per diem; so that the wages per 1000 cubic feet of gas made amount to only 0·18d. The make of gas per square foot of ground covered by the setting amounts to 865 cubic feet, or from 30 to 48 per cent. more than formerly. It is claimed that the reduced expenditure on the retort-house will,

therefore, amount to about 30 per cent., while for each setting only six dip-pipes and take-off pipes are required, and the hydraulic main is shorter relatively to the make of gas. The mechanical equipment is simpler, and the coke and coal conveyors are likewise simplified and so rendered less costly.

## MANUFACTURE OF INCANDESCENT MANTLES.

LATTERLY there has been a tendency in Germany to publish special treatises, each dealing with a particular branch of industry. The recently-published book on the manufacture of the incandescent gas-mantle by the well-known gas-lighting expert Dr. C. Richard Böhm,\* deals with this special branch most exhaustively—consisting as it does of some 450 pages (8vo.), with 431 illustrations and 37 plates. To the layman, and even to many practical workers, it would seem at first sight that the subject would hardly require to be dealt with in a book of such size. When, however, the vast number of manipulations—most of which are now-a-days carried out by special machines—the various sources of the raw material, and the treatment of it at different stages of manufacture, are considered, it will be realized that a comprehensive text-book on the subject meets a long-felt want. Even the magnesia industry, which furnishes the rings for the inverted mantles, and the particular methods adopted for packing the latter for shipment, have not been overlooked. Furthermore, the author has devoted particular attention to the patent literature on the subject, with a view to tracing the gradual development of invention in this important branch of chemical industry.

Dr. Böhm's new book is a sequel to his previous work "Gasglühlicht," published in 1905. In the introductory chapters, the development and present position of the gas-mantle industry are

described in detail. The more important raw materials—such as monazite sand, thorium, and cerium nitrate, and the yarn materials—are fully dealt with. The main part of the work is devoted to the manifold operations conducted in the factory, comprising the knitting, washing, impregnating, and sewing of the mantles, the fastening of the asbestos hook, the magnesia ring, stamping, burning-off, sorting, and packing. These and many other subsidiary operations are completely described. A very interesting chapter on photometry concludes the work.

We can strongly recommend the book to those of our readers who are at all familiar with the German language; for the author's reputation in this branch makes it a standard work for gas-lighting engineers.

**Producer Gas Power Plants in the United States.**—The United States Geological Survey have lately published some statistics of producer gas power plants in the United States. The first producer gas plants were erected about ten years ago; and at the present time there are upwards of 500 in operation, with an aggregate of about 115,000 H.P. Tests made with the Government plants at St. Louis (Mo.) and Norfolk (Va.) have shown a fuel consumption under the most favourable conditions as low as 0·95 lb. per electrical horse power at the switchboard. Tests with 75 grades of bituminous coal show a ratio of coal per brake horse power fired under a boiler to coal per brake horse power burned in a producer of 2·7. Many low-grade coals and lignites which cannot be burnt successfully under a boiler, are stated to give excellent results in a gas-producer.

\* "Die Fabrikation der Glühkörper für Gasglühlicht." By Dr. C. Richard Böhm. Published by Wilh. Knapp, of Halle A/S.; 1910. Paper cover, price 22 marks; in cloth, 23 marks.



## A GAS-WORKS UNDER THE WATERS OF THE SEINE.

The Nanterre Works of the Union des Gaz.



Making a Works Inspection, and Labour Carried on, under Difficulties.

THE disaster by flooding which has befallen Paris and numerous communes along the banks of the Seine has, through the horrors of the situation—the suffering, the deprivation, and the incalculable losses occasioned—evoked general sympathy; but there has been none too much recognition of the labours of those who were in any way called upon, through official position in connection with the public services of the city and the towns involved in the great inundation, to put forth unusual energies in unprecedented circumstances. We cannot make any proper conception of the herculean tasks they have had to perform. Not the least of the beneficent services rendered were by the gas-works in the affected areas that were able, in spite of the unrestrained waters of the Seine, to cause some amelioration of the miseries of the situation by maintaining a supply of gas.



Contemplating Nature's Invading Force.

Example is afforded us by the views placed at our disposal of the submerged Nanterre works of the Union des Gaz. One has only to glance at the pictures to see that the whole engineering and managerial faculties of the chief of the works (M. Paul Lhomme) and his staff had to be drawn upon to cope with a condition of things that opposed effectually all ordinary procedure and routine, and compelled the conduct of work on extraordinary lines amid the discomfort and inconvenience of the watery surroundings. They warred with unusual circumstances, and with an intractable enemy; and that they succeeded so well that, during the floods, only one commune of twenty-two supplied from these works suffered cessation of supply, deserves to be proclaimed a victory. Many other works in the near vicinity of Nanterre were not so fortunate, and were compelled to suspend the gas supply; among these, the large works lately built at Gennevilliers, from which the outskirts of Paris—a complete belt round the City—are supplied. Our sympathies, and those of all gas-engineering men, are with them in their misfortune.

Those of our readers who desire to know the situation of the Nanterre works will, by following on the map the serpentine course of the Seine, find it to the west of Paris between two arms of the river. The old Nanterre works were some distance from the river; but the new (or comparatively new) ones are, for the convenience and economy of material delivery and dispatch, immediately (with only a tow-path between) on one of the banks. There was no escaping the flood; but by engineering prevision, when the works were laid out, the level of the site was raised some 6 feet. This saved the situation; for otherwise no amount of human ingenuity could have combated the swelling flood, and kept going the productive operations of the works. The first part of the works was only built in 1903; so that they are quite of modern type in all respects—in fact, this is seen in the illustrated description that appeared in the "JOURNAL" some time since. The carbonizing plant consists of two benches, of, in all, seventeen settings of nine retorts. The average production of the works is some million cubic feet per day. How nearly these benches were put out of action by the water will be recognized by the fact that—though the ground-floor entrances to the retort-house were partially bricked-in, and though the coke was thrown out of the discharging-stage floor windows, both for the purpose of disposing



The Retort-House Entrances Partially Bricked-up.

[With a Barricade formed by the Coke from the Retorts being thrown from the Discharging-Stage Floor Windows.]





Means of Transport from Coal-Store to Charging-Stage.  
[At the Coal-Store End of the Temporary Bridge.]



Means of Transport from Coal-Store to Charging-Stage.  
[At the Retort-House End of the Temporary Bridge.]

of it, and for forming a sort of dam (as seen in one of the illustrations) to the flood waters—the water flooded the furnace ash-pans, and rose very nearly level with the fire-bars of the producers. It should be explained that the coke-conveyor could not work owing to

the failure of the electric current by which it is driven. In another picture we have a view of the coal-store, isolated by the waters, but with the space between it and the retort-house bridged by a temporary wooden footway above the waters, and across this coal



The Purifier-House (with Elevated Purifiers, and Charging and Revivifying Floors), Machinery Room, and Governor-House.

was carried by men for keeping the retorts going. Under ordinary working, the coal is raised from the delivering barges by a West gravity-bucket elevator, deposited in the store, and from there is

conveyed to the retort-house by a cross conveyor running in a culvert underground. The view showing men on the temporary footbridge at the retort-house end, also illustrates the coal



A Broad Sheet of Water.  
[A more Extended View of the Part of the Works illustrated by the Above Photographs.]





A Gasholder Surrounded by Water.

handling plant disabled by the flooding of the underground culvert. In the pressure and machinery rooms, the water stood at least a foot above the floors.

The photographic views speak with greater descriptive force than mere words as to the difficulties of the situation. But there was good generalship throughout; and the men and all concerned worked willingly and loyally to do their level-best amid their strange environment. Stokers, yardmen, and others remained on the works, and were quartered in the upper stages of the retort-house. Progress about the works could only be effected by boats and horses and carts. In certain parts, however, the current was so strong that the boats could only make way by hauling-lines specially fitted up for the purpose when the water began to rise. The water at the entrance to the works mounted almost to the first floor of the dwelling of the foreman and his assistants, and temporary quarters had to be provided for them in some of the other buildings.

Productive difficulties within the works were supplemented by the trouble of preventing the distribution system becoming waterlogged. Men were placed on point-duty in fixed boats throughout the twenty-four hours to keep the syphons free; and these men were relieved at intervals by boat.

Nothing was neglected. Duty called for the gas supply from the works being maintained, if humanly possible, despite the intervention of Nature in one of her worst moods. And in all but one commune there was success. But not one of those who had part in it will desire a recurrence of the to them unique experience.

## THE MAINTENANCE OF GASHOLDERS.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

THE working life of a gasholder can be extended indefinitely by the exercise of regular supervision, painting, &c., as often as necessary, and attention generally to working details. On the other hand, the certain penalty for neglect, whether occasional or permanent, is a heavy bill for repairs and renewals. If once the skin is allowed to get into bad condition, it is a more difficult and more expensive matter to get the surface right again than to maintain it in proper order. These remarks may appear so obvious as to border on the superfluous; but in these busy days, when the manager is expected to devote a considerable portion of the time that formerly went to caring for and nursing the apparatus and plant to similar duties among the customers, these little details, so necessary to successful gas-works management, are apt to get crowded out. Another contributory cause is the fact that the slack season has become a thing of the past, to the satisfaction, no doubt, of the financial department, but with some increase in the difficulties of keeping the plant in good going order. The consumption, say from May 1 to Aug. 31, was formerly so low that any part of the plant could be spared for overhauling without difficulty, and opportunity could be found for a general clean-out of the hydraulics, foul mains, condensers, scrubbers, connections to purifiers, examination of, and rubbing down, the faces of dry-faced valves, and of attending to the between wind and water lines on the purifier lids and gasholders. But while the annual consumption of gas has doubled within the last 20 years, the summer consumption has increased threefold; and while the facilities for attention to these little matters have diminished, the need for them has increased, because the whole of the apparatus is, if one may use the expression, in more rapid use, and is expected to pass a larger quantity per annum—i.e., to do more work—than formerly. Systematic attention and repairs are more necessary than ever; and a manager who allows the increasing difficulty of dealing with them to be an excuse for neglect, is certainly laying up trouble for the future. In designing new plant, the point should not be overlooked; and care should be taken that, as far as practicable, the whole of the plant can be overhauled, cleaned, painted, &c., without interference with the make of gas.

These remarks are suggested by an inquiry, which appeared in the "JOURNAL" for Feb. 1 (p. 308), as to the best way of repairing

leaky gasholder plates, and which was evidently propounded by the manager of a small gas-works. As this is a matter in regard to which prevention is better than cure, attention may first be directed to the cause of the trouble. The intention to repair gasholder sheets or anything else, involves the assumption that the apparatus is worth repair. In this case, were the sheets too thin in the first place? On account of the extra strain and exposure to which the top and bottom rows of sheets on each lift are exposed, it is usual to provide a thicker gauge for them than the remainder. If there is nothing wrong with the quality or the thickness of the sheets, has the supervision been a little at fault? In small works, steam is not always used, even if it is available, for thawing ice in frosty weather, and the holder may at times become ice or snow bound, or the sheets may be injured by the use of a heavy bar for breaking the ice. Even where painting is regularly practised, the difficulties of getting at the lower few inches lead to that part being neglected altogether, hurried and inefficiently cleaned before painting, or let under water before the new coat has a chance of getting properly set, all of which tend to a more rapid corrosion than in other parts of the holder.

Some account of the way in which a similar difficulty was overcome may be of use to your correspondent. About 15 years ago, it was necessary to deal with an 80 feet gasholder that was badly gone at about the same locality—viz., just at the "between wind and water" line, when the holder was full. There were not two other holders available in this case, and in fact it was the only one on the works that would give a sufficient pressure during maximum consumption, and it could not be spared even for three days at a stretch. The remark about being able to lay off the holder for three months in the summer if required, has a refreshing old world sort of flavour about it. But in this example, the holder could not be spared for at least a twelvemonth ahead, for it had developed not 4 or 5, but more like 40 or 50 perforations, all within a space of a few inches above the bottom curb. The holes were small, the largest not  $\frac{3}{8}$ -inch diameter, the weight and quality of the plates were satisfactory, and the only available explanation was that a pointed bar had been used for breaking the ice during a severe winter. Having ascertained that the plates were strong enough to be worth repairing, the matter was taken in hand by a qualified blacksmith, who felt confident of being able to make a satisfactory job. Each hole was rounded out to the smallest circle that would cover it, after removing all rust or loose scale, and was filled by means of an L shaped bolt, screwed on the short end, and temporarily held in place by a wire-hook. A plate of thin sheet iron of suitable size was placed over it, having first been coated with red lead paint of sufficient consistency to form a solid joint when screwed up, then a large washer and a nut. After screwing up a turn or two (sufficient to grip the bolt), the wire was removed and the patch screwed up tight. When all the holes had been so stopped, the holder was filled as full as possible, and a coating of hot well-boiled tar was laid on all round. Some little ingenuity was needed to keep the coating well above water until it was quite set. This work was done in the summer of 1904, and the holder is in use to-day. The use of the bar for breaking ice in regard to this tank or any other part of the works has been abolished. A steam supply with connections at intervals for some flexible metallic tube, enables steam to be applied wherever required. The holder has had the same attention as the remainder of the apparatus, and it is as sound to-day as when the job was freshly done.

If the holes are small, it is possible that your correspondent, by following this plan, could keep it in going order for some years. But if, in addition to the holes, there is reason to believe that the plates are seriously corroded, the question of a new row of sheets must be considered. And unless the querist or his workmen have some general experience in construction and repairs of ironwork, it would be very much the wiser plan to place the whole matter in the hands of a reliable firm. While the work is in hand, it will be well to examine the guide pulleys, both top and bottom, to see that each one is working truly, not running loose on the one hand or binding on the other and that the axle pins are properly lubricated. The guide-framing may also be examined, having a special eye to oval bolt holes, contact parts between L bars, or where lattice work crosses, as corrosion may go on to a dangerous extent in any crevice that habitually holds water. Telescopic holders call for even a greater amount of care, as neglect of the lutes and other working parts may lead to the throwing out of a large holder at a time when it is urgently needed. Very often the holder is so situated as to receive frequent clouds of dust from the retort-house, coke yard, oxide sheds, &c.; and in this case the lutes should always be thoroughly cleaned out once a year. An appreciable quantity of mud will be found under these conditions. Having cleaned the lute, the water can be lowered by means of a bent syphon for a few inches, or as much as is safe, so as to give an opportunity for coating the "between wind and water line" with boiled tar as described.

The wind and water line also occurs in water-sealed purifier boxes, in iron store tanks, and many parts of the works; and wherever it may be, an annual inspection, cleaning, and painting will be work well spent.

In addition to the contributions of the European Gas Company and Sir John Aird, Bart., to the Mansion House fund for the relief of the sufferers from the Paris floods, as mentioned last week, the Imperial Continental Gas Association have sent £105.



## VICTORIAN GAS MANAGERS' ASSOCIATION.

Fourth Annual General Meeting—Nov. 3 and 4, 1909.

The Fourth Annual Meeting of the Association was opened on Wednesday, Nov. 3, 1909, in the rooms of the Victorian Institute of Engineers, Swanston Street, Melbourne. Mr. P. C. HOLMES HUNT, the President, occupied the chair. There were 31 members present.

The PRESIDENT, in opening the proceedings, said he was sure the members ought to feel very gratified at seeing so goodly an array present. He was very pleased also to see so many visitors from New Zealand and the other States of the Commonwealth with them. They had the satisfaction of welcoming among them Mr. Hungerford, of Dunedin, and Mr. Rabbidge, of Invercargill, New Zealand; Mr. Scholes, of Ipswich, Queensland; Mr. Barson, of Broken Hill, Mr. Ambrose, of Bathurst, and Mr. Kempster, of Waratah, New South Wales; and Mr. Allan, of Hobart, Tasmania. He hoped they would have a very successful meeting, and that the conference would prove highly enjoyable. The first business of the day was the report and balance-sheet.

### REPORT AND ACCOUNTS.

These having been presented and taken as read,

The PRESIDENT moved that they be adopted. He said there was nothing in them to which he need draw special attention with the exception of the paragraph of the report which dealt with the state of the finances. There was again a slight debit balance, in spite of the fact that last year the subscription was raised. The Council thought it better to bring the matter under the notice of members, and ask them to decide what was to be done to meet the deficiency, and how to arrange for them to pay their way better in future.

Mr. T. LORD (Geelong) seconded the motion, and it was carried.

The PRESIDENT said it was now open for the meeting to decide whether the subscription should be raised.

Mr. J. BOWMAN (Sale) said he should like to know whether, if the subscription was raised, it would be of any special benefit to the Association. Was the money needed for anything? He noticed that they were £2 12s. 9d. better off this year than last in the amount of the debit balance, which had been reduced from £4 11s. 10d. to £1 19s. 1d. He did not know whether it was really necessary, as they were getting better off, to increase the subscription.

The PRESIDENT said there did not appear any special expenditure ahead of them; but they were, of course, anxious to pay their way. Under present circumstances, if they simply increased their membership they would certainly be in a better position. Still, he should like the members to consider the matter of increasing the subscription.

Mr. W. FROST (Mornington) remarked that, inasmuch as they had reduced the debit balance—and he supposed there were new members joining whose subscriptions would be available—he did not see any necessity for increasing the annual subscription. If the Executive could give them any reason why they should increase it, they might consider the idea.

Mr. F. TIPPER (Fitzroy) said he should like to point out that at present they did not properly pay their way. They were really financed by the Secretary from one year's end to the other. He thought, if the Secretary were asked, he would tell them he had to use his own money for Association purposes and for the present meeting. He considered it was a great mistake, for the sake of a 5s. subscription, to keep the Executive of the Association short of a pound or two.

The PRESIDENT said the matter did not come before the members in any way other than as a recommendation from the Council to consider the question of increasing the subscription; but if anyone would move a resolution, he would receive it.

Mr. F. TIPPER (Fitzroy) moved that the annual subscription be increased to £1 1s.

Mr. J. LORD (Williamstown) seconded the motion.

Mr. J. BOWMAN (Sale) said that, in order to ascertain the feeling of the meeting, he would move an amendment that the subscription remain as at present—viz., 15s. per annum.

Mr. W. FROST (Mornington) seconded the amendment.

The HON. SECRETARY (Mr. C. W. Howlett), in speaking to the motion, said he might point out that on starting the Association the subscription was fixed at rather a low figure. They hardly knew at the time what their expenditure would be. On taking office, he found that his predecessor had been put to a great deal of expense in conducting the Association's affairs. They certainly made up a little ground by increasing the subscription last year, and they had also received an addition of four or five members to help them along; but if they had the misfortune to lose any, it would place them in the position of having to work from hand to mouth. His own idea was that to work the Association properly they should have more money at their disposal. He would point out one case of how this shortage affected them. They had been granted the use of the room they at present occupied for their meeting; and up to the present had been allowed the use of rooms for all their meetings. He thought it was time that a body like theirs should be in a position to give

an honorarium for the use of the rooms; but they could not at present do so. He considered they should place their officers in the position of feeling a little independent. The information that was received through the Association and from the debates recorded in the proceedings was really worth a guinea a year; and he did not think anyone should grudge that sum.

The motion and the amendment were then put to the meeting; but only the mover and seconder voted for the latter. The motion was therefore declared carried.

### NEW MEMBERS.

The HON. SECRETARY then read the following nominations for membership, as approved by the Council; and they were duly elected:—

W. H. Mutton, Manager of the Shepparton Gas-Works.  
John Saunders, Manager of the St. Arnaud Gas-Works.  
S. W. Beale, Manager of the Frankston Gas-Works.  
A. M. Humphrey, Manager of the Hamilton Gas-Works.  
L. Rodgers, Manager of the Warrnambool Gas-Works.  
T. H. Webb, Manager of the Albury Gas-Works.

### ALTERATION OF RULES.

The PRESIDENT then submitted a motion of which he gave notice at the previous annual meeting—"That the following addition be made to Rule 4: 'The retiring President shall remain a member of the Council for two years immediately following his year of office.'" He said this proposal was approved by the last annual meeting, and it was agreed at Ballarat that it be forthwith acted upon. This had been done; but in accordance with the rules, he now moved that the words be added to Rule 4.

Mr. T. LORD (Geelong) seconded the motion, which was carried.

The PRESIDENT then delivered the following.

### PRESIDENTIAL ADDRESS.

Before attempting to address you to-day, allow me to thank you most sincerely for electing me to this high position. I am proud to occupy the Presidential Chair so early in the life of the Association, and in immediate succession to our first three Presidents, who have been so long and honourably associated with the gas industry in Victoria. Our meeting this year is honoured by the presence of several gas engineers and managers from New Zealand, New South Wales, Queensland, and Tasmania, who have travelled long distances in order to be with us to-day. To them I offer a very hearty welcome; and I trust their presence here will be to the mutual advantage of all.

It may be fairly said that our Association is now based on a thoroughly sound foundation; and, as evidenced by the excellent attendances at our annual meetings and the increasing desire on the part of members to take part in the proceedings, any doubts which may have existed at the first as to its success have vanished. Our Association is, I venture to say, proving of considerable use; and year after year it must become of greater benefit still to all of us engaged in managing works in Victoria—the majority of which are in small towns scattered over the large area of our State. Our annual meeting and the yearly interchange of experiences and discussions on various matters, cannot fail to be of considerable benefit to our daily work, and must quicken in us the gas instinct, and so stimulate us to improve still more on our best results. Yet I would urge on all members the necessity of constant and continued co-operation in order to ensure the success of our annual meetings—co-operation which can only be made real by the offer of papers and the thorough discussion of all subjects brought forward. May I point out, too, that all recognize that managers, even of the smallest works, meet with difficulties, maybe of a unique character, and that information on any point is always available through the Question-Box? It appears to me that, apart from affording facilities for managers to meet and discuss technical matters, our Association might be made useful in other ways. For instance, might not advantage accrue by the appointment of a small Standing Committee to act as a Vigilance Committee, whose duty would be to watch the interests of the industry in so far as they might be affected by contemplated legislation or other outside developments?

You are probably aware that our *confrères* in New South Wales and Queensland have decided to form an Association; and we must congratulate them most heartily on this step—indicating as it does the flourishing condition of the gas industry in our sister States. The determination arrived at in New South Wales and Queensland may surely be indicative of the gradual coming together of all who are engaged in our industry throughout Australia; and, even if it does not portend the eventual formation of one Association, comprising all those engaged in gas-works in the Commonwealth, it would be well worthy of consideration on the part of all of us as to whether it would not be possible to hold a combined meeting of the different Gas Associations every few years—the meetings to take place alternately in the principal cities.

### COAL.

The all-important question to gas managers—the price of coal—continues to give all those connected with the industry very



considerable anxiety. Coal prices are now much more than they were a few years ago; and it is certainly difficult to see what there is to justify such an increase—the price to the majority of works in Victoria being, I suppose, at least 33 per cent. more than it was five or six years ago. Whatever is the effect of the combination of coal proprietors in Newcastle on their own business, there can be no gainsaying the fact that such a combination, or “vend” (as it is called), acts most adversely to the interests of the consumer; competition, that great safeguard of the public, being practically eliminated from the coal trade. It would seem that the combine has determined to continue to ask high prices for coal; for, despite the fact that trade at home, and, indeed, throughout the world, is at present very indifferent and business in Newcastle bad, there does not appear to be any inclination to lower prices, and give the Australian consumer the benefit. Does it not seem, rather, to indicate that the main result of this combination is to make the local consumer and the old regular customers of the Newcastle coalfields pay a high price for coal—higher, indeed, than foreign customers—because it is difficult to imagine that the Australian product, at the present-day f.o.b. price at Newcastle, can compete in the world’s markets with the cheap coal recently obtainable at home? Doubtless you saw a report in the Daily Press a few weeks ago that a certain ship was refused a cargo of coal at Newcastle because she was not included in the list of vessels authorized to be loaded by collieries connected with the vend. Surely there is something wrong when such arrangements are possible!

Looking at the coal position from our particular point of view, it is unfortunate for the gas industry in Australia that it has practically to look to only one coalfield for its supplies of raw material; for although there is coal—and good gas coal, too, I believe—mined in Queensland, yet it appears impossible to obtain supplies in anything like large quantities. We in Victoria are in a worse position than either of our two eastern sister States; and we look forward with considerable interest to the development of the Powlett River field, which has lately been proved to extend over a large area of country. Through the courtesy of Mr. Stanley Hunter, of the Mines Department, I have recently had the opportunity of testing a small sample of the coal. The result was certainly encouraging; for, despite the fact that the sample had been at grass for several months, exposed to the severe weather of last winter, a good yield of gas was obtained. Whatever the quality of this coal may turn out to be when it is produced in bulk, in so far as gas-making is concerned, we cannot but congratulate the Victorian Government on its determination to thoroughly test and open up the field. This is not the place to discuss the *pros* and *cons* of the knotty question as to whether the State should establish its own coal mine; but it is to be hoped that no lengthy time will be taken in developing the field, and that it will be carried out with the greatest possible expedition.

Speaking of coal naturally leads me to refer to the magnificent field of rich coal which has of recent years been developed in the Maitland district of New South Wales. During the past year, I have had the opportunity of inspecting several of the collieries in that district, and I was much struck with the complete equipment laid down at the various mines for all operations. The Maitland coal—somewhat of a non-caking character and rich in volatile hydrocarbons—approaches the nature of cannel, though making an altogether superior coke to the latter. It is, as you are aware, very hard and close-grained—some of it being in this respect almost like pitch; and the seams worked in the majority of the mines are particularly free from band and dirt. The field is situated, for the most part, in charming country, and many of the pitheads have been erected in virgin bush. Evidence, too, of the way population follows the mines is strong; townships having sprung up at all the collieries.

On the experimental scale, and using iron retorts carbonizing 56 lbs. per charge, I have tested samples of coal from all the South Maitland collieries; and eleven samples gave the following average results:—

Gas Made Per Ton. Cor. Bar. & Ther. Cub. Ft.	Illuminating Power by 15-Hole Argand Burner at the 5 Feet Rate. Candles.	Coke Made Per Ton. Cwt.
12,248	15'93	11'75

The sperm value of the South Maitland coals does not vary very materially, and the majority should yield a large quantity of gas of fair illuminating value.

What, however, must finally determine the selection of a Maitland coal is not only the yield and the quality of the gas, but the quality of the coke produced; and several of these coals produce a better coke than others. I may say, too, that in the ordinary method of working—i.e., the laying of a charge of coal on the bottom of the retort—all these Maitland coals give a “short,” small coke. From experience in Melbourne for some months past, I have come to the conclusion that, in order to get the best coking results, the Maitland coals should be carbonized under pressure. By that I mean slightly packed in the retort, in the manner in which the projector type of machinery enables the gas-maker to do now. We find that, working with De Brouwer machinery, and using heavy charges—i.e., 8 cwt. or more—the resultant coke is much better than that produced when the coal is, as I have said, laid in the retorts by other means, or allowed to run in by gravitation, as in the inclined system, though I believe that if inclined could be completely filled, the coke produced would certainly be of good quality.

It is a matter for regret that the Newcastle coals, or what are

known as the “Delta” coals, are being so rapidly worked out, and are not maintaining their quality; and the present position indicates that in a short time there may be only one mine working producing coal from Newcastle suitable for gas-making purposes. For, although the yield of gas from Maitland coals is undoubtedly greater than that obtained from Newcastle, yet the yield of coke is much less, tar slightly less, and ammonia rather more; and when the value of the coals is reduced to a commercial basis, having regard to local conditions, it may be a question whether, in turning to the Maitland field, we shall obtain coal which will prove such a good all-round gas coal as that from Newcastle. To the gas-maker, however, such a raw material as the Maitland coal, which will yield a large volume of gas, offers considerable attraction; and, so far as my study of it has gone, I am driven to the opinion that we are not yet carbonizing it in the best way to obtain the highest possible results. I shall refer later to the matter of carbonizing. But here let me say that I am not sure that we are able yet to realize the potentialities of the Maitland coal; and when we can carbonize it in vertical retorts, there is probably a surprise in store for us.

#### RECENT PROGRESS IN THE GAS INDUSTRY.

Turning our eyes homewards, we see that much has taken place in the gas industry there during the past year. This progress may be summed up under three headings—

1. The advances in carbonizing.
2. The first adoption of a calorific power standard.
3. The largely-extended adoption of co-partnership.

#### CO-PARTNERSHIP.

Referring first to the last-named, it is a notable fact that a number of gas undertakings have now adopted co-partnership—one of the latest being the Gaslight and Coke Company of London, which is the largest gas undertaking in the world, and whose co-partnership scheme embraces over 8000 officers and workmen. All the London Gas Companies and many provincial ones have adopted this method of amalgamating the interests of consumers, shareholders, and employees—all of whom automatically benefit by the progress of their undertakings. The adoption of co-partnership by so many companies must assuredly be establishing the finest memorial to the memory of its founder, Sir George Livesey, who did so much for it, and proved the advantages to be derived from it, over a period of twenty years. The employees of the South Metropolitan Gas Company—the undertaking over which, as you know, Sir George presided—have received as bonuses under the scheme the large total sum of £419,000; and this year, with the price of gas reduced to 2s. 2d. per 1000 feet, the bonus is 7½ per cent. on salaries and wages.

#### THE CALORIFIC POWER STANDARD.

As regards the calorific power standard, I would remind you that for the first time in the history of the gas industry a standard calorific power has been prescribed by the Imperial Parliament for a gas undertaking, the Company being the Gaslight and Coke Company of London. The standard imposed is 125 calories per cubic foot—equal to practically 500 B.Th.U. net. Penalties, however, are not to be imposed unless the heating value drops 10 per cent. below the figure named; so that the standard really becomes 112½ calories, or about 450 B.Th.U. net. Looked at from our limited point of view, the standard strikes me as being a fair one; and I am inclined to question whether it will be advantageous to aim at supplying heating gas of a lower standard than the last-named figure. As time goes on, we shall doubtless learn more about the control of calorific power, which we know little or nothing about at present; and this will probably come about when we are able to approach nearer our ideal—a cheap heating gas—more suitable than an illuminating gas for modern requirements. But at present, at any rate, the standard cannot be a hard one for any gas undertaking to work to. It must be noted, however—and very regrettably, too—that the adoption of a standard calorific test is not accompanied by the abolition of the illuminating power test, for since it is proved that heating value and illuminating power do not follow each other, any inducement in manufacture that a standard calorific power may offer must surely be considerably nullified by having to maintain a candle power standard. Such a revolution, however, could not perhaps be looked for all at once; and the British characteristic, to “hasten slowly,” doubtless guides the change somewhat. At the same time, however, both British and Colonial gas undertakings must assuredly fall into line with the up-to-date methods adopted on the Continent of Europe; and we cannot but read this innovation as indicating what the future may bring forth. It should mean much for the future of gas supply; for, since a heating gas is now required for all purposes in place of an illuminating one, a heating standard should surely be worked to, and the sooner we work to it, the sooner, surely, shall we learn how to control it.

When the change in this matter takes place in our part of the world, I hope that our present candle-power test will be done away with. In Melbourne, we have to test with candles using a 15-hole argand burner with a 7-inch chimney; and in a climate such as ours, where often the air temperature in the testing rooms is over 90° (and that for days together), the absurdity of trying to get decent tests with candles is, of course apparent.

As indicating the amount of gas now used solely for heating purposes, I may mention that our day output in Melbourne is, on the average, rather more than 45 per cent. of the total; and during the summer months the proportion is over 50 per cent.



The following table gives the proportion during each month of the year ending June 30, 1909:—

Month.	Day Output.	Night Output.
July. . . . .	36'98 per cent.	63'02 per cent.
August . . . . .	35'11 "	64'89 "
September . . . . .	44'30 "	55'70 "
October . . . . .	45'05 "	54'94 "
November . . . . .	52'71 "	47'29 "
December . . . . .	53'23 "	46'77 "
January . . . . .	56'39 "	43'61 "
February . . . . .	54'49 "	45'51 "
March . . . . .	45'98 "	54'02 "
April . . . . .	46'36 "	53'64 "
May . . . . .	36'32 "	63'68 "
June . . . . .	37'88 "	62'12 "

The day output is, of course, due to the stove, gas-engine, and industrial consumption. In regard to engines, our consumption has been affected to some slight extent by the adoption of suction producer plants (which, however, invariably have a town gas stand-by); but there are upwards of 900 engines connected to our supply. The night output is almost entirely, I believe, consumed in incandescent burners. In fact, I doubt if the latter are used more universally by gas consumers in any other country. What need, then, for any test of illuminating power?

It has been said, and I think with considerable force, that the gas companies can well be left alone in the matter of standards, and that it is high time such legislation came to an end—it being argued that the gas company knows best what its consumers want, and, knowing this, can be depended upon to supply it in its own interests. There is, I think, considerable force in this. Gas undertakings are now working under very different conditions from those existing a few years ago, and the healthy competition from the electric light is sufficient alone to make a gas company study the wants of its consumers. Anyway, it does seem strange that, while a gas company is compelled to maintain a standard illuminating power, and work under certain conditions, yet our competitors, the suppliers of electricity, have no illuminating standard to work to, are not required to have their meters certified by the municipal authorities, and are even allowed to charge rent for them.

#### CONSTANT QUALITY AND PRESSURE.

Mention of standards brings me to consider distribution. Here I may express my opinion that while the gas, to meet modern requirements, should be primarily a heating gas, yet that gas, of whatever standard, requires to be maintained at a certain quality, with a minimum of variation, and supplied at as constant a pressure as possible, so that, whatever hour of the day or night a consumer may use his burners, he may be sure of obtaining the same satisfactory light. It is the variations that trouble and annoy the consumer; and it matters nothing to him whether the gas be 13, 14, or even 17 or 18 candle power, so long as his burners are properly adjusted for the quality supplied, and that quality constantly maintained. As to whether the ideal condition of supply I have named can be obtained in practice, I cannot say. To me it appears to suggest the extended use of high-pressure mains throughout the area of distribution, connected through governors into the low-pressure mains, and by which arrangement the pressure in the latter can be automatically backed-up as necessary. Some such system has, I understand, just been installed by Mr. Robert English at Christchurch, New Zealand, and must, I feel, make headway in other cities. There is a limit to the simple, but somewhat crude, method of increasing pressures at the works in order to give a better supply in outlying districts.

#### THE COMPLAINT AND INSPECTION DEPARTMENT.

But the distribution of gas not only covers its supply, but also all the wants of the consumer attendant thereon, and its sale; and in this department great development in methods has taken place during the past few years, mainly the result of competition. Every gas company to-day is, I think, imbued with the necessity of adopting up-to-date methods; and every official of an undertaking must be alive to the possibilities of competition, and ever keen to increase consumption. In the case of very small companies, the manager will often find the distribution and sale of gas more important, and demanding more supervision, than the retort-house, provided always that the latter is equipped with an economically designed gaseous-fired furnace or semi-regenerator. It is certainly necessary, therefore, for the manager to know how to sell gas quite as well as how to make it. So the "twenty-four hours man," as he is sometimes styled, must be undoubtedly an all-round individual; and in such cases the secret of his progress is the knack of keeping in touch with his consumers. In undertakings of a larger size, a well organized complaint and inspection department (as part of the distribution department) is an absolute necessity; and the times demand that this department must invariably do a certain amount of free maintenance in order to keep in touch with consumers. By free maintenance, I mean the adjustment and regulation of burners—work which, I feel, must hereafter increase rather than decrease. In Melbourne, we pay considerable attention to our Inspection Department; and a short description of its organization may be of interest to you.

In the first place, the whole of our distribution area (which covers, roughly, 85 square miles) is divided in five districts, each under an independent foreman, who is responsible for the work of his district to a chief complaint inspector at the head office, and to the stove and fittings superintendent. In each district, two

or more depôts are established, as required, and are the headquarters of a number of fitters and inspectors, who are allotted a certain "beat" in the particular area centring round the depôt. These inspectors carry out the whole of the work, including the fixing of stoves and meters, and attend to all complaints—stocks of meters and all material being carried at the depôts. Here, also, youths employed on local maintenance work have headquarters. All the depôts are in direct telephonic communication with the head office; and every endeavour is made to attend to complaints on the same day as received—no man being allowed to leave the depôt at night until he knows definitely that there is no important job to be attended to in his inspection area. Special attention is given to all complaints; and the inspectors are instructed and trained to do everything to help the consumer. Lectures to the fitters and inspectors are periodically given by the superintendent; and special classes for the juniors and boys are held once or twice a week during the winter months.

The old policy of having nothing to do with the consumers' fittings has long since passed away; and wherever an alteration or overhaul is necessary, and the consumer is willing to place the order with us, the work is undertaken as expeditiously as possible. We have found it absolutely necessary to do this in self-defence, owing to the deplorably bad work which has been done in the gas-fitting line in the city and suburbs, and which, of course, simply brings gas into disrepute. Joints and leaks merely puttied over and bandaged up are frequently found by the fitters; while compo. joints—which are really nothing more than blocks to the gas passage—and piping too small for requirements, are matters of almost every-day attention.

It is on account of this bad fitting work, and the increasing necessity, as the result of competition and incandescent lighting, to keep in touch with the consumer, that my Company came out into the open, as it were, a few years ago, and extended this department in the manner indicated; and our experience is that the consumers are glad to know that the Company are prepared to undertake the work of putting their fittings in order. As illustrating the growth of this item, I may mention that in 1907 we did 9627 fittings jobs for consumers; and in 1908, 12,535. I may say also that, in addition to the ordinary staff of fitters and inspectors, we have a special number of stove inspectors, who periodically inspect and adjust stoves on consumers' premises.

We find the inverted burner making considerable headway. This is but natural when one compares the light given from (say) a properly-regulated "Graetzin" burner with any other light, be it gas or electric; and if only some of those fashion-following householders who imagine electricity to be the only suitable light, would seriously compare the two, I imagine that the inverted gas-burner would be selected every time on account of its clearness of illumination and cheapness. Inverted burners, however, are a very strong argument in favour of constant quality and pressure in gas supply. They are most sensitive, requiring most careful and accurate adjustment, and, to ensure a good result, a gas pressure of not less than 20-10ths.

I have indicated the necessity of an efficient complaint department, and a sales department also—all organized for the one object, the sale of gas. But in developing such arrangements, and adopting what, after all, are only sound commercial ideas, the necessity of which, however, did not appeal to the industry before the days of competition, we must not be led unwittingly into the idea that other departments are secondary to the distribution, and forget that the works, after all, are the profit-earning portion of the undertaking. The old adage, "that dividends are made in the retort-house," was never truer than it is to-day; and no gas company can afford to neglect the recognition of this fact. Where regenerative furnaces are already installed, the possibility of improvement is, of course, limited, though it is possible at the present day to considerably improve on the results from a carbonizing installation erected only a few years ago.

#### CARBONIZING.

In regard to carbonization, great advances continue to be made at the other end of the world; and it is doubtless true that in no department connected with the gas industry is progress so marked, or is close attention so well repaid. Retort-house practice has, during the past six or seven years, jumped forward by leaps and bounds; and as experience accumulates and investigations are made, continued proof comes forth that the revenue account will benefit considerably by the adoption of up-to-date methods. These advances have been brought about by the introduction of improved plant and machinery, following, of course, the introduction of regenerative furnaces, whereby high heats are possible. First, there was the stoking machinery of the type where the coal is either laid on the bottom of the retort or pushed in, and the coke pulled out by mechanical rakes; then machinery of the projector type, with the pusher for discharging the coke; and the combination machine, automatically pushing out the coke and filling in coal; the hot-coke conveyor, the tar-tower, and the retort-house governor. Now we have the vertical retorts and carbonizing chambers, introduced within the last three years, and which are proving that carbonizing operations can be carried out very much cheaper than hitherto. Moreover, they have been the means of showing what perhaps is equally important to the gas-maker—that horizontal retorts can be made to do better work by the use of heavier charges. Thus it has been that the names of West, Foulis, De Brouwer, and Fiddes and Aldridge are being handed down to posterity as those who have done much to improve, not only the working results, but also the lot of the worker



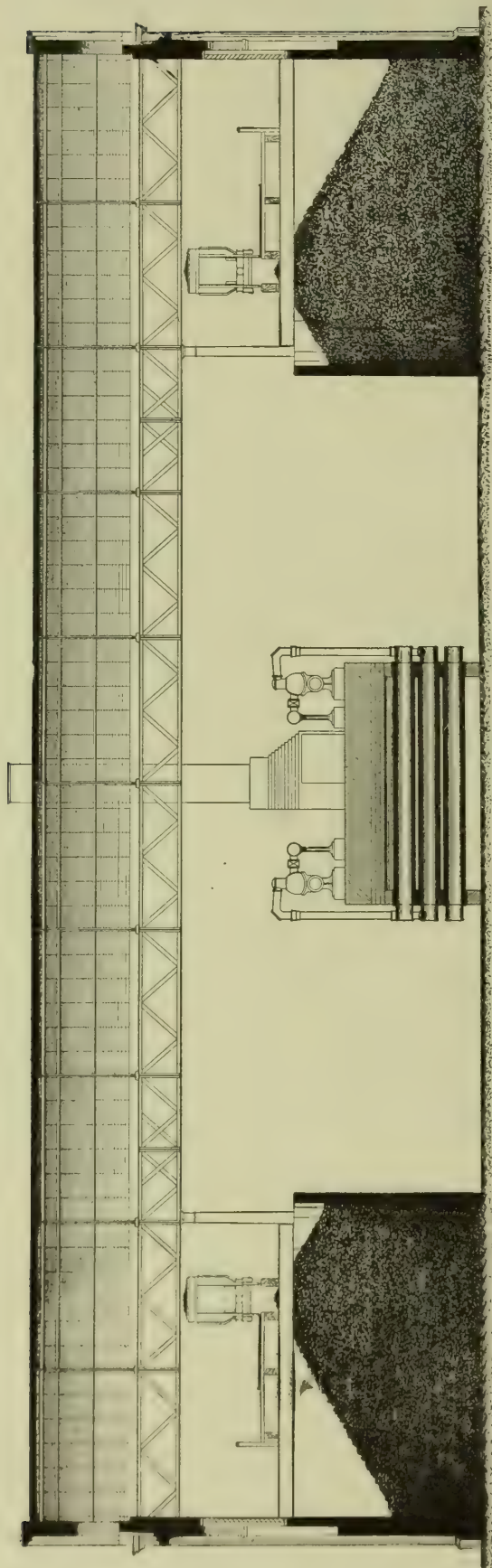


FIG. 1.—TRANSVERSE SECTION OF THE RETORT-HOUSE (ORIGINAL ARRANGEMENT).

Now history is being made by Rueb, Woodall and Duckham, and Glover and West, whose work is likely to result in the complete revolution of retort-house practice, and also, if not to solve, at any rate to lead the way to, the solution of the problem of cheap heating gas.

The progress appears to have proceeded along practically three lines:

- (a) Vertical retorts worked intermittently.
- (b) Vertical retorts worked continuously.
- (c) Carbonization in bulk.

But all three aim at reducing the cost of production to a minimum. In regard to vertical retorts, it appears to me that if the carbonizing results from the Dessau system (which is the intermittent one), on the one hand, and the Woodall and Duckham and Glover and West systems (which are continuous), on the other, are practically the same, the adoption of a system must reduce itself to a comparison of the capital cost and labour charges. Still, continuous carbonization has a fascination difficult to set aside, whatever results may be obtained by any other system; and I would here like to record my admiration for the dogged perseverance of Messrs. Woodall and Duckham, in the face of many difficulties, through a number of years, to obtain a successful system of continuous carbonization. And if, indeed, success is theirs, as now appears to be the case, none will have deserved it more than they.

Despite the apparent advantages of the vertical retort, however, there is, to my thinking, an important point that requires clearing up before they can be adapted to Australian conditions. That point is the quality of the gas produced. Either it must be demonstrated that the vertical retort is capable of making gas equal to our standard, or our standard must be reduced before we can adopt it—provided always that the coals at our command will not give better results than those that are used at home. To

thoroughly appreciate the value of quoted results, one requires to know something of the quality of coal used, and the conditions of working; but, so far as I can ascertain, the following results are the latest published of the various systems:—

System.	Make Per Ton, Cub. Ft.	Illuminating Power, Candles.	Calorific Power, B.Th.U.	Coal Used.
Dessau.	14,522	14' 59	559 Gross	Boldon*
Dessau.	13,815	12' 32	490 Net.	Silesian*
Dessau.	11,339	16' 10	532 Net.	Silesian†
Woodall and Duckham.	14,165	14' 26	551 Gross	Somerset
Glover and West.	13,102	15' 56	514 Net.	Thornley

\* With steaming.

† Without steaming.

You will see from these particulars that, although the make of gas per ton is considerably higher than we are accustomed to, yet the illuminating power is lower than the standard we have to work to here. This point is emphasized, too, when we realize that the tests are made with the new Carpenter No. 2 "Metropolitan" argand burner. It is, of course, well known now that the test burner such as is prescribed for use in Melbourne for testing illuminating power depreciates the value of the gas; and when, a few years ago, Mr. Carpenter, then Chief Engineer of the South Metropolitan Gas Company of London, invented his burner, which can be used so as to give the proper quality of the gas being tested, it was immediately approved by Parliament, and is now being generally adopted for testing in Great Britain. In passing, and as noting the tendency to reduce the candle power of the gas, it is interesting to record that 42 gas undertakings at home have, during the past few years, been allowed, either by Act of Parliament or Provisional Order, to reduce their standard to 14 candles; and I believe that practically all these are testing

with the No. 2 argand burner referred to. But so long as our standard remains as it is, we have to work with the old style of burner. Hence my remarks in regard to the candle power of gas produced in the vertical retort. The cost of production is, of course, much reduced by the use of verticals; and other advantages claimed include improved residuals. On the Continent of Europe many installations of verticals have been erected; and several are now on the point of completion in England.

From reports which have reached us, the development in regard to carbonization in bulk appears to have been great also; and formidable installations of these carbonizing chambers are now at work in Continental gas-works, carbonizing up to, I think, about 7 tons per charge. With these installations, however, there appears again to be the difficulty of illuminating power; for, judging from the reports, one must imagine they are so far specially capable of manufacturing a low illuminating power gas.

The possibility of carbonizing coal in large quantities for the production of gas, possesses an undoubted attraction; and I remember, when I was first beginning to learn something about gas-making years ago, taking a little part in the tests on the working of some coke-ovens, just prior to Mr. Charles Hunt reading his paper, on "Notes on Residuals," before the Institution of Gas Engineers in the year 1896. Returning from a visit to the coke-ovens, I was led to wonder how such a system could be adapted to ordinary retort-house designs; but though I took the foreman of the works into my confidence, no practical solution of the proposal was forthcoming. My idea ran on the lines of using the main arches as existing, and placing in them three ovens in place of nine retorts. The idea, so far as it went, appeared feasible. But what puzzled me was how to fill up the ovens with coal, as it was altogether out of the question to adopt the ordinary method used in a coke-oven installation, of running the coal in through holes in the top arch. I am not a little interested now to see that Mr. Thomas Glover, of Norwich, has, by the ingenious



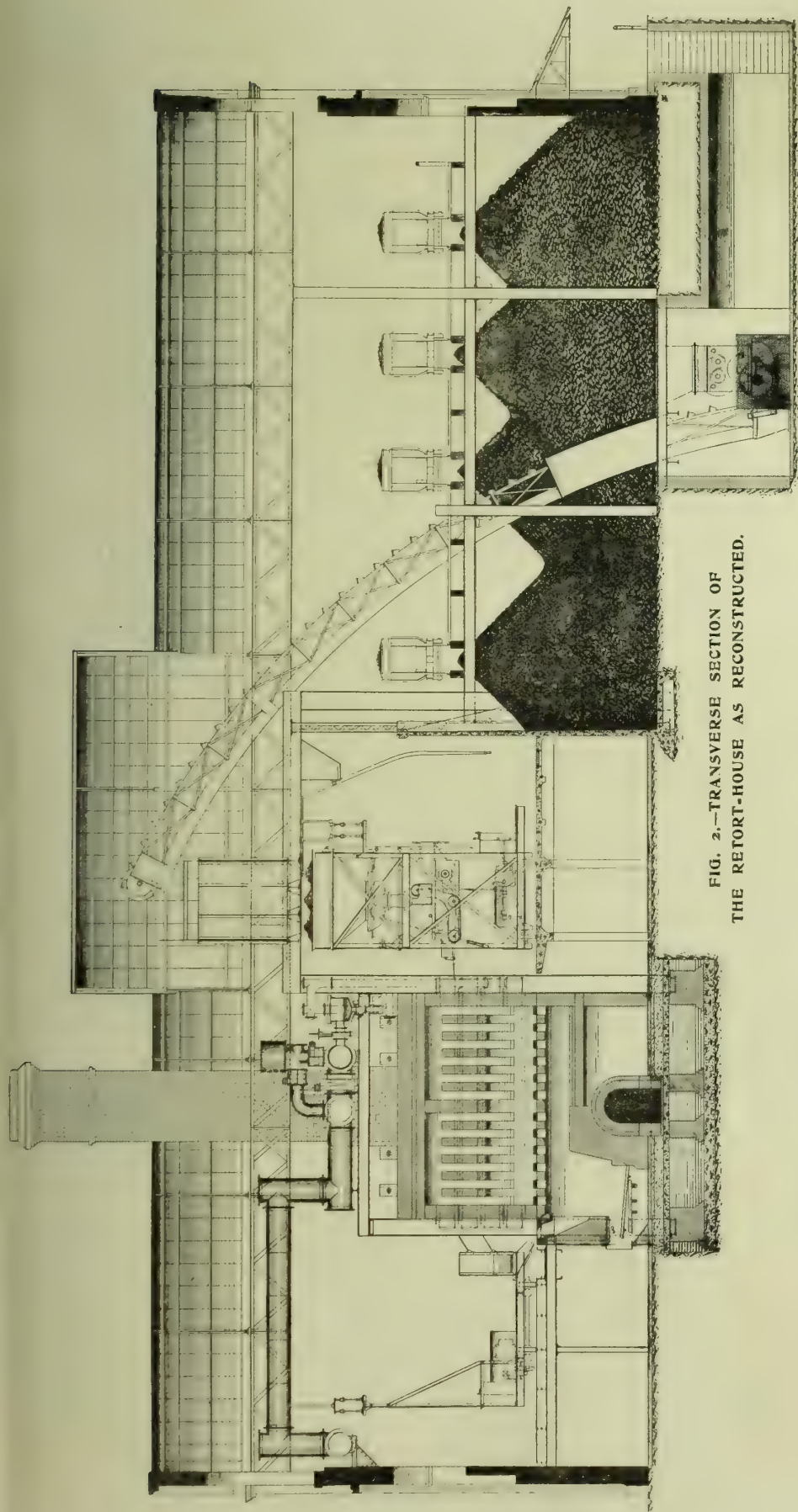


FIG. 2.—TRANSVERSE SECTION OF  
THE RETORT-HOUSE AS RECONSTRUCTED.

adaptation of the De Brouwer charger, successfully demonstrated how to fill an oven with 1-ton charges. By the substitution of six ovens, 36 inches deep, by 12 inches to 13 inches, and 21 feet long, in lieu of ten retorts, and carbonizing 21 cwt. per oven in twelve hours, Mr. Glover appears to have increased the carbonizing capacity of his setting by 5 per cent.; while, in addition, he is able to produce a special quality of coke, and so meet a certain local demand for coke of hard quality.

#### RECONSTRUCTION IN MELBOURNE.

We in Australia, situated so far away from the field of active development, take a keen interest in the reports of the various installations and improvements which occur week by week in our Technical Press. But we naturally find it difficult to decide what form of carbonizing plant to adopt when designing extensions. In carrying out the work of reconstructing our retort-house at South Melbourne two years ago, I had, of course, to choose only between two systems—inclined retorts, or horizontals worked by

the latest type of machinery. The latter system was adopted; and as you will be inspecting the works this afternoon, I will venture to give you a short description of the new plant.

Our South Melbourne retort-house is 460 feet long by 120 feet broad, and contained originally four sections, each comprising ten beds of sevens, all direct fired; and the portion reconstructed was the northern half, which contained twenty beds. Drawings Nos. 1 and 2 show in cross-section the house as it was originally built, and the reconstructed portion as it now stands on the completion of the work. You will notice that the new retort-bench has not been built in the middle of the retort-house, being moved out of centre, and within 20 feet of the wall on the yard side; the arrangement being designed to simplify the removal of coke and ashes to the yard, and also to enable the coal-stores to be concentrated on one side of the retort-house. The new installation comprises twenty beds, each containing eight retorts, 21 in. by 15½ in., □ section, and 20 feet long, in four tiers; the beds being built in one block. The main arches are 8 ft. 6 in. wide; and the

regenerators are of a plain tile design, specially bonded to prevent short-circuiting.

Ascension-pipes (7 inches in diameter) are provided on the charging side only, an arrangement which facilitates the working of the house, in addition to saving large capital outlay. I cannot see any necessity for adopting ascension-pipes at both ends of a 20-foot retort, since there does not appear to be any necessity for them with an inclined retort, in which, of course, the gas has to make its way down hill. The only objection that one might advance against the use of single ascension-pipes is the possible desirability of having them of larger diameter than would be the case if two pipes were used—an arrangement often necessitating the main arch being slightly wider than would otherwise be the case, and so causing greater ground area to be occupied. The hydraulic mains—one to each setting—are of special section to facilitate the removal of tar, which is run off by the tar-main (placed with a sharp fall under the hydraulics) into the tar-towers. There are four of the latter, one to each five beds, and placed one



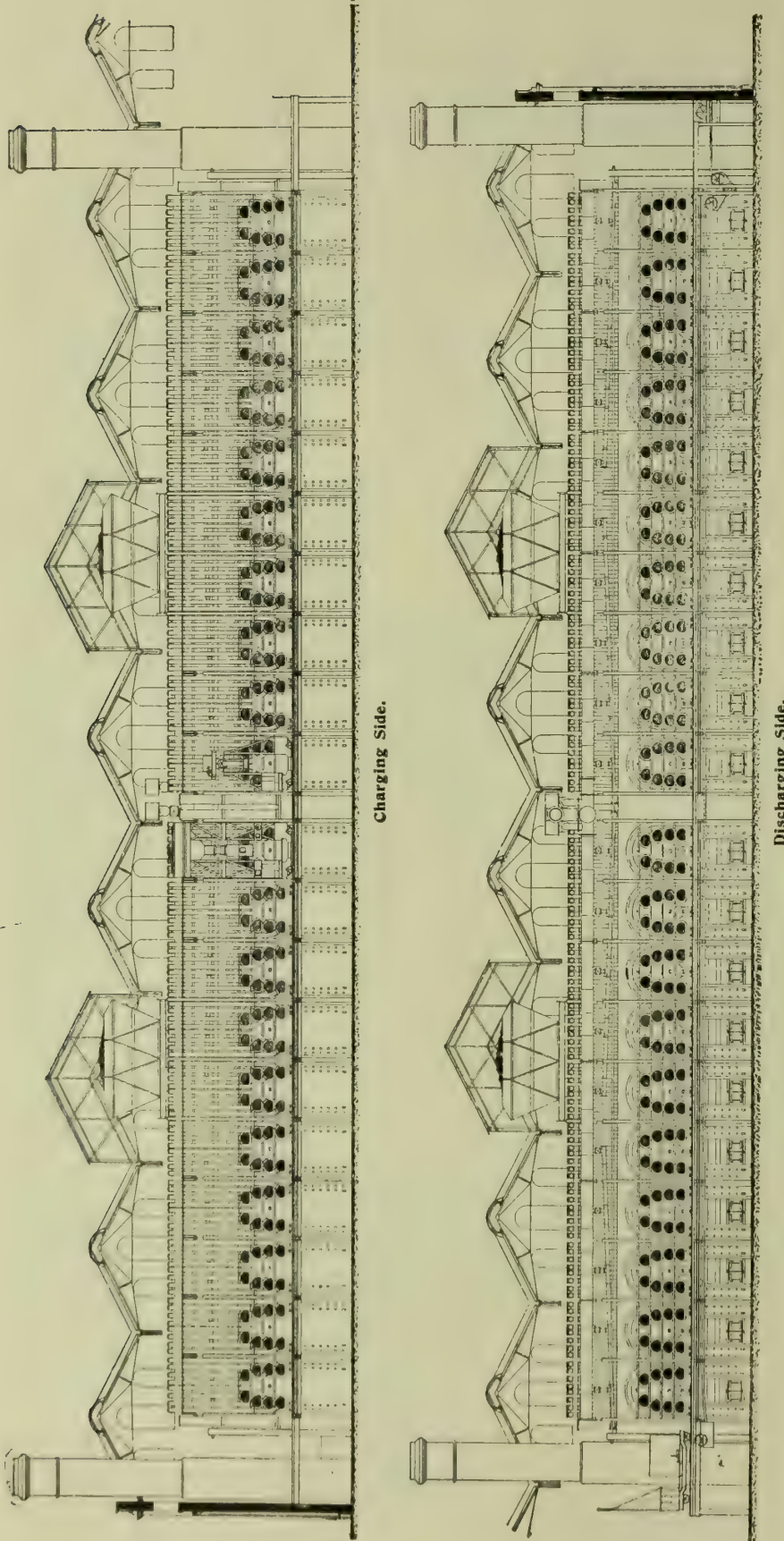


FIG. 3.—ELEVATIONS OF RETORT-HOUSE.

at each end of the bench, and two in front of a specially wide pier between the tenth and eleventh beds. From the hydraulic mains the gas passes into the foul main; two of Cowan's retort-house governors being installed to regulate the exhaust.

The charging stage and wall dividing the coal-store from the retort-house proper are built of reinforced concrete, and the discharging stage of steel. On the charging side run the De Brouwer projector and the Jenkins-De Brouwer pusher for charging and discharging the retorts. You will notice from Drawing No. 3 that the charging machine is supplied with coal from two centrally-situated overhead hoppers; these being fed by elevators, the crushers for which are placed under the centre of the coal-store. A De Brouwer coke-conveyor removes the hot coke as it is discharged from the retorts; the conveyor being divided into two portions, one running longitudinally down the front of the bench, and emptying into a cross inclined conveyor, in which it is quenched, and which carries the coke out of the retort-house and deposits it in the yard. On the discharging side, also, is a machine embodying a travelling platform and coke chute; the

latter being of a special design, with a movable bottom plate, which, when in position, allows the coke to be deflected into the furnaces, or when removed directs it into the conveyor.\* This machine—comparatively speaking, a very small item in the whole installation—has proved to be one of those little points which go to make the equipment of a carbonizing plant complete. Besides saving labour, it facilitates to a marked degree the carrying out of the work in the retort-house, and also simplifies the actual labour the men have to perform. The whole of the machinery, including the coal crushers and elevators, stoking machines, coke-conveyor, and travelling platform, is driven by electricity, the power for which is developed in the power-house at the other end of the works. The generating plant consists of a 65 Kw. British Westinghouse dynamo, coupled direct to a 100 B.H.P. gas-engine, all in duplicate. Here I may, perhaps,

\* Further particulars (and photographs) of the plant here alluded to appeared in the "JOURNAL" for Nov. 2 last year, pp. 307-11, in the course of an article contributed to our columns by Mr. Hunt, entitled "Gas Practice in Australia."—Ed. J.G.L.

say that I am thoroughly satisfied with the adoption of electricity for gas-works purposes, and am convinced that, as time goes on, this power will be very largely used for gas-works operations, since it should be possible to adopt it with advantage for nearly every purpose required.

I am pleased to inform you that the whole of the settings and main arches (with the exception of the retorts and the facing of the piers) are built of bricks of Victorian manufacture; being made at Darley, near Bacchus Marsh. It is gratifying to state that our faith in this local article is proving quite justified; all the combustion arches and other parts of the settings standing well. It is a matter for congratulation that such a good deposit of fire-clay exists in Victoria. Its characteristics are its freedom from iron and other impurities, its high content of silica, and its small shrinkage. As regards retorts, I believe that "sectional" ones, or what are sometimes popularly termed "brick" retorts, are preferable. We have one bed of sectional retorts made of Darley fire-clay on trial, with every indication of satisfaction; so there is considerable possibility of our being able to obtain all



our fire-clay requirements locally for the future. The installation, completed the middle of last year, cost £45,099, and, compared with the previous cost of manufacture with direct-fired settings and hydraulic stoking machinery, is earning 26 per cent. on the outlay.

METHODS OF WORKING.

With the advent of the projector type of charging machine and the pusher discharger, ready means have become available for working horizontal retorts in practically any way desired—either with light or heavy charges. Moreover, the development of the vertical retort has demonstrated the fact that it is possible to carbonize coal with very satisfactory results by filling up the retort and not providing any special space for the gas evolved to make its way to the ascension-pipe. In designing the installation which I have just briefly described to you, the desire in my mind was to obtain an arrangement which could be worked as simply as possible with eight-hour charges; and for the greater portion of the sixteen months that the plant has now been in action, we have worked on this system. This, I may add, has also been the method of working with the De Brouwer machinery at our West Melbourne works for over two years. The weight of the charge at South Melbourne has averaged 8½ cwt., and I am satisfied that the results from eight-hour work and heavy charges are a considerable improvement compared with the old six-hour method. We are able to obtain 11,000 cubic feet of gas per ton of 15½-candle power with mixed Newcastle coal, and we are able to make nearly 11 cwt. of coke for sale. We work with a ¾-inch seal and 7-10ths exhaust on the hydraulic mains.

Last summer we were most anxious to experiment with heavier charges—allowing twelve hours to burn-off; but the opportunity of trying the innovation in such a way as to obtain reliable data as to the result has only offered itself within the last few months. During the past three months, however, we have been working on this system, but almost entirely with a variety of Maitland coals; and although the alteration has taken some time to adjust, I have been able to glean from it some of the possibilities of the best Maitland coals under what I may term “prolonged carbonization.” Owing to the exigencies of our coal supply, I am only able to give you one really comparable result, and regret that I have no particulars as to the possibilities of Newcastle coal with twelve-hour charges. I fear, however, that, since the latter coal swells considerably in the retorts, it will not lend itself to twelve-hour work so well as the Maitland.

Working with the same coal in each case—a first-class Maitland, with one-third small—we obtained the following results:—

Duration of Charge.	Weight of Charge.	Coal per Charge per Foot Run of Retort.	Gas Made per Ton Corrected to 60° Fahr.	Illuminating Power Tested with 15-Hole Argand Burner at 5 Feet rate.	Calorific Power.
Hours.	Cwt.	Lbs.	Cub. Ft.	Candles.	B.Th.U. Net.
8	8½	138.5	12,067	15.09	570
12	11½	126	12,500	15.03	579

My regret about these particular trials is that they did not last more than ten days in the first case, and nine days in the second; and my impression is that the yield with twelve-hour charges would be further increased as a result of continued experience in working. You will notice from the figures that the make per ton increased under the longer period of carbonization by 433 cubic feet; the candle power being practically the same, while the heating power also increased. This latter seems to me a highly important point, and would appear to indicate that, by keeping the charge longer in the retort, a greater amount of gas is made of a heating rather than of an illuminating value. The charges, however, did not average so much as I was anxious to obtain (12 cwt.), due to two causes—first the difficulty on the part of the attendant on the charging machine in accurately gauging the charging of the retort; and, secondly, the small section of the retort installed—this being, as I mentioned before, 20 feet long, of □ section, 21 inches by 15½ inches. It is a point, however, on which we aim for improvement. Working with twelve-hour charges, the cost of production is reduced; and the quality of the coke made is undoubtedly improved. Under this method, a good Maitland coal can be made to coke very well indeed—yielding a coke of a harder, denser, and less friable nature than when carbonized in smaller charges, and undoubtedly superior to that produced when the coal is charged by hand or by any other method which lays it on the bottom of the retort. There is a great point, however, in crushing the coal uniformly small. The illuminating power of the gas produced was not very high; and on this point the prolonged system may possibly solve a difficulty which, I have heard stated, exists in some works when using Maitland coal—that is, the inability to keep the illuminating power down. Generally speaking, I may say my experience with longer charges confirms that obtained at home; and, further, I believe that twelve-hour work, or, at any rate, very heavy charges, must result in increased economy in manufacture and improved residuals, and will prove the best and most satisfactory way of carbonizing Maitland coal in horizontal retorts. Certain it is that the horizontal retort is not yet dead, and that great improvement is possible by simply changing our method of working. At the same time, however, I feel that at South Melbourne we

are handicapped in adopting 12 cwt. charges, owing to the size of the retorts. I believe that to make either eight-hour or twelve-hour work thoroughly successful, a larger retort than we have installed is necessary; and if circumstances will allow it, a longer one also—such as Mr. S. Y. Shoubridge has adopted, and is so successfully working at the works of the South Suburban Gas Company in London.

There is every indication, in fact, that the smaller sections of retorts to which we have been so long accustomed, have seen their day, at any rate for works large enough to adopt machinery, and it should now be possible, with the latest knowledge at our command, to design installations of horizontal retorts capable of reducing manufacturing costs considerably below those resulting from plants in general use at the present time.

A few words more on the subject of Maitland coal. The sulphur contained is higher than in the Newcastle coals—about 1.17 per cent., compared with 0.87 per cent. in the latter. But I must draw attention to the fact that the volatile sulphur in the coal does not increase in anything like the same proportion. Consequently the cost of purification should not be greatly enhanced. On the subject of sulphur in coal, it is very necessary, in selecting Maitland coal for gas-making purposes, to see that none is obtained from the upper seam of the Greta measures. The coal in this seam contains a large quantity of “brassy tops,” with a high percentage of sulphur, which, of course, not only brings up the cost of purification very considerably, but also renders the coal unsafe to store in large quantities.

COKE-CONVEYORS.

Of retort-house appliances, none has simplified the work of carbonizing more, or made the lot of the stokers easier, than the hot-coke conveyor; and in my opinion no better means can be provided for removing the coke. At our annual meeting in 1907, you, doubtless, recollect inspecting a De Brouwer conveyor, then recently installed in our retort-house at West Melbourne; and it may interest you to know that the expenditure on maintenance during the two years it has been in continuous use has only totalled £7 4s. 6d. A new chain and other renewals will soon be necessary, at a cost of several hundred pounds; but, nevertheless, the result is highly satisfactory. The modern retort-house—and I speak here of horizontal installations—can now be arranged, owing to the ingenious inventions at our command, on very simple lines; and the secret of its successful management is close supervision and constant inspection of all details.

CONDENSATION.

The condensation of gas has received particular attention of late, chiefly in regard to its effect on the naphthalene difficulty. You will recollect the highly interesting investigation and researches carried out by Dr. H. G. Colman at the instigation of the Committee appointed by the Southern District Association of Gas Engineers and Managers. The object of the inquiry was to endeavour to arrive at a system of condensation whereby sufficient quantities of the light oil vapours could be retained in the gas to carry the naphthalene along with them. In Melbourne, the naphthalene trouble has at times been severe; the number of stoppages from this cause being invariably greater in the summer time than in the winter months. This, I believe, is largely due to our inability to properly cool the gas before it enters upon the subsequent stages of purification. With the ordinary agents at our command, it is practically impossible to do this. This may be more readily understood when I remind you that the average daily temperature of the air during the summer is constantly over 80°; and the temperature of the available water supply 70° to 75°. These figures do not indicate the variations to which we are subjected; for, as you are well aware, we occasionally get a week in which the air temperature reaches well over 100° each day. A study of these local conditions led me to recommend a modification of our condensing arrangements; and I am pleased to say that the Board whom I have the honour to serve is installing, at one of our works, a special water-cooling plant, worked on the anhydrous ammonia system. This will enable us to cool all the water supplied to the water condensers to practically any required temperature. It is my intention to endeavour to arrange the working of the plant and the regulation of the condensers so as to cool the gas to the same temperature (within limits) all the year round. It is not proposed, of course, to cool the gas any more in the winter than has been done hitherto, but to endeavour to continue the winter temperature through the summer. In the whole process of gas-making no portion is varied during the year, with the exception of the condensation; and to my thinking, improved results should accrue by our being able to control this in the manner indicated. It is our intention also to supply this cool water to the washers and scrubbers during the summer months, hoping thereby to increase the amount of ammonia recovered. The plant is only just completed, and during the coming summer we shall make the first attempt to regulate the temperature on the lines mentioned. At some subsequent meeting, I hope to have the pleasure of laying the results before you.

AMMONIA RECOVERY.

In regard to ammonia, I should like to bring under your notice a thought which has occurred to me in regard to the many small works that exist in Victoria. You have doubtless noticed from the reports in recent technical journals that Mr. F. T. Eustace, in his Presidential Address to the Irish Association of Gas Engineers, states that it is possible for a works making such a small



amount of gas as 10 million feet per annum to profitably instal a sulphate of ammonia plant. Several gas-works in Victoria of that size, and even larger, are at present running all their ammonia to waste. The manufacture of sulphate is, of course, out of the question; but would it not be possible for these works to provide a suitable amount of storage accommodation for the liquor, and for the companies interested to combine and provide a small ammonia concentrating plant (which is neither expensive nor extensive), and which might be sent to a works as required to concentrate the liquor? A suitable condenser could be erected on the spot; and I take it that steam could always be obtained by hiring a portable boiler. Such a proposal perhaps does not come within the scope of our Association; but, at any rate, members might discuss the matter informally, and see what could be done. In these days of competition, a little additional revenue must always be acceptable; and I believe the concentrated ammonia could be readily disposed of.

#### RESIDUALS.

The market for residuals, which is always varying, has not of late given gas managers cause for complaint. But we naturally hope that the demand for tar will improve, on account of its increasing use for road purposes. It is gratifying for us to know that the general opinion of road engineers in America, Europe, and Australia is that tar is the best article for the purpose of improving roads and reducing the dust nuisance. In Melbourne, large quantities are employed annually; and I believe our City Council was one of the first Councils to realize its advantages. All the tar so used is first distilled; and here I venture to say, in regard to quality, that success depends on its being prepared in such a way that the resultant distillate is of a constant consistency—a point on which gas managers should be able to assist the road engineer. It is unfortunate that for road purposes the demand for tar necessarily only takes place in the summer. This means storing a large stock during the months of greatest make; and there must, of course, be a limit to the amount of storage accommodation provided on a gas-works.

#### QUALIFICATIONS OF GAS MANAGERS.

Before bringing this address to a close, you may possibly look to me to say something upon two important matters—namely, the qualification of gas managers, and the competition with the electric light. In regard to the first, so much has been said on various occasions by many who are better able than I am to discuss the matter, that I will not inflict upon you my views on this particular point. But I will venture to say this, that whatever training a man may have before entering upon the management of a works, unless he can command a shrewd amount of common sense or “nouce,” as it is called, together with a certain amount of tact, he will be of little service to a company. Our every-day work and our contact with consumers of all temperaments demand the exercise of these two qualities more than anything else; and the man in charge of a small works, particularly, who is able to combine them with an ordinary amount of technical skill, will prove the most successful manager of such an undertaking.

#### ELECTRIC LIGHT COMPETITION.

A large amount of public lighting is now undertaken by the municipal authorities. As you are aware, all the streets of Melbourne are lighted by flame arc lamps, supplied with current from the City Council's own supply station. Other Victorian Municipalities are constantly talking about promoting electricity undertakings to provide current both for public and private lighting; and in the minds of those town councillors who cannot, or will not, appreciate proved facts, electricity is better than our own commodity. At the present time, two well-known municipalities are considering a joint scheme of electrification, and they recently circularized their ratepayers on the matter, asking if they would use electric light for domestic purposes if it could be supplied as cheaply as gas. The favourable replies were computed to represent a gas consumption of 856,000 cubic feet per month. Now, this quantity of gas, in a good inverted burner, should give a total illumination equal to 17,000,000 candles, and, taking gas at 5s. per 1000 cubic feet, would cost £214. To give the same illumination by means of metal filament lamps (allowing 1·3 watts per candle power), current would have to be charged at 2·3d. per unit to equal the cost of gas. If, however, carbon filament lamps were used—allowing an efficiency of 3·9 watts per candle power—the charge for current would need to be 0·77d. per unit. It is difficult to see, then, how the electric light proposal can possibly be further considered.

Apart from such an instance as this, municipalities who are contemplating electricity for their district might do well to make themselves thoroughly acquainted with the progress in Europe, and particularly the recent action of the City of London in regard to the matter of public lighting. A few months ago, this Corporation appointed a Special Committee to inquire into the street lighting, and to visit the principal cities of the Continent. As a result, the Committee have recommended the adoption of high-pressure incandescent gas-lamps with inverted burners for all future extensions; the second portion of the recommendation reading, “But where gas is impracticable, electricity, with open arc or flame arc lamps, should be installed.” The Committee also reported the very interesting fact that the Berlin municipal authorities are spending £50,000 sterling per annum in installing high-pressure gas lighting in the various streets, in lieu of the existing gas and electric lamps. This expenditure has been going

on now for over two years, and will last another five years, at the end of which time £350,000 will have been spent in providing efficient gas lighting in the public thoroughfares. Knowing how thoroughly the Germans go into technical matters, there need be no doubt that the Berlin authorities quite satisfied themselves that they were obtaining the best lighting service before embarking on this huge expenditure. Moreover, it is decided that in future incandescent gas lighting only will be used in Berlin. In view of all this, I feel that municipalities here, who have at heart the desire to save the ratepayers' pockets, and at the same time obtain the most efficient light for public thoroughfares, must adopt gas lighting.

To meet competition, however, strenuous and unremitting activity must be shown by the suppliers of gas; and it will be found advantageous to recommend only the best of burners and mantles. In this respect, we cannot but regard the amount of cheap material being sold to the public as very detrimental, by reason of its flimsiness, to the interests of gas. As regards mantles in particular, I am compelled to speak strongly about the unsatisfactory nature of the locally manufactured article. Judging from my experience during the few years I have had the pleasure of residing in Australia, a mantle of a uniform and reliable quality seems too much to expect. What we require is a strong mantle, having a lasting illuminating power, and manufactured in such a way as will ensure the supply being of constant quality month by month. Support of local industries is to be highly commended. But there is a limit to everything, including the annoyance and dissatisfaction caused by a state of affairs such as I have indicated; and if, in the interests of our industry, other means are adopted in order to ensure supplies of a reliable mantle for maintenance purposes, the Australian manufacturer will, surely, have only himself to blame.

Mr. S. E. FIGGIS (Ballarat) proposed a very hearty vote of thanks to Mr. Holmes Hunt for his most comprehensive and able address. He remarked that he had given them a lot of matter to think over and digest at their leisure.

Mr. G. SWINBURNE (Melbourne), in seconding, said the election of Mr. Hunt to the chair at the last annual meeting had been well justified by the contents of his able statement that day, as well as in other ways. They looked to Mr. Hunt for a great deal, as Engineer of the principal Gas Company in Victoria. He had there opportunities which very few men had of doing a great deal of experimenting; and he was delighted to think that they had a man at the head of the Metropolitan Gas Company's affairs who had a great deal of energy, considerable originality, and initiative. It was only by means of engineers who had opportunities of experimenting, that they could get to the bottom of the many difficulties with which they had to contend. Mr. Hunt had given them his experience as to the values of Newcastle and Maitland coals; and he had a great deal more information, no doubt, which he did not want to put into a public address, but which he would be willing to give members privately. The study of the naphthalene difficulty was of enormous interest in a hot climate; and his experiments in this direction should be of great value. He was very pleased with the way in which Mr. Hunt had tackled these problems; but he thought that he (Mr. Hunt) was quite right in saying, when touching on vertical retorts, that they were going to keep their horizontal retorts. As most of their works were run by what were termed “twenty-four-hours-a-day managers,” they would have to keep their horizontal retorts probably for a long time. It would be the largest gas-works only that would have the benefit of revolutionizing things by using vertical retorts. He had to congratulate the President on the great pains he had taken and the success he had achieved in giving the Association such a vast amount of information. He was glad so many visitors were there to hear the address.

The motion was carried by acclamation.

The PRESIDENT, in acknowledging the compliment, said he thanked them very much indeed for their hearty vote. He could assure them he was only too pleased to do what he could for the benefit of the gas industry in Victoria. In reference to the question of experimenting and investigation work, he wanted to say this: Mr. Swinburne had spoken very kindly about his work; but he wished to acknowledge the ready help of his very able body of assistants at the various works. In connection with the investigations in regard to the Maitland coals, he mentioned particularly the two Analysts, Mr. Macintosh, of West Melbourne, and Mr. Bleauchae, of South Melbourne, who had done a lot of hard work while certain trials and tests were being carried out.

#### PAPERS AND DISCUSSIONS.

The papers, entitled “Gaseous Firing for Small Works” and “Two Valuable Adjuncts to a Carbonizing Plant,” were then read by their respective authors, Mr. J. W. Bean (Wangaratta) and Mr. A. G. Ambrose (Bathurst, New South Wales); and the meeting then adjourned for luncheon at the invitation of the Metropolitan Gas Company.

In the afternoon a visit was paid to the South Melbourne works of the Metropolitan Gas Company for the special purpose of seeing the new carbonizing installation and other improvements recently carried out there. The party was shown over the works by the President and Mr. C. W. Howlett (Works Superintendent). The company were entertained at afternoon tea.

These latter proceedings will be noticed next week.



## JUNIOR INSTITUTION OF ENGINEERS.

### Engineering Truths.

The customary success attended the anniversary dinner of the Junior Institution of Engineers on Saturday, when the President (Engineer Vice-Admiral H. J. Oram, C.B.) was supported by a company of distinguished guests. Men identified with the gas industry that one met were the President of the Institution of Gas Engineers (Mr. James W. Helps), Mr. Sam. Cutler, jun., Mr. E. Cutler, Mr. W. T. Hogg, Assistant Manager of the Mitcham and Wimbledon Gas Company, and the Secretary of the Institution of Gas Engineers and of the Institution whose anniversary was being celebrated (Mr. W. T. Dunn). After dinner several toasts and a programme of excellent music combined to give considerable pleasure.

The speeches were excellent. They all, in view of the position of the President, had a strong tendency to marine engineering; but there was much in what was said that applied to engineering generally. In proposing "Engineering and National Defence," Dr. T. J. Macnamara, LL.D., M.P., Financial and Parliamentary Secretary to the Admiralty, warned that while this country would without doubt keep in the forefront in "physicalism," we had to reckon with scientific attainment, and in the products of such attainment we must try to excel. The same line of thought ran through the response of Sir William H. White, K.C.B., F.R.S. Fittingly in view of his retirement from active work, there was retrospect in his remarks. He traced the progress of engineering in his particular sphere, and during his time. It was a stately march of achievement that he brought to notice. The importance of each step forward is best seen by such a long-period review, as time after time "we have seen these things pass, and have hardly stopped to wonder at the marvel." Another point was the recognition of the immense obligation under which the individual engineer rests to other engineers. It is by the combination of their work that the greatest results are ever accomplished. But wonderful though their inventions may be, it is the man behind who operates the apparatus who controls the result. The force must always be the man, notwithstanding all that is done in providing the machines. Then Mr. James Swinburne, F.R.S., proposed "Steam-Turbine Propulsion;" and he dilated on the great influence that accuracy in modern engineering work had had upon efficiency. Mr. Summers Hunter, the President of the North-East Coast Institution of Engineers and Shipbuilders, replying, in the absence of the Hon. C. A. Parsons, enlarged upon the aim of mechanical engineers in getting greater work and economy out of the machine.

What he regarded as the toast of the evening—"The Junior Institution of Engineers"—was proposed by the Rt. Hon. Lord Pirrie, K.P., P.C. He dilated upon the advantages that junior engineers have in these days. He realizes this the more when he compares the position of things that obtained when he first entered the engineering world, and when each man had to go largely "on his own." He envied the junior engineers of to-day their opportunities. As an Irishman, he was pleased that the Institution were to visit Ireland in the coming summer; and if the members visited Belfast, his own firm would be pleased to show them what they had. Naturally, the invitation was heartily received; and it was more expressly acknowledged by the Chairman of the Institution (Mr. Geo. T. Bullock), in replying to the toast. He also referred to the work of the Institution, pointing out that one of its aims was to assist the members not only while studying, but in their practical work. Not only, too, did they work side by side with the technical colleges and other institutions, but they found for the members social advantages—claiming that this was an important factor for young men when they were commencing the serious part of life. During its 26 years of work the Institution had met with great success. Many of the members occupied important positions to-day, not only in this country, but across the sea; and they attributed much of their success to their association with the Institution. They were a progressive body; and they offered to junior engineers an opportunity of showing their worth. Progress was well maintained. The Institution now numbered over 1000 members, distributed over the whole globe.

## SOCIETY OF ENGINEERS.

The First Ordinary Meeting of the new Society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society was held on Monday last week at Caxton Hall, Westminster. At the commencement, the meeting was presided over by Mr. E. J. Silcock, M.Inst.C.E., the last President of the Society of Engineers, and Mr. W. Noble Twelvetrees, M.I.Mech.E., the last President of the Civil and Mechanical Engineers' Society. Among the premiums awarded by the Council of the Society of Engineers for papers read during the past year were the President's gold medal to Dr. David Somerville, for his paper entitled "Some Observations on the Chemistry and Bacteriology of Sewage Purification;" and the Nursey premium of books to Mr. E. R. Matthews, for his paper on "The Corrosion of Steel Reinforcement in Concrete." The premiums awarded by the Civil and Mechanical Engineers' Society included a premium of books and instruments to Mr. R. O. Wynne-Roberts, for his paper on "The Past, Present, and Future of the

Organization of the Engineering Profession;" and a premium of books and instruments to Mr. H. Laurence Butler, for his paper on "Specifications for Engineering Works." Votes of thanks to the Presidents, carried by acclamation, brought this portion of the proceedings to a close.

The first President of the new Society—Mr. Diogo A. Symons, M.Inst.C.E., then delivered his Inaugural Address. After expressing his thanks for his election, he alluded to the internal affairs of the new Society—pointing out that since the amalgamation there were more than 700 members—and put in a plea for large attendances at the meetings. Referring to the examination which is to be the qualification for Fellowship, he said he believed its introduction would have the same beneficial effect as had been the case in the Institution of Civil Engineers. Proceeding to more general subjects, the President called attention to the value of workshop training to engineering students, whether they intended to take up the civil or the mechanical branch of the profession. He belonged to the civil branch; but he had often looked back with gratitude to the time he spent in the shops. Touching some of the branches of engineering work with which he was associated, the President referred to the question of water supply in foreign cities. In reference to ferro-concrete, so largely used at the present time, though it had in many instances proved economical and entirely satisfactory for constructional works, he considered that a large factor of safety should be allowed, and every care taken to ensure the use of the very best materials and workmanship. The other subjects dealt with were the disposal of sewage, the motor industry, aviation, and the education of young engineers.

A vote of thanks was accorded to the President for his address.

## REINFORCED CONCRETE CONSTRUCTION IN WATER-WORKS ENGINEERING.

The Liverpool University Engineering Society had this subject under consideration at their meeting last month—in the form of a lecture by the President, Mr. H. J. F. Gourley, B.Eng.

According to a brief report of the proceedings in the current issue of "Ferro-Concrete," the lecturer, in opening, mentioned the chief characteristics of concrete, steel, and of the combination of the two materials, adding that reinforced concrete had been extensively used in America and on the Continent (particularly in France and Germany) for water-works for many years. In this country its use was quite a recent development. The attitude of the Local Government Board, in refusing to sanction loans for reasonable periods on ferro-concrete structures, had much to do with the slow progress which had been made. There was still some prejudice amongst engineers against its use, and this in spite of the fact that experimental and practical evidence proved that ferro-concrete was a most satisfactory and durable material. The theory of reinforced concrete design to-day was in a perfectly logical and definite state, and had been endorsed by eminent bodies of engineers, both in Europe and in America. The main requirements to be fulfilled by the component parts of the concrete and by the reinforcing metal were briefly outlined. The difference of opinion with reference to what might be termed "clean sand" was referred to; and it was pointed out that it was not so much that a little extraneous matter was objectionable as that the variation in the strength of the concrete due to variation in the quantity and character of the impurity was most undesirable, particularly in reinforced concrete work. The leading systems of reinforcement were then described and illustrated; the advantages claimed in each case being briefly enumerated. The numerous advantages possessed by ferro-concrete over brick, stone, concrete, and steel when employed in the construction of reservoirs, aqueducts, high-pressure mains and dams were detailed. The lecture was illustrated by a number of excellent lantern slides showing the actual application of reinforced concrete in water-works structures.

**Cuprous Compounds of Ethylene and Carbon Monoxide.**—In continuation of a previous investigation, MM. Manchot and Brandt have studied in the "Annalen" the action of ethylene on cuprous chloride; and according to an abstract of their article given in the current number of the "Journal of the Society of Chemical Industry," it is found to be analogous to that of carbon monoxide—a dissociable compound, in which one molecule of ethylene is combined with one molecule of cuprous chloride, being formed in the presence of water or certain other substances, such as ammonia and aniline. Under like conditions, however, the compound is much more strongly dissociated than the carbon monoxide compound; and in all cases—i.e., in the presence of water, hydrochloric acid, or ammonia—the absorption of ethylene is found to decrease with an increase in the copper concentration. On adding hydrochloric acid to the aqueous solution of the compound, much of the ethylene is evolved. Experiments both with ethylene and with carbon monoxide show that a rise of temperature, at constant gas concentration, is accompanied by a shifting of the equilibrium in the sense of increased dissociation, as observed in similar cases. Applying the results of the investigation to the question of gas analysis, it is pointed out that ethylene must be removed from a gaseous mixture before the absorption of carbon monoxide by cuprous chloride.



THE CAUSES AND RANGES OF  
VARIATION IN CALORIMETRIC TESTS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.  
(Continued from p. 356.)

CHANGES OF ATMOSPHERIC RELATIVE HUMIDITY.

THE calculations in the preceding article have all been upon the basis of complete saturation by moisture of the gas, air, and products of combustion; the details given taking into account each element of the case, and comparing it in a preliminary way with the rule of the Gas Referees, which makes no reference to atmospheric humidity. Doubtless both the gas and the products of combustion are saturated; thus it is necessary only to consider how far variations in the saturation of the air affect the results.

The percentage humidity of the air relative to saturation varies throughout the 24 hours and throughout the year, and is affected by general climatic as well as local conditions. It will perhaps be best to give definite data over certain periods, to see what is the magnitude of the meteorological deviation that must be taken into account in its effect on calorimeter readings. The following are returns for relative humidity from the Kew Observatory.

TABLE III.—Percentages of Saturation at the Ruling Temperature

Dates and Periods.	Maximum of the Day.		Minimum of the Day.		Average of the Day.
May 1. . . . . 1909	88°0	2 a.m.	49°0	noon	71°0
" 2. . . . . "	92°0	4 "	50°0	4 p.m.	69°8
" 3. . . . . "	94°0	5 "	51°0	5 "	71°2
" 4. . . . . "	88°0	4 "	45°0	3 "	63°9
" 5. . . . . "	83°0	2 "	41°0	1 "	62°9
Mean of month of—					
May. . . . . 1909	84°8	4 "	52°9	4 "	69°0
May. . . . . 1886-1905	87°5	4 "	59°0	4 "	73°0
July 1. . . . . 1909	81°0	4 "	61°0	5 "	74°0
" 2. . . . . 1909	90°0	3 "	57°0	2 "	76°2
Individual minimum of the month	July 20	..	43°0	5 "	..
Individual maximum ditto	July 4	97°0	7 a.m.	..	..
Mean of month of—					
July. . . . . 1909	87°4	4 "	64°2	5 p.m.	75°7
July. . . . . 1886-1905	88°0	4 "	56°7	3 "	72°3

Table III. gives a maximum of 97 and a minimum of 41, and the records for longer periods than are here exhibited show that any return below 41 is very exceptional, while inland stations do not often record more than 97 per cent. Taking the monthly mean degree of humidity at every hour of the day as recorded at Greenwich for the year 1906, we find the highest to be November, 88 per cent.; the lowest April, 69 per cent.; and the yearly mean, 78 per cent. The lowest hour, 3 p.m., 64 per cent.; the highest hour, 4 a.m., 88 per cent. As to Scotland, it is on record that 73 per cent. is the lowest mean humidity that occurs during May, the driest month.

As already shown, so far as relative humidity is concerned, the problem with the sample of gas chosen is reduced to a comparison of 5·2 cubic feet of air of *x* per cent. saturation *versus* 3·61 cubic feet of products saturated. The question of temperature change as affecting humidity under conditions of saturation has already been discussed; so that in this paragraph temperature is assumed to be unchanged. It has been shown that where the air is saturated the air and gas take into the calorimeter 0·0274 cubic foot of water vapour more than the exit gases take out, and that in such a case the gross calorific value and the condensation figure would both be over-estimated to the extent of 1·45 B.Th.U.; leaving the net value unaffected by this aspect of the case.

If the above-mentioned air supply—the theoretical one—be exceeded, such excess will not, under this condition of saturated air, alter the effect just named, which appears to be the greatest error that can proceed from this cause in this direction. But in the opposite direction what is the greatest error to be expected? Suppose this to be due to a low value—namely, a 40 per cent. relative humidity of the atmosphere. Under these circumstances, the air would take in 0·09 × 0·4 = 0·036 cubic foot of moisture, while the exit gases would continue to take out 0·0623 cubic foot—a difference of 0·0263 cubic foot, producing an under-estimation of the gross value and of the condensation figure of 0·0263 × 53 B.Th.U. = 1·394 B.Th.U., again leaving the net value unaffected. The figures show further that at 69·3 per cent. relative humidity there would be no error.

This humidity happens to coincide with the average of the monthly means for 1906 at Greenwich for the hours from 8 a.m. to 5 p.m., which was 69·3; the maximum being 80 and the minimum 64. The range of nine hours per day just given would often include the period within which calorimeter tests are made, but not necessarily always so; and therefore in this inquiry attention must be paid to the extremes possible as well as to the mean values. The highest relative humidity of the atmosphere is about 4 a.m., gradually falling to 8 a.m.; when it drops perceptibly up to 4 p.m., then rises gradually to 4 a.m. The average of the day for May, 1909, when the particular sample of gas was produced and tested, was 69 per cent., so that an average series of tests in

that month would have involved no error. In other words, individual tests would have erred either way to the extent of the departure of the actual humidity from this mean. The highest was about 94 and the lowest 41 per cent.; so that a range of 25 above or below the mean of 69 would appear to be all that seems likely to occur. Yet, to include the most improbable, a 33·3 per cent. humidity will be taken into account.

Table IV. shows that with the theoretical quantity of air 1·45 B.Th.U. may be added to the gross value and condensation figure, leaving the net value unaffected at one end of the series; and 1·72 B.Th.U. may be taken from the gross value and condensation figure, at the other end of the series—a range of 3·17 B.Th.U. as between full and one-third saturation.

TABLE IV.—Effect of Humidity when the Theoretical Quantity of Air is Employed.

Relative Humidity per Cent.	Moisture.			Increasing Gross and Condensation.	Moisture Taken Out of Calorimeter.	Decreasing Gross and Condensation Figures.
	In Air.	In Exit Gases.	Left in Calorimeter.			
	Cub. Ft.	Cub. Ft.	Cub. Ft.	B.Th.U.	Cub. Ft.	B.Th.U.
100°0	0·0897	0·0623	0·0274	1·45	..	..
94°0	0·0844	0·0623	0·0221	1·17	..	..
79°6	0·0715	0·0623	0·0092	0·49	..	..
69°4	0·0623	0·0623	..	..	0·0000	0·00
44°0	0·0395	0·0623	..	..	0·0228	1·21
40°0	0·0359	0·0623	..	..	0·0264	1·40
33°3	0·0299	0·0623	..	..	0·0324	1·72

In practice, this ratio of air to gas is exceeded; but there seems no reason why it should go, in the case of the Boys calorimeter, beyond a margin of 50 per cent. The figures of Mr. Coste and Mr. Butterfield show that in some tests this ratio was almost reached. Taking this basis as an extreme, the following relationships arise: The 0·0898 cubic foot of water vapour in the air becomes 0·1347 cubic foot in the fully saturated air of 60° Fahr., yielding products which contain 0·0449 cubic foot of moisture more than before—a total of 0·0623 + 0·0449 = 0·1072 cubic foot.

TABLE V.—Effect of Humidity when (A) 50 per Cent. Excess and (B) 25 per Cent. Excess of Air is Employed.

[A.—Air entering calorimeter in excess of theoretical need, 50 per cent.]

Relative Humidity.	Moisture.			Increasing Gross and Condensation.	Moisture Taken Out of Calorimeter.	Decreasing Gross and Condensation Figures.
	In Air.	In Exit Gases.	Left in Calorimeter.			
	Cub. Ft.	Cub. Ft.	Cub. Ft.	B.Th.U.	Cub. Ft.	B.Th.U.
100°0	0·1347	0·1072	0·0275	1·45	..	..
94°0	0·1266	0·1072	0·0194	1·03	..	..
79°6	0·1072	0·1072	0·0000	0·00	0·000	0·00
69°4	0·0935	0·1072	..	..	0·0137	0·72
44°0	0·0592	0·1072	..	..	0·0480	2·54
40°0	0·0539	0·1072	..	..	0·0533	2·82
33°3	0·0449	0·1072	..	..	0·0623	3·30

[B.—Air entering calorimeter in excess of theoretical need, 25 per cent.]

100°0	0·1122	0·0847	0·0275	1·45	..	..
94°0	0·1055	0·0847	0·0207	1·10	..	..
79°6	0·0893	0·0847	0·0046	0·24	..	..
75°5	0·0847	0·0847	0·0000	0·00	0·00	0·00
69°4	0·0779	0·0847	..	..	0·0068	0·36
44°0	0·0494	0·0847	..	..	0·0353	1·87
40°0	0·0449	0·0847	..	..	0·0398	2·11
33°3	0·0374	0·0847	..	..	0·0473	2·51

Table V. shows that when 25 per cent. excess of air is furnished there is no error when the relative humidity is 75·5 per cent., and when 50 per cent. of excess air is passed through there is again no error when the relative humidity is 79·6 per cent. Thus with a rise in relative humidity, a rise in the rate of air supply tends to counteract the error. Tables IV. and V. show that the error in one direction remains unchanged—viz., 1·45 B.Th.U.; but in the other direction it increases from 1·72 to 2·51 and 3·30 B.Th.U. when the air supply is in excess 25 and 50 per cent. respectively. The range of variation possible thus becomes 3·17, 3·96, and 4·75 B.Th.U. respectively.

Table VI. shows the relationship of the rate of air supply to the relative humidity which secures freedom from error.

TABLE VI.

Percentage of Excess of Air.		Relative Humidity Corresponding to no Error.	
0	..	69°4	..
12°5	..	72°8	..
25°0	..	75°5	..
37°5	..	77°7	..
40°0	..	78°0	..
50°0	..	79°6	..

It is worthy of note as to humidity that the average at Greenwich for each hour of 1906 was 78, while for the same period for the nine hours each day, from 8 a.m. to 5 p.m., it was 69·3 per cent.



Having ascertained the magnitude of the several disturbing factors, it now remains to be seen how a combination of these may compare with the correction which is applied by those who work according to the instructions of the Gas Referees.

Tables VII. and VIII. show that the factors at work are diversified in their effect, and that the rule for correction adopted by the Gas Referees leaves untouched the observational errors as they affect the condensation figure. As their correction applied to the gross value also includes radiation, and to that extent must

differ from the results that are here set forth, it is apparent that it is incomplete, by reason of its ignoring the atmospheric humidity. It is noteworthy that for the three examples worked out in Tables VII. and VIII. the maximum error as to the net value is  $\pm 0.127$  Cal. for each degree difference between the inlet and outlet gases, and this concurrently with its irregular distribution in the gross value and the condensation figure. It would appear that a final record of 1.39 Cal. too low in the net value is one calling for attention where accuracy is required. Any modification of the system of correcting should evidently take into account the factors that are in operation within the instrument, and apply a specific correction for each of them.

TABLE VII.—Effect of Combination of Factors under Declared Conditions Compared with the Referees' Rule.

	Adding to the True Values in Calories.		Adding to the True Values in Calories.		Adding to or Taking from the True Values in Calories.		Remarks.
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	
Sensible heat. . . . .	0.120	0.000	0.12	0.00	+0.19	+0.00	Exit gases leaving 3° C. below temperature of air entering. General result: Approximately 0.38 Calorie too little assigned as the net value of the gas.
Change of moisture . . . .	0.24	0.240	0.24	0.24	+0.24	+0.24	
Effect of change of volume of products and relative humidity . . . . .	0.363	0.363	0.00	0.00	-0.83	-0.83	
Total or net disturbance	0.723	0.603	0.36	0.24	-0.40	-0.59	
Referees' rule deducts . . .	0.500	0.000	0.50	0.00	0.50	0.00	
Leaving the record too high	0.223	0.603	..	0.24	..	..	
" " " low	..	..	0.14	..	0.99	0.59	
Degree of air saturation	Fully Theoretical.		69.4 per cent. Theoretical.		33.3 per cent. 50 p. c. excess.		
Rate of air supply . . .							
	Increasing or Reducing the True Values in Calories.		Reducing the True Values in Calories.		Reducing the True Values in Calories.		
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	
Sensible heat. . . . .	0.120	0.000	0.12	0.00	0.19	0.00	Exit gases at 3° C. above temperature of air entering. General result: Approximately 0.38 Calorie too much assigned as the net value of the gas.
Change of moisture . . . .	0.24	0.240	0.24	0.24	0.24	0.24	
Effect of change of volume of products and relative humidity . . . . .	-0.363	-0.363	0.00	0.00	0.83	0.83	
Total or net disturbance	-0.003	-0.123	0.36	0.24	1.26	1.07	
Referees' rule adds. . . . .	0.500	0.000	0.50	0.00	0.50	0.00	
Leaving the record too high	0.503	0.123	0.14	..	0.76	1.07	
" " " low	..	..	..	0.24	..	..	

TABLE VIII.—Effect of Combination of Factors when Outlet Gases are 11° C. below Inlet.

Description.	Adding to the True Value in Calories.		Adding to the True Value in Calories.		Deducting from or Adding to the True Value in Calories.		Deducting from or Adding to the True Value in Calories.		Adding to the True Value in Calories.	
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.
Sensible heat. . . . .	0.44	0.00	0.44	0.00	0.68	0.00	0.56	0.00	0.56	0.00
Change of moisture . . . .	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Change of volume of products and relative humidity . . . . .	0.363	0.363	0.00	0.00	-0.83	-0.83	-0.63	-0.63	0.00	0.00
Total deviation . . . . .	1.683	1.243	1.32	0.88	0.73	0.05	0.81	0.25	1.44	0.88
Referees' rule deducts . . .	1.833	0.000	1.833	0.00	1.833	0.00	1.833	0.00	1.833	0.00
Leaving the record too high	—	1.243	—	0.88	—	0.05	—	0.25	—	0.88
Leaving the record too low	0.150	—	0.513	—	1.103	—	1.023	—	0.393	—
Degree of saturation of air	Fully Theoretical.		69.4 per cent. Theoretical.		33.3 per cent. 50 per ct. excess.		33.3 per cent. 25 per ct. excess.		75.5 per cent. 25 p. ct. excess.	
Volume of air supply . . .										
Leaving the net calorific value too low after the application of the Referees' rule . . . . .	1.393		1.393		1.153		1.273		1.273	
					Gross.	Condensation.				
					0.64	0.00				
Sensible heat . . . . .					0.88	0.88				
Change of moisture . . . .					0.00	0.00				
Change of volume of products and relative humidity . . . . .					1.52	0.88				
Total deviation . . . . .					1.833	0.00				
Referees' rule deducts . . .					—	0.88				
Leaving the record too high					0.313	—				
" " " low										
Degree of saturation of air					78 per cent.					
Volume of air supply . . .					40 p. ct. excess.					
Leaving the net calorific value too low after the application of the Referees' rule . . . . .					1.193					

Probably they would need to be somewhat of the following nature :—

- 1.—The correction for sensible heat, per degree cent., to be 0.051 Cal. when 25 per cent. of air in excess is employed, and 0.0623 Cal. where 50 per cent. excess obtains; and it should be confined to the gross value.
- 2.—The correction for change of moisture, which operates in the same direction as the preceding one, should be double that—viz., 0.1 Cal. and 0.12 Cal. respectively—and needs to be applied to both the gross and the condensation values.
- 3.—The change due to shrinkage of the products, approximating 0.363 Cal., applied to both the gross and condensation values.
- 4.—The change due to departure of the air from complete saturation, approximating (a) 0.012 Cal. for each 1 per cent. falling off, when the theoretical volume of air is passed through; (b) 0.015 Cal. when 25 per cent. excess is used; and (c) 0.018 when 50 per cent. excess air is passed through. Applied to both the gross and the condensation values.
- 5.—Changes due to radiation from the calorimeter.

It is obvious that the application of the necessary corrections, or even knowledge that they were negligible, would involve the determination of the relative humidity of the air and the composition of the waste gases.

Ascertaining Relative Humidity.—When air is relatively stagnant, it is a much more difficult thing to ascertain its humidity than when it is moving freely; and to provide for the former case, which usually applies to any room, a fan must be employed in conjunction with a dry-bulb and a wet-bulb thermometer, constituting essentially a Richard Assmann psychrometer. As an alternative, a gravimetric test of the atmospheric moisture may be made; and this, upon the authority of Mr. W. J. A. Butterfield,\* can be carried out by a two minutes' absorption, with an error of not more than 1 per cent. of the moisture present.

It is clear, therefore, that where accurate calorimetric returns are desired, there is no valid objection,

either as to time or complexity, in ascertaining the important factor of relative humidity. As most of the doubts in calorimetry are assembled in the condensation figure, as is shown by many published returns, it is surely desirable that a series of experiments of this kind should be made.

COMPOSITION OF THE WASTE GASES.

In order to compute the degree of excess of air passing, it is sufficient to ascertain the carbonic acid by absorption with caustic alkali, the oxygen by absorption with alkaline solution of pyrogallic acid, and the nitrogen by difference. The sample may be taken from one of the holes on the circumference of the cover of the Boys calorimeter; and some idea of its probable volume composition may be seen by an inspection of Tables IX. and X.

\* See "JOURNAL," Vol. CVI., p. 373.



TABLE IX.—Effect on Composition of Exit Gases of Excess Air Supply.

Experimentalist . . . .	(1) Butterfield	(2) Butterfield.	(3) Coste.	(4) Coste.
Rate of gas consumption per hour	5'00	5'00	4'60	4'60
CO <sub>2</sub> produced per cent. of original volume of gas . .	61'36	61'36	56'00	57'10
Carbon dioxide, per cent. . .	8'00	8'75	8'76	8'52
Oxygen . . . . .	7'00	5'68	6'17	6'47
Nitrogen . . . . .	85'00	85'57	85'07	85'01
Carbon dioxide } In cubic feet	0'613	0'613	0'560	0'571
Oxygen . . . } per cubic ft.	0'537	0'398	0'395	0'433
Nitrogen . . . } of gas burnt	6'517	5'998	5'444	5'696
Total exit gases in cubic feet .	7'668	7'010	6'399	6'700
Air to gas burnt . . . . .	8'250	7'600	6'900	7'200
Excess of air supply per cent.	44'890	33'300	37'500	40'100

With the first sample of Table IX. it was found that with 8'25 of air to 1 of gas the effluent gas contained 7 per cent. of oxygen, which by the writer's computation is equivalent to 44'89 per cent. of excess air supply. With the same gas, with diminished air supply—viz., 7'6—the effluent gases contained only 5'6 per cent. of oxygen, and there was no combustible matter present. The altered proportion of air was secured by closing one of the five holes on the calorimeter cover. It then amounted to 33 per cent. excess. Columns 1 and 2 have been calculated from Mr. Butterfield's experimental data; and columns 3 and 4 from those of Mr. Coste—the excess air in the last-named tests being 37'5 and 40 per cent., or an average of 38'8 per cent.

TABLE X.—Effect on Exit Gases of Excess Air Supply.

[Computed from an Analysis of Gas from the St. Helens Vertical Retorts.]

Carbon dioxide per cent. . .	10'62	6'94	8'474	7'63
Oxygen . . . . .	0'00	7'64	4'660	6'30
Nitrogen . . . . .	89'38	85'42	86'866	86'07
Carbon dioxide } In cubic feet	0'49	0'50	0'50	0'50
Oxygen . . . } per cubic ft.	0'00	0'55	0'27	0'41
Nitrogen . . . } of gas burnt	4'12	6'15	5'13	5'64
Total exit gases in cubic feet .	4'61.	7'20	5'90	6'55
Air to gas burnt . . . . .	5'18	7'81	6'50	7'15
Excess of air supply per cent.	none	50'00	25'00	37'50

Note.—The quantity of moisture in the exit gases is not here stated, but is given in Sections III. to V. of Table I. (*ante*, p. 356).

Table X. shows how a rise in the air supply to the specific sample of gas affects the percentage composition of the products. The incidence of this factor in the corrections required for various rates has already been given; and from Tables IX. and X., it appears that about 37'5 per cent. excess may be looked for with the Boys instrument. Especially is this so when the gas burnt per hour is proportioned to its calorific value, as then, within the limits of the capacity of the instrument, it is to a certain extent self-adjusting.

(To be continued.)

### American Gas Institute and the Pipe-Thread Question.

The volume of proceedings of the American Gas Institute for the past year which was noticed in the "JOURNAL" last week contains the report of the delegates of the Institute (Mr. A. G. Glasgow and Mr. Van der Willigen) to the second conference of the members of the Commission on the Unification of Pipe-Threads for Gas Appliances organized by the Société Technique du Gaz, held in Paris last June. The summary and conclusions of the report show that, with regard to the profile and taper of thread, the American Briggs system has been accepted; as to diameters, the 17 mm. size has been reduced to 16'5 mm., and the 60 mm. size to 59'5 mm., making them no longer interchangeable with  $\frac{3}{8}$ -inch and 2-inch pipes respectively; and with respect to pitches, 2'30 mm. (11 threads per inch) has been decided upon for diameters from 33 to 114 mm. inclusive, thereby adopting the British standard instead of the American pitches of 11½ threads per inch from 1 inch to 2 inches, and 8 threads per inch from 2½ to 4 inches. The delegates recommend the conditional approval by the Institute of the pitches adopted at the conference, and the concentration of the entire American influence upon securing, as far as possible, diameters that will be interchangeable with the Briggs standards. In connection with this subject, it may be mentioned that Mr. J. W. Helps, the President of the Institution of Gas Engineers, represented that body at the conference; and his report appears in their "Transactions" for last year (p. 293), as reprinted from the "JOURNAL," Vol. CVI., p. 885.

"All the great public services partaking of the nature of a monopoly, such as water, lighting, and means of communication, should be in municipal hands," says Sir John Benn, the leader of the "Progressives." "Well," says the "Financial News," "the water supply of London is already under the control of a public body—the Water Board—with such results that London has over and over again wished it were possible to get rid of it, and to replace the old Water Companies in their control of the supply."

## VISIT TO THE VOELKER MANTLE FACTORY

By the London and Southern District Junior Gas Association.

A pleasant and instructive afternoon was spent last Wednesday at the mantle works of the Voelker Lighting Corporation by those members of the London and Southern District Junior Gas Association who were fortunate enough to be able to take advantage of an invitation by the Directors to inspect the factory. Considering that the visit took place in mid-week (so that everything might be seen in full swing), the attendance was a very large one; the visitors numbering between fifty and sixty. To show so large a party as this over the works at one time was a big undertaking for the management; but owing to the excellent arrangements that had been made, the inspection was of a thorough character—each member having ample chance of seeing and appreciating every point of interest (and there were many) about the place. This end was accomplished primarily by the splitting up of the visitors into quite small parties, so that crowding was avoided and all could keep in close touch with the guides. On arrival, it must be mentioned, the visitors received a hearty welcome by Mr. C. E. Masterman (a Director), Mr. C. R. G. Bowden (Manager and Secretary), Mr. F. Barnes Grundy (Chemist and Works Manager), and Mr. W. E. Fisher (City Representative), by whom, and other members of the staff, they were subsequently taken in hand. Mr. T. D. Asten, the Chairman of the Company, was unfortunately away in the United States.

The works of the Voelker Lighting Corporation (which are in Garratt Lane, Wandsworth, S.W.) do not, on approach, present an imposing appearance; but entering them it is soon perceived that they are well adapted for the purpose to which they are put. The site on which they stand comprises some 2 or 3 acres; and the ranges of buildings in which the processes of manufacture are carried on are single storey ones, which is found to be an advantage in various ways. At the busiest season of the year, employment is found for some 500 hands—which will give some idea of the business that is carried on. Of course, much of the work is done by machinery; but nevertheless each mantle, in process of manufacture, passes through the hands of perhaps more than a dozen workpeople, practically all of whom are women and girls. The evenness and rapidity with which they carry out the various tasks allotted to them—in fact, the smoothness with which everything in the factory proceeds—is one of the first points that strike a visitor; while another is the cheerful and well-ordered appearance of the workers, which speaks well for their employers.

The vital importance of the incandescent mantle to the gas industry in the present day, must under any circumstances have rendered a visit to a factory of this kind of value to a body like the London and Southern District Junior Gas Association; but in the case of the Voelker works, it may fairly be said that an additional element of interest attached to the inspection on account of the product being an "All British" mantle. All sorts and sizes of mantles are made. Indeed, nowadays requirements vary so much that adding together all the different qualities, shapes, sizes, &c., turned out by the Company, the total would probably reach several hundreds. As already remarked, all these are British made right through. The ramie fibre which forms their base is obtained from Yorkshire; and from this stage the manufacturing operations are all carried on in the works. The first process of knitting the yarn into single or double woven "stockings" (according to the style of burner on which the mantle is intended to be used) is carried out by the aid of a large number of machines; and here, of course, no labour is required, beyond the supervision of the machines themselves. The next stage is an important one; consisting, as it does, of washing, purifying, and drying the fabric. Ramie resembles cotton in the matter of being cellulose; and it is necessary to get out all the dirt, grease, resins, and ash. What the Company aim at, of course, is to get a mantle fabric that burns completely away, and leaves simply the rare earths. For the washing, there are distilled daily on the works about 1000 gallons of water. After the final washing in weak acid, the fabric is placed in centrifugal driers; and then it is taken to the drying-room. Up to this point, the fabric is in long strips; and in the drying-room these strips are stretched over steam-coils. When thoroughly dry, the fabric is rolled up again, preparatory to being cut into the lengths required.

It is in some of the processes of manufacture subsequent to this that one sees long rooms filled with active-fingered workpeople. For instance, in the very next stage the cut lengths (for the better quality of mantles) have narrow bands of tulle—or what is really mosquito netting—sewn round the tops. Then the mantles are soaked in what is technically termed the lighting fluid. They are dipped by girls wearing rubber gloves into the thorium solution, and placed on a revolving band which passes them between two rollers. By this means all the surplus liquid is squeezed out; the impregnating material which is left being spread quite evenly over the fabric. Later on the mantle heads are treated with a chemical and aniline dye solution, for the purpose of toughening them, and so preventing the breaking away of the asbestos loop. The dye has, of course, nothing to do with the toughening process, and, in fact, comes out during the burning-off; but it serves the useful purpose of indicating infallibly whether the mantle-head has been covered with the hardening solution. The sewing-rooms—rapid machines and as



rapid girls—perform their part of the process; and at this stage, one pauses to admire the ingenuity of a machine which, on one movement, threads the waxed asbestos loop through the top of a mantle.

The mantle has by this time approached a stage at which the individual skill of the worker is an all-important factor—that is to say, it has to be shaped. For this purpose, it is taken to what is called the "seasoning room," so that the girl who is subsequently going to treat the mantle may first of all shape it. This shaping is done on a wooden model; and it is found that each girl is able to do her own shaping in the way best suited to her own seasoning. In fact, these parts of the process of manufacture depend so entirely on the personal element that really every girl has to see her own mantles through. When they have been shaped, the mantles are sent to one of the burning-off rooms, where all the ramie is removed, and only the chemicals—thorium and 1 per cent. of cerium—are left behind. This accomplished, they are returned to the girls who shape them, and are by them seasoned by means of gas at about 10 lbs. pressure. To season a mantle rightly, requires several years' practice on the part of the operator; and even after long training, it is not every girl who can do it properly. It is really skilled labour of quite a high order. The gas for these processes is taken from the mains of the Wandsworth and Putney Gas Company through a 1000-light meter by Messrs. Thomas Glover and Co.; and then the portion that is required to be under high pressure is compressed. There are separate burning-off and seasoning rooms for vertical and inverted mantles.

The final process is, of course, the collodionizing, by which the mantles are rendered fit for transport. They are then ready to be sent to the packing rooms. There is, however, one more point about the Voelker works that is worthy of notice, and that is the system of testing which has been adopted by Mr. Grundy. The rule is to take for this purpose samples of every girl's work; but no girl in the seasoning room knows which particular bar of mantles that she turns out is going to be tested. Each girl has a number; and Mr. Grundy goes round, puts labels on such bars of mantles as he may select; and they are taken to the testing-room. Particulars of these tests are entered in a register, so that a record is kept of exactly what happens to the work of each girl as it is tested.

At the conclusion of the inspection, the visitors were invited to partake of tea and other refreshments; and after ample practical appreciation of this hospitality had been manifested, there was a little speech-making appropriate to the occasion.

The PRESIDENT (Mr. W. J. Liberty) remarked upon the pleasure he felt at seeing so many juniors around him. The fact that so many members had turned out on an afternoon in the middle of the week fully justified the visit. They were delighted to be at the Voelker mantle works, not primarily because it was the Voelker mantle works, but because it was a mantle works; yet they were all glad to be at this particular mantle works, because there was so much to be seen there. It was about a quarter-of-a-century since Welsbach first applied the bunsen flame to make heat supply light; and soon afterwards, a German gentleman, hot from the works of Welsbach himself, came to the City of London and called at the Guildhall, with a request to be allowed to put up what he called a "stocking," to show what he could do at 1s. 3d. each. The "stocking" was a very fragile affair; and on the day after it was fixed, when he (the President) turned up at his desk over which the arrangement had been placed, he found a little heap of dust on his blotting-pad. That was the end of the first Welsbach mantle he knew of in the City. How things had altered since that time, they were all aware. When, however, the visit to the Voelker works at Wandsworth was arranged, he for one had no idea of their ramifications. He did not at all expect to see a factory of the magnitude of that which they had just inspected. They were under a deep debt of gratitude to the Company for giving them permission to visit the works, and to the gentlemen who had so completely placed themselves at the disposal of the members. The staff had given up to the Association time which could have been otherwise employed; and they had taken the members round in small parties so that nothing should be missed. When he mentioned that many of those present had come from outlying places in the Southern district, it would be understood how fully the privilege of visiting the works had been appreciated. They had seen the process of manufacture from first to last—nothing had been hidden from them. They had inspected a mantle works where they really made a British mantle; and in view of what the firm had proved themselves able to accomplish, he felt confident that there was a great future in store for the Company. They all heartily wished success to the undertaking, because it was a British works.

Mr. F. AINSWORTH (Ilford), proposing a cordial vote of thanks to the Voelker Company, remarked that everything possible had been done to enable the visitors to see all that there was to be seen about the works. Those who had acted the part of guides had taken pains to give the fullest possible explanation of each process and piece of apparatus. The manufacture of mantles seemed to be very complex, for he understood that each one passed through about fourteen hands on the works. It must be a boon to the neighbourhood to have a factory which employed so many people; and it could be easily seen that the workers were well treated. It appeared strange, while the gas industry was

talking about a pressure of (say) 54 inches, to find that the seasoning of the mantles was carried out under a pressure of about 10 lbs. He would have thought this was almost impossible. It gave him the greatest pleasure to propose a hearty vote of thanks to the Company for the hospitality they had extended to the Association, and to the staff for their trouble in showing the members round.

Mr. STANLEY BEVINGTON (Croydon) seconded the vote, and said the works had been a very agreeable surprise to him. When he was leaving for Wandsworth, Mr. Helps said to him "Mind you learn something." Well, he thought he had certainly done so; and he believed that this was the case with all the other members as well.

Mr. T. F. CANNING (Ilford), in supporting the motion, said it had been most interesting to see the mantle go through all the stages of its manufacture; and the experience they had thus gained must be of assistance to all the members in connection with their daily work.

Mr. S. A. CARPENTER (Hon. Secretary) remarked that at the first glance a mantle seemed quite a simple thing; and no one who had not been over a factory such as this would realize how many processes had to be gone through in making it.

Mr. E. PILBROW said that he had had great pleasure in joining the Association in the visit; and he was glad to support the vote of thanks which had been proposed.

The vote having been carried by acclamation, Mr. C. E. MASTERMAN (a member of the Board) said that in the absence of the Chairman, Mr. T. D. Astén, who had been called away suddenly to the United States, it fell to his lot to thank the members for the kind way in which they had acknowledged the little efforts that had been made to give them a hearty welcome. It had always been the policy of the Company to try and produce the best mantle; and they wished their reputation to rest upon this, and not upon the cutting of prices, or anything of that kind. They were anxious that their customers should know they could rely upon them to supply the very best article that they could, compatible with the difficulties of which the members had already gained some idea. They could not secure the best article were they not a united works, and were not all branches of the staff working with one aim and object in view. The members had expressed appreciation of the Company's methods; and he thought any success they might claim for the mantles which they turned out was due very largely to the facts he had mentioned. If it was a works divided against itself, he was sure their mantles would fall. It was a small Board—there were only three members—and they had worked harmoniously together for a considerable time. He believed he was the oldest Director; but the most hard-working one was Mr. Astén, who was ably seconded by Mr. Bowden. The members had seen the works; and he need not therefore say anything about Mr. Grundy, who (as the excellent condition of everything proved) received hearty support from the other members of the staff. It had been mentioned by the speakers that everything had been thrown open to the visitors. The Board thought the time had come when scientists knew how the mantle was produced. The principal trade secret now was—"Skill, care, and patience." If they had all these qualities, and exercised them to the utmost, they would turn out good work; and though occasionally small matters might crop up which the Company would not wish immediately to give away, still these constituted a very minor detail compared with the three essentials he had mentioned. The good treatment of the employees had been alluded to. Well, the Company could not secure good results from discontented workpeople; and their aim had been to make the conditions the best possible. The undertaking had gone through much litigation at the outset; and it had only been by patient perseverance that they had arrived at the point where they were doing a quiet, steady business. They wished the representatives of the gas industry to realize how mantles were made. The management did not mind honest criticism if anything slipped by them; but they took care that nothing slipped by them which an honest man might not send out to his customers. He thanked the President and the other speakers for the kind things which had been said; and trusted this would not be the last visit which the Association would pay to the factory of the Voelker Lighting Corporation.

The party then separated.

#### Southern District Association of Gas Engineers and Managers.

—We learn from Mr. A. F. Browne, the Hon. Secretary, that the next general meeting of the Association will be held on Thursday, the 10th prox., at the Hotel Cecil, at four o'clock, when Mr. C. Stafford Ellery, of Bath, will read his Presidential Address, and Mr. James Paterson, of Redhill, will take over the duties of Honorary Secretary and Treasurer.

**Recent Wills.**—Alderman G. Awburn Allan, the Chairman of the Walker and Wallsend Union Gas Company, whose death, in his eightieth year, was recorded in the "JOURNAL" for the 11th ult., left £4076. Sir William Lloyd Wise, founder of the Chartered Institute of Patent Agents, who died on the 6th ult., at the age of 64, as mentioned in the "JOURNAL" shortly afterwards, left estate of the gross value of £36,522, of which the net personalty has been sworn at £25,118. Mr. Thomas Appleby, the Chairman of the Hartlepool Gas and Water Company, who died on the 20th of November last, left £116,954.



## MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Saturday afternoon at the City of Birmingham Technical School—the PRESIDENT (Mr. A. O. Jones, of West Bromwich) in the chair. It had originally been arranged that two papers should be read; but the author of one of them was unable to fulfil his promise, in consequence of a change in his position. The only business before the meeting, therefore, was a paper by Mr. P. C. BALCON, of the Central Laboratory, Birmingham, on "Gas-Works Calorimetry." This, however, proved quite sufficient to occupy the time at disposal; for it was followed by a lengthy discussion, which had reference to some extent to details of the apparatus which the author described. Specimens of the various calorimeters were on view; and this, of course, lent an additional interest to the contribution. Further than this, at the conclusion of the paper, Mr. Balcon exhibited a series of lantern slides showing sections of the different instruments.

The PRESIDENT (after the minutes of the previous meeting had been read) expressed his regret that the second contribution had fallen through, and then called upon

Mr. P. C. BALCON (Birmingham), who read the following paper.

### GAS-WORKS CALORIMETRY.

*Apropos* of the recent acceptance of a calorific value penalty clause by the Gaslight and Coke Company, to avert opposition by the London County Council to their Bill in the last session of Parliament, I might point out that, while the illuminating power of the gas supplied by a large undertaking varied during a long period as much as 20 per cent., the calorific value did not vary more than 7 per cent. It will be seen that the calorific value is practically constant; and that provided the illuminating power is kept within certain limits, there is no necessity to take special measures to maintain the calorific value steady, because it will remain so. I do not make the statement that calorific value is a function of illuminating power, or that it varies as the illuminating power varies. But I do say that, provided you are dealing with gas of fairly constant composition, it is possible to maintain a fairly constant calorific value, provided you see that the illuminating power is kept within reasonable limits. The limits which have been put in the Act of the Gaslight and Coke Company with regard to calorific value, give little cause for apprehension and for the outcry against the double penalty. If they keep their illuminating power at the limit of 14 candles and supply a mixture of coal and water gas with very little (if any) benzole enrichment, there should be no reason why a calorific value of 112·5 calories or 446 B.Th.U. should not be maintained. The introduction of the calorific value penalty is a step in the right direction for many reasons, and especially from the point of view of the chemist.

The calorific value test is an absolute measure of the gas value, and is not influenced by burner construction or physical outside influences, such as affect a gas-flame burning on a photometer. Provided the gas is completely burnt, and the calorimeter is properly constructed, there is no possibility of uncontrollable error creeping in. Then, again, the personal element is so much less likely to influence a calorimetric test than an illuminating power test; the personal work consisting only in reading two thermometers and reading a meter correctly.

In using the calorimeter as the measure for selling gas, none of the objections to illuminating power tests hold good. The calorimeter is practically automatic. Atmospheric conditions appear to affect the result scarcely at all, and the results can be expressed in absolute units.

After this short digression, I should like to describe a few of the instruments in use generally for the purposes of gas-works testing.

The first instrument is, of course, that prescribed by the Gas Referees for use in London, and the instrument upon which the gas supplied by the London Companies is tested. It was invented by Professor Boys for this special purpose. It makes use of the principle generally adopted in gas calorimeters—*i.e.*, heating a measured quantity of water with a measured quantity of gas, and noting the rise in temperature; the calorific value being obtained from the following formula:—

$$\text{C. V. in Cals. per cub. ft.} = \frac{\text{Diff. in temp.} \times \text{Wt. of water in kilos}}{\text{Volume of Gas.}}$$

$$\text{Cals.} \times 3\cdot968 = \text{B.Th.U. per cubic foot.}$$

The Boys calorimeter consists of three separate parts: (1) The base carrying the pair of burners and a regulating tap; the upper surface being covered by a bright metal plate and three centreing blocks which carry the body of the calorimeter. (2) A bright cylindrical vessel provided with a central copper chimney and a condensed water outlet. (3) The essential portion of the calorimeter, supported by the rim of the vessel (2), and attached to the wooden lid, which also carries the inflow and outflow arrangements and the thermometers.

Starting from the outflow end, we find a temperature equalizing chamber consisting of two dished plates of thin brass, held in place by three thin brass scrolls. The lower portion of this chamber is kept cool by the circulating water, the channel for which may be made in the solid metal on the right side, or may be a tube sweated-on on the left side. Connected to the water-channel at the

lowest point, by a union, are five or six turns of copper pipe, such as are used in a motor-car radiator of the Clarkson type. On this, a helix of copper wire threaded by copper wire is wound, and the whole is sweated together by being immersed in a bath of molten solder. A second coil of pipe of similar construction surrounding the first is fastened to it at the lower end by a union. This terminates at the upper end in a block to which the inlet water-box and thermometer holder are secured by a union. An outlet water-box and thermometer holder are similarly fixed above the equalizing chamber. Between the inner and outer coils is placed an annular insulating brattice made of thin brass and containing cork dust. The upper space in this is closed by a wooden ring, and is inserted in molten resin to protect it from any drops of water which may condense upon it. This insulator is carried by an internal flange which rests upon the lower edge of the casting which forms the outlet-box. A cylindrical brass wall, a little smaller than the diameter of the containing vessel, is fastened to the lid, so that when the calorimeter is lifted out of the vessel, the coils are protected from injury. A regular supply of water is maintained by connecting one of the two outer pipes of the overflow funnel provided to the tap, and fastening the funnel about 1 metre above the apparatus. The other outer tube is connected to the apparatus through a short brass tube containing a diaphragm in which is a hole 2·3 mm. diameter. The flow of air to the burners is determined by the degree to which the passage is restricted at the inlet and outlet. The metal centring blocks are made of  $\frac{1}{8}$ th inch metal, to restrict the passage of air at the inlet. The holes in the lid, which determine the restriction at the outlet, are five in number, and  $\frac{5}{16}$ -inch diameter. The thermometer for taking the temperature of the outlet gases is fixed in a sixth hole. A glass vessel should be provided, containing a solution of sodium carbonate and the calorimeter after use should be lifted out and placed in this until again required for use.

This calorimeter gives extremely consistent results; but it requires to be used by an experienced person, or errors are liable to creep in. It also has a few constructional disadvantages; the most important being that it has luminous burners, thus precluding its use for rich gases. The others are merely mechanical, and can easily be overcome. For instance, it should be unnecessary to have to lift the whole body of the calorimeter off when lighting up. This may be of little moment in a testing-station similar to those in London, where the examiner has only one or two tests to make, and so lights up before placing the calorimeter in position; but where the operator has to perform as many as five or six tests on different gases, it becomes burdensome. Again, in my opinion it is a serious mistake to have the condensed-water drip in its present position; it being necessary to fill up to the level of this before commencing to test. The reason that this is disadvantageous is that the calorimeter, containing, as it does, a quantity of water just flush with the drip-pipe, must not in the slightest way be moved or disturbed during a test, as the smallest jerk may cause water to be bumped over into the receiver for condensed water, and so render the observation useless. It is also necessary with this calorimeter to take the condensation over a much longer period than is necessary for the actual test for gross value, as the water is delivered in a very jerky manner. The drip-pipe could easily be brought from the bottom of the vessel (which should also be given a slight slope), and so avoid the really unnecessary danger of spoiling a test by slightly disturbing the calorimeter.

An instrument which gives most accurate and consistent results, which can be used for any grade gas, and also which is probably more used than any other, is the Junkers apparatus. This calorimeter is probably the most useful of all the apparatus in present use for determining the calorific value of gases. The only alteration necessary to make in the instrument for use with gases of varied richness is in the injector-nipple. This is easily removed and replaced by one either larger or smaller, as required. Two nipples are supplied; and as the burner is an atmospheric burner giving complete combustion, there is a wide range of grade for each size; so that only when one comes to producer and such gases is it necessary to use a large nipple.

The apparatus is made in two forms—the standard type and the technical type. The standard apparatus consists of a combustion chamber formed by an annular copper vessel; the annular space being traversed by a number of copper tubes (about fifty), connecting the roof with the bottom of the chamber. The products of combustion pass through these tubes in a downward direction; while the water passes upwards outside them. The waste gases are thus cooled to the temperature of the inlet water, and pass away through a side conduit. The water which condenses in the apparatus falls to the bottom, and drains from a small tube into a measuring cylinder. The pressure of the water is kept constant by means of an overflow funnel; and the water leaving the apparatus has also to pass over a funnel, thus keeping always quite full. The rate of flow is adjustable by a quadrant cock (not, as in the Boys apparatus, by means of a permanent hole in a diaphragm); and it passes over the bulb of a thermometer just before entering the apparatus. The whole is jacketted with a bright plated copper jacket, to prevent loss by radiation. The technical apparatus differs from the standard type only in slight modification of constructional details; and these only tend to make the instrument more compact, and so more portable than the more elaborate type, while it is also slightly cheaper. The results it gives are very reliable, and are quite consistent. I have experience of a series of tests of a Junkers calorimeter of the technical type against a standard instrument; the difference in



the results being no more than 0.2 per cent. The newest form of Junkers calorimeter possesses the advantage of having the two thermometers at the same level, so that they can be more easily read.

Another apparatus much used in this country is the Simmance-Abady calorimeter. This is a very useful and cheap form of apparatus, which gives good results; my only quarrel with it being that it is too cheaply constructed. It depends upon the same principle as the apparatus already dealt with, but in place of the tubes, it has concentric annular copper vessels. The water flows upwards in the annular spaces, and the gases flow in the opposite direction outside them. The apparatus is carefully lagged with wood, to prevent radiation losses. An advantage which this instrument possesses over the older Junkers instruments is that the thermometers are placed at the same height; but, as already explained, the drawback referred to has been done away with in the latest form of Junkers calorimeter. This advantage, I might point out, is also shared by the Boys calorimeter.

May I now proceed to the actual test. Certain precautions are necessary to enable the results obtained to be properly comparative, and I might say reliable, and will do a great deal to increase the comfort of the operator. It is essential that the temperatures of the inlet and outlet water be maintained as nearly constant as possible, and also that the water supply should be as nearly as practicable independent of supplies which are liable to be suddenly started or stopped. Further, it is essential that it be maintained at a fairly equable temperature. This is best ensured by having a tank large enough to contain sufficient water for a number of tests, and placed at a convenient height to get a good head. It should, of course, not be supplied by an automatic arrangement, but should be filled up when the series of tests is completed, and so left until again required for use. The water will thus be able to attain a temperature near that of the atmosphere, and will also be at the same temperature throughout. It is quite easy, with the thermometer lenses supplied, to read the thermometers to 1-50th of a degree. This may appear to some to be an unnecessary refinement; but the test is so absolute that this gives additional accuracy at very little trouble, and so, of course, should not be disregarded. It is foolish to attempt to get reliable and consistent results with only a small quantity of water and gas used. If possible, at least 5 litres of water should be passed. Another refinement which should be employed, and which tends towards increased accuracy, is the graduation of the flask or vessel into which the water is delivered, to read grammes of water, and not cubic centimetres. The thermometer at the outlet should be read at least every half-minute during the test, and the inlet thermometer every minute, and the averages used in calculating the difference in temperature. The Gas Referees require a correction for the temperature of the gases leaving the instrument; but as in almost every case this is lower than atmospheric, it is not necessary for works' purposes. An excellent method of recording results is that adopted by Dr. Davidson at the Birmingham works, and which I give here.

Gas Tested.			
Date.	Hour.	I.P.	
Vol. =	at	°F. and	
Vol. at 60° and 30" =	x	=	(v)
Weight of Water Used (x) Kilos.	Volume of Condensed Water. (y) C.C.	Temperature Inlet. C.	Temperature Outlet. C.
$x \times d \div v = \text{gross Calories}$ $= x \div \frac{v}{d} =$ (g) $g - \frac{y \times 0.6}{v} = \text{net Calories}$ $= - \times 0.6 =$ (n)			
$g \times 3.968 =$ B.Th.U. gross. $n \times 3.968 =$ B.Th.U. net.			
Averages . . . . .			
Difference =		(d)	
Initials			

A number of attempts have been made within recent years to introduce recording calorimeters, the most successful of which are the Junkers and the Beasley.

The Junkers apparatus is one which records gross value and is similar in construction to the ordinary Junkers calorimeter. It is fitted with a regulating arrangement which consists of combined water and gas meter. As these two deliver constant quantities of gas and water, it is very easily seen that the rise in temperature is directly proportional to the calorific value. This rise is measured by a thermo-couple which actuates a needle and a pen. The gross value can thus be either read upon a galvanometer scale or recorded upon a chart. The apparatus is much used on the Continent.

The Beasley apparatus is an English attempt at recording calorimetry, and it does its work well. It consists essentially of a U tube communicating at both ends with reservoirs containing floats arranged differentially. The one limb of the U tube is formed by an annular vessel, in the central space of which is burnt the gas under record. The U tube is filled with an oil of fairly

high specific gravity; and both the limbs are fitted with surface plates, to ensure perfect radiation, and so increase the sensitiveness of the instrument. The expansion of the oil in the warm limb is used to measure the heat value of the gas. The oil expanding raises the float in its own particular reservoir, and so causes the needle attached to the differential shaft to make a movement. The pen is attached to the lower end of the needle, and a clockwork arrangement is used to move a chart under the pen. It was found difficult at the commencement to make a perfect governor to regulate the supply of gas and keep it perfectly constant; but an ingenious arrangement has been adopted which effectually overcomes this. A meter is used in conjunction with a pendulum escapement; and the shaft is connected to the clock attachment by means of a fairly large watch spring, to prevent the meter being pulled up by the jerk of the pendulum. This, combined with a small anti-fluctuator of the gas-bag type, has been found to effectually regulate the gas supply.

Of course, the difficulty with all recording instruments of this type is that they do not correct themselves for temperature and barometric pressure. But a correction table is easily worked out and the necessary corrections applied to the indicated reading. Where calorific value is of importance—as it now is wherever gas is made and supplied—an instrument of this type is invaluable, as it enables an eye to be constantly kept upon the quality of the make. This is of importance in these days of large makes; and it also enables us to sail much nearer the mark than would be possible if only assisted by laboratory tests. This apparatus for all time disposes of the worry of keeping a continuous watch upon the various plants which go to make the gas supply of our towns; and incidentally I might point out that it disposes of that old nuisance the jet photometer.

Before leaving the calorimetry of gases, I might refer to the effect of the diluent gas carbonic acid upon calorific value and illuminating power. While 1 per cent. of carbonic acid has a deleterious influence of 3½ per cent. upon illuminating power, it has only an effect of 1 per cent. upon calorific value—a fact which, while very obvious, is still of the utmost importance. Another fact which is of interest and importance is that, while above a certain make the illuminating power of coal gas drops very rapidly, its calorific value drops but slowly; and the inference from this requires no dilation on my part.

Another branch of calorimetry which is, I am sorry to say, much neglected in gas-works, is the calorimetry of fuel. The increasing competition of coking-ovens and carbonization in bulk compels us to look upon our coke no longer as only a residual, but as an important branch of our industry; and to properly appreciate our coke, we must know its steam-raising and its general calorific power. A number of appliances have been designed for this purpose; and among these the earliest are our old friends the Thomson and Lewis Thompson calorimeters. These instruments, while being all right in their way, could only produce results which were, to say the least, comparative. But an instrument which is absolute was not used until within comparatively recent years. It is only possible to obtain accurate results with a calorimeter of the bomb type.

A splendid instrument is that designed by Berthelot and Mahler, and modified by Dr. Kroeker. The combustion portion of the apparatus consists of a nickel plated steel bomb, which has a lid to screw firmly on, and has a capacity of about 300 c.c. The lid is strengthened in the centre with a bridge, through which pass the entrance and exit gas-channels, both of which are closed by screw needle-valves. One of the channels is continued with a platinum tube right into the vessel, and is used for the introduction of oxygen. The joint is made tight by means of a lead washer. The lid and platinum tube also act as an electrode; the other electrode being introduced through the lid, and well insulated from it. A small platinum or clay crucible is used for containing the very finely powdered coke; and the fuse for igniting the coke consists of a very fine platinum wire, which just dips below its surface, and is connected to both the tube and the wire electrode. The bomb is filled with oxygen up to a pressure of 25 to 30 atmospheres, and is placed in a water-container, into which is introduced a weighed quantity of water. The whole is then placed in an insulating mantle—in this case consisting of a copper annular vessel containing water. The water-container is brightly nickel plated, and rests upon a vulcanite stand. A stirring arrangement is attached to the insulating vessel for keeping the water in the container constantly agitated; and a thermometer is used which is capable of being read to 1-500th of a degree.

#### Discussion.

Mr. R. S. RAMSDEN (Burton-on-Trent) remarked that there was in the paper one point on which he was afraid he could not agree with the author. Mr. Balcon said the introduction of the calorific value penalty was a step in the right direction for many reasons. He himself thought it was not a step in the right direction unless at the same time that it was introduced the illuminating power test was done away with. They had, of course, to sell gas for lighting, heating, and motive power; and the competition they were subjected to from electricity and in some cases from oil and petrol gas plants for lighting, from coal for heating, and from electricity, steam, and producer gas plants for motive power, made it necessary for them to supply the gas that was best suited to the requirements of their customers, without anything in the nature of a penalty test. If, however, they were to have a penalty test at all, it should be of one kind only; and as the illuminating test was



now becoming obsolete, the calorific power test should meet the case. With regard to maintaining the water for the tests at the same temperature as the atmosphere, what sized storage tank would the author employ? Did he always use 5 litres of water for each test with the Junkers apparatus, or did he keep to the 2-litre measure?

Mr. C. C. BARBER (Birmingham) said the paper had come at a very opportune time, since the whole of the gas profession was interested in the suggestion of a parliamentary calorific standard being adopted in lieu of the illuminating power standard. A comparison between the methods of testing for calorific value and illuminating power was very useful, and showed how much more reliable the calorific test was than the illuminating power test. However, there were in the paper one or two statements with which at the present time he could not agree, and also a few matters which, in his opinion, required further explanation. The first point to which he desired to call attention was the Boys calorimeter. With luminous flames, it would appear that a certain amount of heat was wasted, either by incomplete combustion of the gases or by deposits of lamp-black on the apparatus. After the calorimeter had once been placed over the burners—unlike the Junkers or Simmance-Abady type—it was impossible to see how the flames were burning. Then the reading of the thermometers to 1-50th of a degree, certainly appeared to him to be an unnecessary refinement, since there were other errors that were liable to creep into the test which were more important. In the first place, it was seldom one met with thermometers that were generally used for gas-testing purposes which agreed to so fine a point as that. Next there was the question of the measurement of the volume of water passed through the calorimeter. Surely, to make the test accurate, this should be corrected to some standard temperature. He found from the Gas Referees' instructions for making the calorific test, that they considered that it was necessary to make a correction for the temperature of the effluent gases. In the instructions, the following statement appeared: "The difference in degrees centigrade of the temperature of the effluent gas and of the surrounding air shall be taken, and one-sixth of this difference shall be added to the result previously found if the effluent gas is the warmer of the two, or subtracted if the effluent gas is the cooler of the two. [This correction has been found by experiment.]" This, he would say, was far more important than the reading of the inlet and outlet thermometers to 1-50th of a degree. With regard to recording calorimeters, there was not the slightest doubt that they were exceedingly useful; but he could not agree with the statement that "this apparatus for all time disposes of the worry of keeping a continuous watch upon the various plants which go to make the gas supply of our towns, and disposes of that old nuisance the jet photometer." The recording calorimeter enabled one to keep a better watch upon the various plants, and thus ensure a more uniform quality of gas as regarded calorific value. But since, as was generally known, the illuminating power did not vary proportionately with the calorific value, the jet photometer could not be discarded until the illuminating power standard was done away with. If the atmospheric conditions were taken into account, then the jet photometer was a guide as to the illuminating value of the gas being made. Apart from the fact that recording calorimeters did not correct themselves for atmospheric conditions, there was the question of the amount of air that was passed to burn the gas. The flame was set so that it was just non-luminous. Supposing that during the course of gas making a richer quality of gas came along, then the flame would become partly luminous, and thus a portion of the heat would be wasted. In congratulating Mr. Balcon upon his paper, he would suggest that comparisons between illuminating power and the corresponding calorific value would have been useful; and perhaps the author would be able to oblige the members with some when replying to the discussion.

Mr. W. S. SMART (Saltley) voiced the indebtedness of the members to Mr. Balcon for having brought to the meeting so much apparatus for their inspection. Referring to the paper, he said, with regard to the test for calorific power, the author seemed to think that the outcry against this had been raised because of the difficulty of complying with it; for he stated that there should be no difficulty. So far, however, as he (the speaker) understood the matter, the outcry that had been raised against these tests was more on the question of principle. For this reason, the Birmingham Corporation recently successfully resisted the claim of the King's Norton Urban District Council to test the illuminating power of Birmingham gas supplied in their area; and he would fancy (of course, he spoke without authority) that, so far from welcoming a calorific test as "a step in the right direction," the Corporation would strenuously resist—and he hoped successfully—any endeavour on the part of the twelve or thirteen authorities in their area of supply to obtain the right to test the gas for calorific power. In connection with technical papers, the most extreme accuracy of expression was essential. This remark was called forth by the fourth paragraph of Mr. Balcon's paper, which opened with the words: "In using the calorimeter as the measure for selling gas." This was certainly liable to misconstruction on the part of those unacquainted with the subject. Such persons might think that their old and much-abused friend the meter had been superseded by the calorimeter as a measure for the sale of gas, instead of the latter being merely an instrument for testing quality. With reference to the suggested modification of the Boys calorimeter, in his opinion there would be a tendency

for globules of condensed water to collect on the sloping bottom; and by this means, a certain amount of error would be introduced. The method adopted for recording results at Birmingham would have been more easily followed if a typical example had been worked out. The spaces left for the introduction of the figures in the equations in the form as printed were very small, and led to confusion. With reference to the calorific power tests for fuel, everyone would agree that they had been neglected; but he did not think the members would be unanimous in considering that laboratory tests were the best method of obtaining reliable information as to the steam-raising power of coke. It had been found out long ago that carbonization on a fairly large scale was the only reliable index to the value of coal for the production of gas; and test-plants of relatively large capacity had to be erected for this work. Such a course would be even more necessary in the case of a material of varying quality like coke. Practical boiler tests, which could be easily undertaken, would, in his opinion, be much better than laboratory experiments for ascertaining the calorific power of coke.

Mr. F. SHEWING (Droitwich) said he noticed in the paper that 1 per cent. of carbonic acid reduced 16½-candle gas to 16 candles. This reminded one again of the question of lime and oxide purification. If the value was reduced so little by allowing carbonic acid to remain in the gas, he thought it was a good argument against the continued use of lime, which many works still clung to. The author referred to the personal element in taking photometric tests. He (the speaker) assumed that by this he implied that it was possible to make out the gas to be just what candle power was thought necessary. Surely, with an ordinary amount of practice, the results were to be relied upon. It appeared to him that the adoption of a calorific standard would not materially affect the manufacturer who distributed straight coal gas, because he rarely sent out gas of less than 14-candle power; but if water gas or some other diluent gases were mixed with it, the calorific standard would, in a sense, protect the consumer. He had seen a "Sarco" CO<sub>2</sub> recorder at work on furnace gases; and its operation was very satisfactory. It was a useful instrument where a large quantity of fuel was consumed.

Mr. H. E. STONE (Birmingham) agreed with Mr. Smart that the suggested improvement of the Boys calorimeter would introduce an error. He did not think the proposed method would be suitable for that instrument. He was rather sorry Mr. Balcon had not mentioned the effect of the different constituents of coal gas on the calorific value—methane, hydrogen, carbon monoxide, &c. This would have been extremely interesting.

Mr. L. J. HOYLES (Derby) asked whether Mr. Balcon had made any comparative tests of the same class of gas with the three different kinds of instrument. He thought the figures would be interesting.

Mr. W. H. JOHNS (Saltley) remarked that Mr. Balcon said: "The introduction of the calorific value penalty is a step in the right direction for many reasons, and especially from the point of view of the chemist." He would like to know the chemist's point of view. Personally, as the Superintendent of a works, it was his duty to make the gas; and speaking from his point of view, he thought they should not be bound down by two penalties—that was, the illuminating power penalty and the calorific value penalty. Let there be one or the other, but not both. One of the great advantages of using coal gas compared with producer gases was on account of its greater heating value; and therefore he did not think they should try to reduce the calorific power, but to retain it at over 500 B.Th.U. net. He had recently had a recording calorimeter fixed at his works; and he would have liked to have been able to give the members comparative figures. Owing, however, to the apparatus not having been at work sufficiently long, he could not do this. Personally he felt very much obliged to Mr. Balcon for bringing forward his paper at this time, when such a lot was being heard about calorimetry; but he hoped that the gas companies who were in Parliament would be successful—as he believed that one or two were last session—in resisting the insertion of clauses dealing with compulsory testing for calorific value where already testing for candle power was imposed by the authorities.

The PRESIDENT, in closing the discussion, remarked that the subject dealt with in the paper was one of increasing importance nowadays—especially as the idea was to make parliamentary stipulations as to what calorific power should be supplied. He was not in agreement with the member who proposed the keeping of the calorific power at a high figure. He thought that nowadays—especially when water gas was being made—the calorific power ought to be kept lower even than the figure mentioned in connection with the Gaslight and Coke Company. Carburetted water gas had a calorific power 10 or 15 per cent. less than coal gas for a given candle power; and, of course, blue water gas was even less. It might be their policy in future years to supply a lower grade gas, in order to keep their consumers. Of course, there was a big margin between coal gas at 500 or 600 B.Th.U. and power gas at 160 B.Th.U. He was sorry Mr. Balcon had not left the "beaten track" more than he had done, because it was the criticism of apparatus and the record of personal work that made such papers of value. He would have liked some figures in the matter of the relation of calorific value and illuminating power. Only recently it was stipulated that the Buenos Ayres Gas Company should supply 14½-candle gas with a calorific power of 539 B.Th.U. As a matter of fact, under ordinary conditions at present, coal gas of 14½-candle power would not have



such a calorific value. It showed how little was known of the matter that such a stipulation should be made.

Mr. JOHNS: I do not know whether I heard you correctly. Did you say the tendency was to supply gas of lower calorific value? Will the carburetted water-gas plant you have just installed at West Bromwich supply gas of a higher calorific value than the blue water-gas plant which you previously used?

The PRESIDENT: Yes.

Mr. JOHNS: Why are you converting your blue water-gas plant to a carburetted one, if the tendency is to supply gas of a lower calorific value?

The PRESIDENT: The reason is more a question of £ s. d. than of calories. In 1901, when blue water-gas plant was installed at West Bromwich, petroleum oil for making carburetted water gas cost 5d. or 6d. a gallon—a figure which prohibited its economical use for making gas. At present petroleum can be bought for 2½d. per gallon, which renders it economical for making gas. Consequently we have installed a plant to manufacture carburetted water gas when desired; but it is arranged so that we can supply blue gas when the price of oil prohibits its use.

Mr. BALCON, in the course of his reply to the discussion, said Mr. Ramsden had expressed disagreement with the remark in the paper that "the introduction of the calorific value penalty is a step in the right direction for many reasons," unless at the same time the illuminating power test was done away with. Of course, to be saddled with two burdens would be rather an unusual thing to wish for, if it was possible only to be saddled with one. He did not advocate personally the use of two penalties. He said that, with the limits which had been put in the Act of the Gas-light and Coke Company with regard to calorific value, there was little cause for the outcry against the double penalty. There was no reason why a calorific value of 446 B.Th.U. should not be maintained with gas of 14-candle power. Mr. Ramsden seemed to deplore the fact that gas was tested at all. It was true that the electricity people were not subjected to tests; but he thought there was hardly any doubt of the necessity for a test with a commodity like gas. In the case of electricity, they measured energy, not something which could vary in composition; and a meter which was accurate showed exactly what was being purchased. With gas, it might be the case that a meter, though it measured accurately, did not give the consumer what he was expecting to buy. Hence the necessity for a penalty test. As to maintaining the water for the tests at the same temperature as the atmosphere, and the size of tank that should be employed, he might say they actually used 5 litres for each test; and the storage tank would be of a capacity to hold a sufficient number of 5 litres to make up the number of tests required, and a little bit over. Mr. Barber had referred to the flame in the Boys calorimeter, and expressed the opinion that, with luminous flames, a source of error might arise. He (Mr. Balcon) knew of a calorimeter which had been in use a long time, and the chimney was hardly blackened. The flames, of course, were very small; and they gave almost complete combustion. If the flames were too large, and touched the sides of the vessel, it might be that the apparatus would become blackened. Once the instrument was lit up and fixed, it was necessary to depend upon it to remain constant. In a number of the "JOURNAL OF GAS LIGHTING," there appeared some few weeks ago\* a paper read by Mr. J. H. Coste before the Society of Chemical Industry, in which the author stated that he had made experiments with the Boys calorimeter, and had found that practically the whole of the gas was burnt, and that therefore the error due to imperfect combustion was negligible. But, of course, care must be taken not to let the flames touch the side of the vessel. Then Mr. Barber did not agree with reading thermometers to 1-50th of a degree. This, however, could be done without any extra trouble.

Mr. BARBER remarked that it was all right if the thermometers agreed; but he did not think he had ever come across a pair of thermometers in a calorimeter test that had agreed to 1-50th of a degree.

Mr. BALCON replied that he had a pair which agreed exactly.

Mr. BARBER said that, any way, if the author read his thermometers so accurately, he must get the other errors corrected if he could.

Mr. BALCON remarked that it resolved itself into a question of the time occupied in the test. To make a correction for the temperature of the effluent gases would involve extra expenditure of time; and, as he said in his paper, it was not necessary for works purposes. The thermometers could be accurately taken without any additional time being occupied. In the manufacture of coal gas, the recording calorimeter was invaluable, and disposed of a lot of worry which the variations of the jet might cause. With regard to a richer gas suddenly coming along and causing the flame to vary and alter the test, the change would have to be a very great one to affect the luminosity of the flame to a very small extent; and this would hardly affect the instrument. Such a change as would suddenly render the flame entirely luminous was not likely to be met with. With reference to Mr. Smart's remarks as to the claims of outlying authorities in the matter of testing gas, so long as it was the illuminating power test that was in question, he quite agreed with what had been said. It was understandable that passing gas through a long length of main would, in severe weather, result in a substantial drop in illuminating power; but in the case of the calorific value test, he did not see any such objection. The calorific value of the gas would not

alter so much in passing through a long main. It would alter, there was no doubt, but not to anything like the same extent. This being so, he did not think there would be so much opposition to a calorific test, if it was properly interpreted. Then Mr. Smart quarrelled with laboratory tests of the calorific value of coke. Did he know of any other? The steam-raising qualities of coke depended, of course, upon its calorific value and the efficiency of the boilers. For selling coke, the calorific value test was a splendid comparative test. Certain coxes gave a certain calorific value; and their value for steam-raising purposes was directly proportional. As to Mr. Shewring's remarks, it certainly seemed that the introduction of the calorific value test would go a long way towards putting an end to the use of lime, where it was still employed. Of course, this was extremely expensive as a purifying agent; and if they could do without it altogether, so much the better. Mr. Stone did not like the suggested method of improving the Boys calorimeter; but he would no doubt admit that it was a difficulty to have to put so much water in the instrument.

Mr. STONE: I agree that it is very awkward, but you must not sacrifice the accuracy of the apparatus for the sake of saving yourself trouble.

Mr. BALCON: I do not see that you need interfere with the accuracy of the instrument by making the water drip from the bottom. Continuing, he said he was sorry not to be able to give any figures as to the effect of the different constituents of coal gas on the calorific value. He had not himself made any such tests; and so the only figures that he could have given would have been general ones obtained from various authorities. In answer to Mr. Hoyle, all the instruments had been tested against each other; and they agreed within reasonable limits. Replying to Mr. Johns, he might point out that the calorific power of gas was a thing about which there was no doubt. Alluding again to the Beasley calorimeter, he said it gave very consistent results, and agreed within reasonable limits with the actual laboratory tests. The President hoped that in time they might reduce the calorific value of the gas. Well, he (Mr. Balcon) hoped the day would be long coming when they would find it necessary to reduce the quality of the gas in calorific value. They knew it was easy to maintain gas at a fairly reasonable calorific value, as they had done it for many years. A matter of 530 B.Th.U. was easily maintained without any serious extra cost. But even the 450 B.Th.U. which the Gaslight and Coke Company had to supply at 14 candles, was really a high figure compared with producer gas. They were far and away in front of any other gas that was made for calorific value.

### Lectures on Smoke Prevention.

The first of a series of lectures which are intended to enlighten the public upon the evils of air contamination by smoke, was delivered in the High School, Glasgow, last Wednesday evening, by Mr. A. Wilson, the Gas Engineer to the Corporation. Bailie Paxton, the Sub-Convener of the Corporation Gas Committee, presided. Mr. Wilson's subject was "The Lighting and Heating of the Home." Dealing with coal gas, he mentioned that in Glasgow about 700,000 tons of coal were carbonized annually, producing a clean, smokeless fuel, which he contrasted with raw coal as used in ordinary coal-fires, in which at least 75 per cent. of the total heat generated by combustion of coal is lost in the form of flue heat, and from which solid and semi-gaseous impurities, equal to 5 per cent. of the weight of the coal burned, pass into the air to pollute it. This meant that for every ton of raw coal burned in an open grate, practically 1 cwt. of semi-solid impurities went into the air. The remedies he suggested were: (1) Coke specially prepared for domestic use, samples of which were shown, and regarding which Mr. Wilson said it was hoped that a supply would soon be available in Glasgow; but this remedy would only do away with the smoke, and would leave much of the dirt to be tackled. (2) Coal gas. The common objections to the general use of gas-fires were as unreasonable as objections to gas lighting from the hygienic point of view. It had been proved time and again that combustion in a properly constructed gas-fire is as perfect as in a good lighting burner. He made the suggestion that those who had not had experience with this type of heating should first try gas-fires in occasional rooms—stating his belief that a year's experience with gas-fires so used, and if properly attended to, would do more to convert economical housekeepers to the full use of gas as a heating agent than all the figures which could be put before them. Descriptions were given of the construction and working of apparatus for lighting and heating by gas, as well as practical illustrations of the use of gas; and numerous lantern views were shown. In the second of the series, held on Friday night, Professor J. W. Graham, of Dalton Hall, University of Manchester, said that he looked for the cure of house smoke to gas, to electricity, but especially to one of the new fuels such as coalite, which was made by extracting from coal, by high distillation at low temperature, the smoke hydrocarbons which the coal gave off first. In his opinion, every municipality should be urged to manufacture coalite or its equivalents, which should be saleable at about the price of coke. Pound for pound, coalite had 90 per cent., the value of coal; and it was clean, and, after the first few minutes, perfectly smokeless. It needed a free draught, and was probably not yet perfect. Gas at 1s. 6d. to 2s. per 1000 cubic feet could compete, even for all-day use, with coal.

\* See "JOURNAL," Vol. CVIII., p. 816.



## SCOTTISH JUNIOR GAS ASSOCIATION.

## EASTERN DISTRICT.

## Visit to Messrs. Laidlaw and Son's Meter-Works.

The members of the Eastern District Division of the Scottish Junior Gas Association, to the number of thirty-five, visited last Saturday the meter-works of Messrs. R. Laidlaw and Son, Limited, Simon Square, Edinburgh. They were received by the Managing-Director (Mr. A. Young), Mr. G. Mills, Mr. A. Brown, and Mr. A. Thomson, representatives of the Company.

The walk round the works began with the foundry, and was continued through all the departments, till the one was reached in which the finished orders were being sent out. The making and fitting of the multitude of parts which are used in the construction of a meter were shown; the works having been kept running till after the visit, in order that this might be accomplished. Most of the power employed in the works is derived from gas-engines; and the whole of the lighting is by means of inverted incandescent gas-burners. The workshop is located in a building which is only a year or two old, in consequence of which, as might be expected, the working rooms are spacious and airy, and are well lighted; thereby making most comfortable the working conditions for the hands (numbering about 300).

Before the company left the premises, Mr. J. Rosie explained to them, and practically illustrated, the working of the apparatus for automatically lighting and extinguishing gas lights, of which he and Mr. James M'Kelvie, of Edinburgh, are joint patentees. The apparatus was described in the "JOURNAL" for the 14th of December last (p. 740). It was mentioned that the apparatus was used in connection with the lighting of the band-stand in the Exhibition in Edinburgh in 1908, and that during the whole of the season its action never failed.

After a pleasant drive, the company took tea together. Mr. A. Young presided, and said that, on behalf of Messrs. Laidlaw, he had had much pleasure in inviting the Association to inspect their works. He expressed the hope that what the members had seen would be for their instruction in regard to their particular business, and that it would also enable them, when they were questioned about gas-meters, to answer the inquiries put to them. He supposed most of the visitors had thought the works were not so large as they had found them to be. The prepayment meter business had given new life to the gas-meter trade. Last year their output of these meters was practically five times that of ordinary ones. Obtaining permission to visit works must be a great benefit to juniors. The more they could learn about the practical working of things relating to their business, the better it would be for them all. He hoped the Association would go on prosperously; and he was sure that manufacturers of apparatus would give them all the help they could in their striving for greater efficiency in their particular business.

The President (Mr. H. Rule, of Falkirk), speaking on behalf of the Association, thanked Mr. Young and his co-Directors for the pleasure they had given the members, and also for their hospitality. He likewise thanked the staff for the courtesy shown them. The works were in keeping with the progressive nature of the Company who owned them, and were equipped with machinery and apparatus with the object of turning out a sound and well-finished article such as they desired to have.

On behalf of the staff, Mr. G. Mills said what they had done for the visitors had given them very great pleasure.

A social hour was then spent; and at the close, on the motion of the Hon. Secretary (Mr. J. Dickson, of Kelty), a vote of thanks was given to Mr. Young for presiding.

## Paris Gas Company's Electricity Station.

A recent number of the "Journal de l'Eclairage au Gaz et à l'Electricité" contained an illustrated description of the electricity station of the Paris Gas Company at their works at Le Landy (St. Denis). It was equipped by the French Thomson-Houston Company; and its object was the provision of the motive power required for driving all the coal and coke handling plant. The buildings consist of two machinery halls, each 74 feet long and 50 feet wide, and a central hall of similar length, but 80 feet wide. The latter contains the boilers, and forms a shelter for the conveyor. Each generating set consists of a compound tandem horizontal engine with two cylinders and a single crank, equal to 650 H.P., coupled direct to a 400-kilowatt continuous-current dynamo, arranged to keep up a pressure of 250 volts. Each boiler is of the multitubular type, and has a heating surface of 1571 square feet. It is combined with a steam superheater having a superficial area of about 160 square feet, and is equal to the production of 5500 to 6600 lbs. of steam per hour, at a pressure of about 170 lbs. per square inch at a temperature of 525° Fahr. At the rear of each boiler is an economizer consisting of 72 tubes. The normal speed of the set is 125 revolutions per minute.

In Trinity Hall, Bournemouth, a few days ago, Mr. Samuel Wood, F.C.A., gave an interesting lecture before the Bournemouth Natural Science Society, on "The Growth of the English Language"—a subject to which, as already mentioned in the "JOURNAL," he has devoted much study.

## AN ELECTRIC GAS-METER.

Last December, Professor Carl C. Thomas, of Madison, Wisconsin, read a paper before the American Society of Mechanical Engineers, describing a meter the operation of which depends upon the principle of adding electrically a known quantity of heat to the gas, and determining the rate of flow by the rise in temperature of the gas, between the inlet and outlet of the meter.

A recent issue of the "Electrical Review" reprints the paper, from which it appears that the meter possesses the following characteristics: (a) There are no moving parts inside the meter or in contact with the gas. (b) The accuracy of the meter and its sensitiveness are independent of the rate of flow of the gas, and of fluctuations in pressure and temperature. (c) The meter may be used to measure gas at high pressure as well as at low pressure, and is independent of small fluctuations in pressure, such as those in the discharge from an air-compressor or in the suction of a gas-engine. (d) The meter produces a continuous autographic record showing the rate of flow and its variation. (e) Meters of comparatively very small size have very large capacities. (f) The meter may be opened for inspection, for blowing-out accumulated matter with an air-blast, or for washing with gasoline; and it can be dismantled to any extent desired, without interfering with the operation of the plant.

The meter consists of the measuring element, and a bye-pass through which the flow of gas can be diverted by means of valves. The measuring element consists of an electric heater disposed across the gas passage so as to impart heat uniformly and at a regular rate to the gas passing through the meter. The temperature of the gas on entering and leaving is measured and autographically recorded by means of two electrical resistance thermometers, one on either side of the heater.

These thermometers consist of wire wound on vertical tubes so disposed as to come into contact with all the gas passing through the meter, and substantially constructed. Diagrams are given in the paper, which show that every small fluctuation in the rate of flow is recorded. On one of them the variations are from 17,000 to 75,000 cubic feet per hour. A temperature difference of about 4° Fahr. gives a satisfactory record.

If heat is supplied uniformly and at a regular rate, then the difference in temperature will depend solely on the rate of flow of the gas—the smaller the flow, the greater the rise, and conversely. The speed of travel of the recorder paper may be altered.

The meter may be operated in two ways. In the first way the difference of temperature between the inlet and outlet is kept constant; and the watts required to maintain this constant difference of temperature vary directly as the rate of flow. The watts may be measured by a recording wattmeter or a watt-hour meter. The difference maintained is about 5° Fahr.; and this is kept constant by a device similar to that used in temperature recorders in connection with resistance thermometers. The variation of energy input is effected by a small motor-controlled rheostat on the switchboard. The second method allows the energy input to remain constant, and records the difference in temperature.

Of the two methods, the first is said to be superior, as it is independent of any change in the electrical resistance of the material composing the heater. The second method requires the maintenance of constant voltage, and constant resistance of the heater, or it becomes necessary to record both the energy input and the temperature difference. The meters can be arranged to operate with either continuous or alternating current; and the controlling device can be made to suit any voltage.

A test was made in which an electric gas-meter was compared with a newly calibrated wet meter, with satisfactory results.

The specific heat of a given kind of gas appears to be nearly constant, and a table was given in the paper showing the specific heat of illuminating gas and its various constituents. There was also a table referring to blast-furnace gas, the specific heat of which is almost identical with that of atmospheric air. The presence of ordinary amounts of water vapour has no effect on the accuracy of the meter, as the water does not undergo a change of state.

The quantity passing can be closely calculated from a knowledge of the energy input and the specific heat of the gas; and this affords an additional check on the meter's accuracy.

Professor Thomas has for some years been experimenting with reference to the determination of the specific heats of gases by heating them electrically; and the regular performance of a properly constructed heater led him to the idea that it might be used for the purpose indicated in the paper. The whole process of heating and temperature measurement is accomplished in a relatively small space, thermally insulated from the metallic walls of the meter.

The curve connecting the degrees rise in temperature per kilowatt introduced with the rate of flow takes the form of a rectangular hyperbola, asymptotic to the co-ordinate axes. The product, weight of gas multiplied by degrees rise per watt introduced, is a constant; and this constant, for a given kind of gas, takes the place of a calibration curve.

As the meter takes note of the quantity of the gas, and not only of the volume, changes in pressure do not affect its accuracy. The temperature of the incoming gas does not affect it, as it is the difference in temperature between the inlet and the outlet upon which the measurement depends. With gas-engines and



air-compressors, these features of the meter render it especially useful.

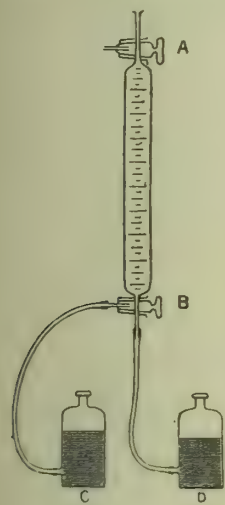
The temperature difference maintained can be altered to suit different rates of flow of gas. The electrical energy required is approximately 1 kw. per 50,000 cubic feet hourly capacity.

A modified form of the meter can be used for the measurement of steam, and also for determining its quality or the percentage of moisture in it. For quantity measurements, the steam is slightly superheated between the boilers and the meter. The measurement of superheated steam is simpler than is the case where superheat is not used. The amount of moisture in steam can be measured by passing all the steam through the meter and noting the amount of energy required to dry it and cause superheating to commence. Tests may be made by passing all the steam (which is, of course, the most accurate method) or only occasional samples, through the measuring element of the meter. The bye-pass may be used as in the case where the instrument is employed as a gas-meter.

The automatic recording device is so arranged that in the event of the flow of gas ceasing, the current is cut off at the switchboard. Further, if the flow becomes too small or too large for the making of a satisfactory record, the rheostat can be altered and the energy input decreased or increased as required. When a constant temperature difference is maintained, the rheostat is motor-controlled, and hand manipulation is unnecessary.

### Simple Burette for Estimating Carbon Dioxide.

The current number of the "Chemical News" contains an illustrated description, by Mr. H. H. Stephenson, of a simple burette for the estimation of carbon dioxide in gas. It is a modified form of the Bunte burette, fitted with a three-way stopcock at each end. One way of the lower stopcock B is connected by a sufficiently long rubber tube to a bottle C containing water, and the other to D containing caustic soda solution of 1·28 sp. gr. To operate the burette C, the water-bottle is first raised till the burette is filled. The sample of gas, after running for a moment through the exit way of the upper stopcock A, is connected with the burette, and 100 c.c. of gas taken at barometric pressure in the usual way. The upper stopcock being closed, the water-bottle C is lowered till the water just appears in the burette above the bottom stopcock. The cock is turned to connect with the bottle containing the caustic soda solution, and the absorption of carbon dioxide promoted either by shaking the burette or by raising and lowering the bottle. The gas is then brought to barometric pressure, and the absorption read off. Before the next sample is taken, the burette should be allowed to drain off the caustic soda, or else be washed from the water-bottle, the contents of which must be frequently changed. In an Orsat apparatus, the water is often acidified and coloured red with methyl orange; but with the burette



described, such a process might lead to the generation of carbon dioxide bubbles by the action of the acid on the carbonated soda solution. It is better to leave the water neutral, and colour the soda blue with litmus, so that its presence may be detected in the burette or the water-bottle. The burette can be used by workmen little trained to chemical manipulations.

For a long time past, Dr. Nogier, of Lyons, has been experimenting with the mercury vapour lamp, finding that the ultra-violet rays emitted from it are very powerful in destroying any bacteria that may be present in limpid liquids, especially water. He is reported to have succeeded in removing the most virulent germs from drinking water without altering its chemical composition. One minute's exposure to the rays of the lamp suffices for the process of sterilization. He has now perfected an automatic water sterilizer, consisting of an aluminium tube containing a mercury vapour lamp, and controlled by an electro-magnetic tap, which at once stops the flow of water should the lamp be put out of action. This method of sterilizing drinking water is claimed to be infinitely better—more certain, more scientifically perfect, and cheaper—than the electro-ozone process.

The first annual dinner of the Illuminating Engineering Society was held at the Criterion Restaurant, Piccadilly, last Thursday—Sir H. Trueman Wood presiding, in the absence, through indisposition, of Professor Silvanus P. Thompson. Among those who were present were Dr. Vernon Harcourt, F.R.S., and Dr. J. S. Haldane, F.R.S. (two of the Metropolitan Gas Referees); Mr. J. W. Helps, the President of the Institution of Gas Engineers; Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company; and Dr. R. Lessing. "Prosperity to the Illuminating Engineering Society" was proposed by Mr. A. P. Trotter; and "Kindred Societies," by Mr. Leon Gaster, the Hon. Secretary of the Society. Mr. Helps, in his remarks upon this toast, said the question of illumination required to be discussed independently of the interests of any particular luminant; and he wished the Society all prosperity in the good work it was doing.

## REGISTER OF PATENTS.

### Producing Ammonia from Peat.

WOLTERECK, H. C., and the SULPHATE OF AMMONIA COMPANY, LIMITED, of Fenchurch Street, E.C.

No. 27,905; Dec. 22, 1908.

In the process of producing ammonia from peat by moist combustion (as described in patent No. 16,504 of 1904), the patentees mention that "it is of the utmost importance to maintain the temperature of the reaction within a limited range." For this purpose, they proposed to employ varying quantities of steam or water vapour to check the tendency of the temperature to rise; and, in consequence of the use of rather wet peat in the process, the gases leaving the furnace or generator contain a very large amount of steam. It has already been proposed, they say, in the process of making ammonia from peat to return to the apparatus the gases which have been generated in the process and contain steam, after freeing them from ammonia.

According to their present invention, they dispense with the use of live steam nearly or altogether, by causing a part of the gases containing large quantities of steam, after the removal of ammonia and such other bye-products as it may be advantageous to remove, to enter the furnace or generator beneath the zone of reaction. The gases "mix with the air introduced for the purpose of the process, and greatly facilitate the maintenance of the temperature of reaction within the desired limits."

They carry out this modification of the process by withdrawing part of the hot gases after leaving the last scrubber or acid tower, as the case may be, by means of a fan or blower, and by conducting the same, by means of a pipe or pipes, or suitable duct, well protected against loss of heat, into the furnace or generator, as described.

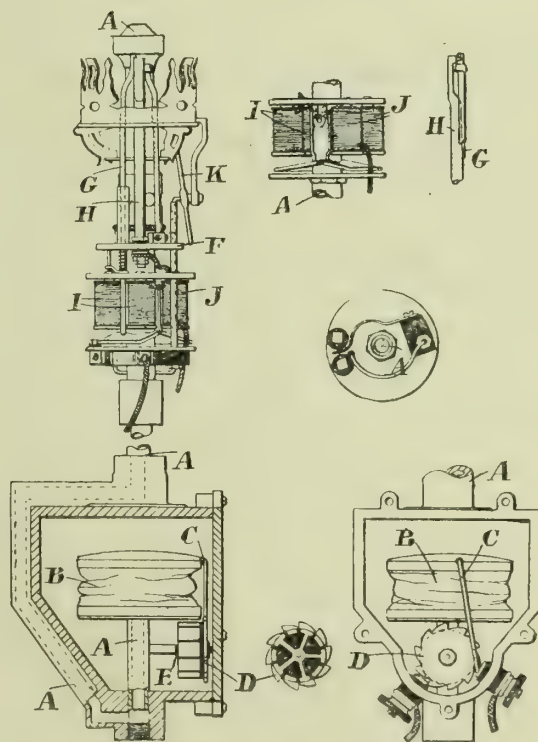
This arrangement is said to furnish not only the steam required by the process, practically free of cost, but it also assists to check the rise of temperature by means of the quantity of inert gases contained in the hot gases.

### Lighting and Extinguishing Gas-Lights from a Distance.

BOUSFIELD, J. E. (a communication from the Nightingall Gas Control Company, Limited, of Melbourne, Australia).

No. 1264; Jan. 18, 1909.

This apparatus, for lighting and extinguishing street and other gas-lights from a distance, consists of an expanding governor, a thermostat, a capsule or other device actuated by temperature and operating a two-way switch.



The Nightingall Gas-Controller.

As shown, the gas supply pipe A is fitted with an expanding chamber B, the upper portion of which is weighted for the purpose of returning it to its normal position when the gas returns to its normal pressure. By adjusting the weights, the pressure at which the apparatus will operate can be determined. A swinging arm C depends from the moving part of the expanding chamber, and is bent inwardly at its lower end to engage with a notched or toothed wheel D, upon which is a commutator mounted at its centre upon a spindle E. A supporting platform F is mounted immediately under the burner, which is provided with a pilot-tube leading from the main supply pipe A.

A pair of contact pieces are arranged a little above the pilot-burner—one is a fixture, and the other is mounted upon a vertically sliding-rod G. The rod H is in electrical connection with a pair of electro magnets I depending from a support attached to the main gas-pipe a short distance below the platform F. The armature of the magnets bears against the



underside of the vertically sliding rod G, which is provided with a spring tending to return it to its normal position after it has been raised by the armature. Another pair of magnets J depend from the support carrying the magnets I. The armatures of the magnets are fitted with upwardly projecting arms—one adapted to open the gas-supply valve and the other to close it by bearing against a projection on the valve.

In its simplest form (where the lamp is merely required to be turned on and off by the alternate raising and lowering of pressure of the gas supply), the alternate segments are in electrical communication with the central spindle; so that each time the pressure is raised first one brush and then the other will be put in circuit—thus conveying the current to the turning-on magnets I and the turning-off magnets J alternately. In operation, when it is desired to light the lamp an extra pressure of gas is supplied so as to inflate the expanding chamber B. The swinging arm C lifts and revolves the commutator one notch, making contact with the battery. This action sends the electric current from the battery around the magnets I which attract the armature, whose upwardly projecting arm pushes the valve projection over to the opposite side and opens the valve, which allows gas to circulate through the burner and pilot-tube. Immediately the magnets I attract the armature, the latter pushes up the sliding-rod G, which carries the contact, and thus breaks the circuit. The spring then returns the sliding-rod, and the circuit is again completed. This make-and-break action is continued, and the sparks from the contacts light the pilot, which, in turn, lights the burner. After the gas has been burning a little time, it heats the expanding capsule or other heat-operated device K, which throws the switch over to the opposite terminal and stops the make-and-break ignition gear.

When it is desired to turn the light out, an extra pressure of gas is again supplied through the pipe A, so as to again inflate the expanding chamber B, the swinging arm of which, on rising, revolves the commutator the distance of another notch. This action brings an insulated section of the commutator opposite the brush, and puts it and the magnets J in electrical communication with the battery. This action sends an electric current around the magnets, thereby attracting the armature, whose projecting arm pushes the valve projection over to the other side, closes the valve, and thus turns off the gas supply. The current continues to flow through the magnets until the capsule K contracts owing to the absence of heat from the extinguished burner. This allows the two-way switch to again assume the original turning-on position in contact with the terminal of the wire leading to the turning-on magnets I. The parts are then in position ready to turn on and ignite the gas immediately the pressure has been raised so as to turn the commutator another notch.

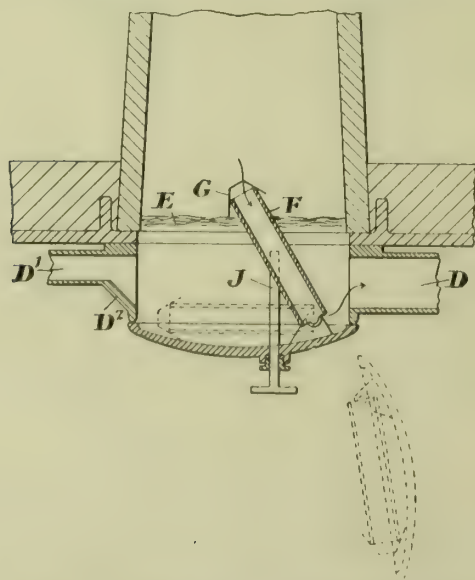
### Vertical Gas-Retorts.

R. DEMPSTER AND SONS, LIMITED, BROADHEAD, J. W., and  
TOOGOOD, H. J., of Elland.

No. 1484; Jan. 21, 1909.

This invention relates to vertical gas-retorts of the type in which the gas-outlets are placed in or near the bottom mouthpiece; the gas from the periphery of the charge thus passing downwards through the charge.

When using certain varieties of coal, the patentees point out that a layer of tar may, at a certain period of carbonization, be formed just below the heated zone of the retort, and on the surface of the coke or coke breeze usually fed into the mouthpiece before charging the retort with coal, and which layer of tar "would offer resistance to the downward flow of the gas." To obviate this, it has previously been proposed to employ a perforated pipe for conducting the gas from the coal above the tar layer to the outlet—a pipe capable of removal from the retort, as a fixed pipe would form an obstruction to the descent of the coke when discharging the retort, and has other disadvantages. The present invention has for its object the provision of means whereby the pipe can be withdrawn from the retort before discharging.



Broadhead and Toogood's Vertical-Retort Gas-Exit.

In the accompanying illustration (a sectional elevation of the lower end of a retort and parts connected with it), the lid C works on hinges (not shown) at the side which comes under the gas-outlet pipe D. An additional outlet pipe D<sup>1</sup> may be employed with an inclined part D<sup>2</sup>, whereby any coke which may have lodged therein is allowed to fall out when the retort is discharged. E shows the tar layer; and F the pipe for conducting the gas from the charge above this tar layer. This

pipe F may be perforated, and may be provided with a cap or deflector G to prevent entry of coal. The pipe F is pivoted to the lid, and raised, from the position shown in dotted lines to the position shown in full lines by the fork J, before charging.

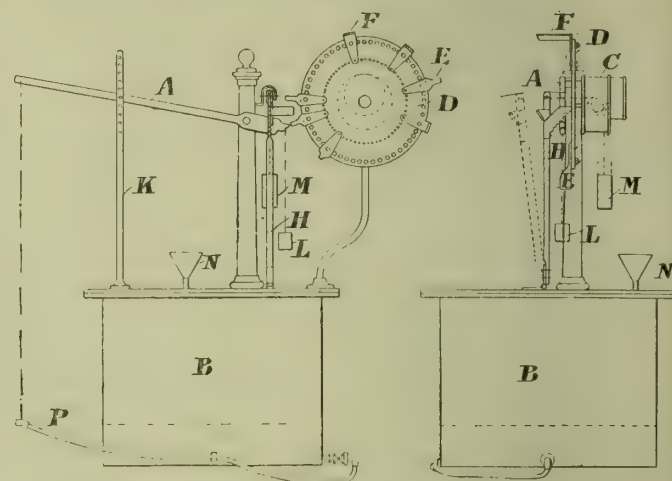
Instead of being arranged as illustrated, the pipe F may be so arranged as to be capable of being withdrawn into the gas-outlet pipe D before discharging the retort.

### Pressure Changer for Gas-Governors.

LEIGH, F., of Witney, Oxon.

No. 5242; March 4, 1909.

This is a method for automatically varying the load and pressure on a gas-governor by using a water-loading tank, with a stream of water continuously flowing into it, with special arrangements for regulating the height of water in the tank according to the pressure required at various hours of the day and night. It consists (as shown) of a copper tank mounted on the governor, into which tank a stream of water, regulated by a tap, is continuously falling. The outlet near the bottom of the tank consists of a short length of copper pipe, a tap, and a piece of flexible metallic tube fixed to it; and it is by the mechanical raising or lowering of the free end of this tube that the weight and depth of the water in the tank are controlled. The free end of the flexible tube is connected to a lever, working easily on a steel bearing. The lever is fixed so that five-sixths of its length is one side of the bearing, and one-sixth on the other—thus securing an intensified movement when the short portion is moved. A counterbalance weight is hung from the short end in such a manner that the long end, together with the flexible tube it supports, is slightly the heavier, and will remain at the lowest position at which it is allowed to fall, and if raised will fall again as soon as the raising force is removed.





end of the bracket arm, and in making the vertical gas-way in the tapering plug of the joint by drilling a hole through the top face of the "square" and through the end of the bracket arm therein. The upper end of the hole is screw-threaded, and combined therewith is a set or fixing screw, for firmly securing the inner end of the bracket arm in the "square." Where the bracket or fitting has two or more jointed arms, there is made in the bottom "square" and around the base of the screwed projection of the bottom "square" (on to which one of the arms is screwed) an annular groove or recess into which the extreme end of the arm fits.

#### APPLICATIONS FOR LETTERS PATENT.

- 2320.—BONE, W. A., WILSON, J. W., and M'COURT, C. D., "Heating media." Jan. 31.  
 2345.—BEST, R. H., and WILLIAMS, H., "Taps or cocks." Jan. 31.  
 2354.—KERRILL, H., CONYNGHAM, F. E. S., and MOLEYUS, F. R. W. E. DE, "Petrol gas." Jan. 31.  
 2356.—EWART, J. W., "Water-heaters." Jan. 31.  
 2416.—WILSON, A. & L., "Manufacture of producer-gas." Jan. 31.  
 2426.—BALDWIN, W. J., "Separating various materials from gases." Jan. 31.  
 2444.—DUNLOP, J., "Gas-producers." Feb. 1.  
 2445.—HEATHER, C. M., "Gas-saver." Feb. 1.  
 2463.—DUDLEY, S., and WILSON, T. W., "Stands for supporting utensils to be heated by gas." Feb. 1.  
 2528.—HIRSCHHORN, J., "Regulator for bunsen burners." Feb. 1.  
 2675.—WILLS, C. E., "Gas-stoves." Feb. 3.  
 2687.—REES, W. B., "Pressure-reducing valve." Feb. 3.  
 2736.—DOWN, H. L., HAVERS, E. W., and TELEPHOS, LTD., "Igniting and extinguishing gas from a distance." Feb. 3.  
 2739.—FAIRBROTHER, G. T., and SMITH, N., "Carburetted air." Feb. 3.  
 2808.—TOURTEL, J. M., and STEVENS, J. H., "Incandescent burners." Feb. 4.

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

#### Flow of Gas Through Pipes.

SIR,—Mr. Carpenter will confer a benefit on the gas industry, no less than that conferred by his standard burner, in advancing the scientific treatment of a further problem, by the valuable experiments that Mr. Chandler has been making for him on this question (*ante*, p. 357); which experiments, like the knowledge gained by Mr. Helps at Nuneaton on his high-pressure main, demonstrate beyond contention the incompleteness of Dr. Pole's formulæ.

Two features of this formulæ have always been stumbling-blocks to myself, and, I suppose, to many others. First, they are based upon the behaviour of a fluid which is inelastic—viz., water—and, therefore, has a radical differentiation from a very elastic fluid of such very different weight as coal gas. Further, the formula for the flow round curves involves the anomaly that the complete rotation of a circle would give no greater resistance than that of a quarter circle. Both these points give one cause to pause. Unfortunately, the means of practical experimenting are not very commonly to hand.

It is idle to make any experiments except upon conditions which can be absolutely reproduced; and I hardly know of any suitable location for such experiments upon an important scale, except (say) the long, straight road between the Beckton Gas-Works and Canning Town, where probably some 2 or 3 miles of perfectly straight pipe could be installed with the necessary plant for testing the flows under different pressures. It is possible that the Governor of the Gaslight and Coke Company might grant some such facilities; and such experiments would be invaluable to the whole of the gas industry, which might contribute to the cost of making them.

It occurs to one that a further improvement in the experiment would be to have some resistance at the outlet of the pipe, instead of a free discharge into air, and that the pressure exhausted by the friction should be calculated as between the pressures at the origin and at the point of delivery.

So important have I always regarded this question that, in my year of presidency of the Institution of Gas Engineers, I sought the contribution of a lecture on it from Professor Unwin, which forms in their records a classic in gas literature.

In my practice many years back, owing to the difficulties arising from condensed obstruction, and from the indirectness of the courses necessary to be followed in most cases, I laid down a scale for the guidance of the staffs, giving calibres largely in excess of the Pole formula, and abolished altogether as uneconomical mains below 4-inch, and services below 2-inch bore, which course further provided for the possibly extended demand arising with cheaper gas and a better knowledge of its fuel value.

Palace Chambers, Westminster, S.W.,  
Feb. 10, 1910.

HY. E. JONES.

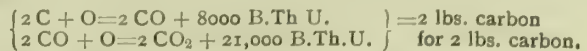
#### Mr. Marwick's "Chemistry of Coal Gas" Paper.

SIR,—I shall feel obliged if you will allow me space to make the following corrections.

During the discussion on Mr. Marwick's paper, read before the Scottish Junior Gas Association, a report of which appeared in your last issue, I referred to the fact that chemical actions can be of two kinds—viz., exothermic and endothermic reactions—reactions in which the heating effect is either positive or negative. By way of illustrating this fact, I took as representing an endothermic reaction the equation,  $C + H_2O = H_2 + CO$ , but which has been misrepresented by your reporter.

I also drew attention to the fact that the interaction between carbon

and oxygen can take place in two forms with the production of heat; and in stating the last equation a printer's error seems to have crept in, as 3 lbs. of carbon is given instead of 2 lbs., as per the following reaction



In conclusion, I need hardly add that for the economical working of the regenerative setting, this reaction should be carried out in separate parts of the setting.

Helensburgh, Feb. 12, 1910.

PETER MACDOUGALL.

## LEGAL INTELLIGENCE.

### THE VALUATION OF PREMISES FOR WATER SUPPLY.

#### HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Feb. 11.

(Before Justices PHILLIMORE and BUCKNILL.)

#### Metropolitan Water Board v. Streeton.

This was an appeal by the plaintiffs from the decision of his Honour Judge Woodfall, at the Westminster County Court; and it raised the short point whether, in case of dispute, the annual value of premises has to be fixed by two Justices, or whether the valuation list of the Metropolis is binding. The case was noticed in the "JOURNAL" for the 29th of June last (p. 983). The respondent, who is the owner of three houses in Rotherhithe, each rated to the poor at £19, was sued for 17 quarters' arrears of water-rates in respect of these houses; and he contended before the County Court Judge that the Water Board must prove by expert evidence that the "annual value" of the property was under £20. This the Board were unable to do; and the learned Judge nonsuited them. From this decision they now appealed.

Mr. DANCKWERTS, K.C. (Mr. A. B. SHAW with him) argued that "annual value" meant rateable value as ascertained by the assessment list, and that it was not necessary to get the value ascertained by two Justices.

Mr. GIVEN represented the respondent.

Justice PHILLIMORE, in giving judgment, said the action was to recover from the owner of certain premises 17 quarters' arrears of water-rate. In respect of four quarters, the defendant had paid the amount into Court; and as to the others the Board were content to waive their claim, though without prejudice to their rights in other cases. Section 68 of the Water-Works Clauses Act, 1847, provided that the water-rate should be paid by, and be recoverable from, the person requiring, receiving, or using the supply of water, and should be payable according to the annual value of the tenement supplied with water. If any dispute arose as to this value, it was to be determined by two Justices. Section 72 enacted that where the annual value did not exceed £10, the owner instead of the occupier of the premises was liable for the rate. For a very long time there was considerable doubt as to what was meant by "annual value;" but it was set at rest in 1883 by the decision of the House of Lords in the Dobbs case, in which it was laid down that "annual value" meant the value as declared by the Parochial Assessments Act (6 & 7 Wm. IV., cap. 96). After that case had been decided, the Water-Rate Definition Act (Torrens's Act) was passed; and it was now contended that this Act must not be taken as interfering with vested rights. The Act did not alter the valuation either for the purpose of the payment of the rate or for settling which of two persons was to pay. It only provided a natural and cheap mode of ascertaining what the value of the premises was, for the purpose of either section 68 or section 72 of the General Act. Torrens's Act provided that "annual value" should be the rateable value as settled from time to time by the local authorities. The cumbrous procedure under section 68 of the Act of 1847 of having the value settled by two Justices ceased to be operative; and for the purpose of making this clear, the Definition Act was passed. There was nothing in that Act which altered the rights of tenants and owners towards water companies. He was of opinion that in respect of the four quarters in dispute the Board were right in their contention; and the judgment of the County Court Judge must be varied in this respect.

Justice BUCKNILL concurred.

The appeal was therefore allowed, with costs; but leave to the respondent to appeal was granted.

### ALLEGED TRESPASS BY A GAS COMPANY.

#### HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, Feb. 8.

(Before Mr. Justice DARLING and a Special Jury.)

#### Cato and Wife v. Ventnor Gas and Water Company and Another.

This was an action for damages for trespass, in putting in an execution on certain premises—Highport Towers, Ventnor—rented by plaintiffs, in respect of a judgment for £41 10s. 11d., signed, in default of appearance, after obtaining an order for substituted service. The plaintiffs afterwards had the order set aside for irregularity; and the present action was then brought. The case originally came before Mr. Justice Ridley, who non-suited the plaintiffs; but the Court of Appeal directed it to be re-tried.\*

Mr. SCHOLEFIELD appeared for the plaintiffs; Mr. POWELL, K.C., and Mr. MACKENZIE represented the defendants.

Mr. SCHOLEFIELD, in opening the case at some length, narrated the circumstances out of which it arose. It appeared that the plaintiff,

\* See "JOURNAL," Vol. CV., p. 392, and Vol. CVI., p. 737.



Mr. G. P. Cato, and his wife, in 1906 took the house in question—a large house with about 5 acres of ground—which had been unoccupied for some years, at the very low rent of £40; and the claim of the Company was for gas and gas-fittings.

Mrs. Regina Cato was called, and her evidence-in-chief occupied the rest of the afternoon. She represented that the putting in of the execution and the consequent proceedings had prevented her getting a theatrical engagement for a considerable time, and that she had also lost a large sum from having to give up a quantity of furniture obtained on the hire system, on which about half the instalments were paid.

Witness was cross-examined in great detail, as to the position of her husband, with whom she stated she was not on good terms, who was said to have an agency for an African house, to deal in postage stamps, and to be a journalist; and also as to her putting off payment of tradesmen's accounts, rates, &c. There was also some cross-examination as to the alleged visits of Mr. Raeburn, clerk to Mr. Drew, a solicitor and co-defendant, who issued the writ and put in the sheriff.

Mr. George Porter Cato also gave evidence. He said there was a dispute with the Gas Company as to their account.

In cross-examination, witness stated that he never gave an address when he left home, though he might be away for weeks or months. He was once served with a writ by registered letter in Africa, but not in England. He was not now living with his wife.

Mr. Edward B. Chester, plaintiffs' solicitor, said they were indebted to him about £50 for costs of the proceedings for setting aside the writ. In addition to these, he recovered from the other side.

In cross-examination, witness gave the particulars of the proceedings with regard to setting aside the service of the writ, which the District Registrar saw no ground for doing. He had received, he thought, about £80 in costs from the other side; but he was not sure that it was not £120.

Mr. POWELL having submitted that the plaintiffs had suffered no damage, and that whatever had happened was, in fact, due to their own conduct,

Mr. Raeburn, clerk to Messrs. Buckell and Drew, said he called several days in succession at the plaintiffs' house for the purpose of serving the writ, but was unable to see anybody, except on one occasion, when Mrs. Cato told him she did not know her husband's address.

Mr. Drew having given formal evidence,

Mr. POWELL summed up the case for the defendants.

Mr. SCHOLEFIELD addressed the Jury in reply.

Justice DARLING summed up the case; explaining the law and commenting upon the evidence.

The JURY, without leaving the box, immediately returned a verdict for the defendants.

His LORDSHIP gave judgment accordingly, with costs, including the costs of the previous trial; and he ordered that a sum of money which had been paid into Court by the defendants, with a denial of liability, should be returned to them.

## QUESTION OF LIABILITY FOR A STOPCOCK ACCIDENT.

### HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Feb. 10.

(Before Justices PHILLIMORE and BUCKNILL.)

Osborne v. Metropolitan Water Board.

This was an appeal by the defendants against the judgment of his Honour Judge Woodfall, at the Westminster County Court, awarding the plaintiff £30, with costs, in respect of an accident caused through tripping over an open stopcock in the pavement.

Mr. A. B. SHAW appeared for the appellants; Mr. STURGES represented the respondent.

Mr. SHAW said the facts were not in dispute; the only question was as to the application of the law to the case. The plaintiff met with the accident through putting her toe into an open stopcock which was let into the pavement by the old Lambeth Water Company; and the learned Judge in the County Court had found that this hole was a nuisance; also that the stopcock was rightly put down by the Company, but had not been properly maintained by the Water Board. The opening which led down to the stopcock was 2½ inches across. It was filled with soft straw wadding; and the defendants did not dispute the allegation that this was not level with the pavement. The Judge held that, as the Board were empowered to put in the boxes, they must be kept in such a condition as not to be a danger to persons using the streets; also that the hole was a nuisance, and that the defendants failed to keep it in a safe condition. Counsel contended that, the box having rightly been put down in the first instance as an open box, the defendants were not liable, as they had merely done what the Water Company had done. Stopcock boxes were placed in the street under statutory authority.

Justice PHILLIMORE remarked that statutory authority only gave defendants power to put down safe stopcocks.

Mr. SHAW said they called evidence to show that the box in question was one of the best type known. He submitted that the learned Judge in the Court below had misdirected himself on the law, as there had been no want of reasonable care.

Mr. STURGES supported the decision of the County Court Judge, who, he said, had, after bearing all the evidence, come to the conclusion that there was negligence in keeping the stopcock in the way in which it had been kept.

Justice PHILLIMORE asked whether it was a part of defendants' duty to put in the wadding.

Mr. STURGES said it was their duty to see that the hole was not left in a dangerous state; and in leaving it in an unguarded condition they were guilty of negligence, as had been decided by the Divisional Court in the case of *Strube v. Southwark and Vauxhall Water Company*.<sup>\*</sup> Power had been given to water companies to open the roads and do what was necessary; but there was also an obligation to reinstate them, and put

them in the same condition as before. Evidence was given that it was unusual to put in stopcocks that had not lids. The question of whether the hole was properly maintained must be one of fact in each case; and here no evidence was given that the box had been inspected from time to time, or that there was no depression. In fact, all the evidence was the other way; for defendants' inspector said: "We always make it a duty to put in a wad and fill up."

Justice PHILLIMORE: Do you say that a hole of this kind is a necessary evil, that it is the duty of those who make it to do what is reasonable to prevent accidents occurring, and that it is none the less their duty because their motive for making it was to protect the stopcock from frost?

Mr. STURGES said that was his contention.

Mr. SHAW, in reply, urged that there had been no negligence on the part of the Board in not keeping the box filled up and flush with the pavement. Their only duty was to protect the stopcock; and to do this they put in the wad.

Justice PHILLIMORE, in giving judgment, said this case was not without difficulty in some respects. In his opinion, there was no negligence in the original construction of these stopcock boxes by the predecessors in title of the defendants, or in the way they did without a hinged cover to them, which might prove a source of danger as much as a protection; and the County Court Judge was therefore right in holding that the defendants were not responsible simply because they were the owners of these boxes. Then came the much more difficult question of whether the owners of these things were under a liability to keep the hole containing them filled up to the level of the pavement. It was proved to have been the practice of the Water Company to put a wad of straw or hay round the spindle of the stopcock at the bottom of the hole, to preserve it from frost and grit; and if the wad did not come up to the surface, they filled it up with earth. The question was whether there was a duty on the defendants to keep watch on all these numerous appliances, to see whether the level had been so worn away that it was necessary to put in a fresh wad or to fill up the vacant space. This was a question of very great difficulty; but he had come to the conclusion, though not without hesitation, that the learned Judge might have found, on the facts proved before him, that the true inference was that, when the box was last dealt with, either no wad, or an inferior, or insufficient, one, had been put in, and that this was the cause of the accident. Whether or not he was right in drawing this inference was quite another matter; but on this ground he thought that the judgment might be supported, and that the appeal by the Water Board must fail.

Justice BUCKNILL gave judgment to similar effect. He said the case was one of great difficulty; but he could not decide that the learned Judge was wrong in coming to the conclusion that something had been omitted which was customary, and that this amounted to negligence. He therefore agreed, though with some doubt, that the appeal must be dismissed, with costs.

Mr. SHAW asked leave to appeal, if so advised.

Justice PHILLIMORE said it would be evident from the judgment that leave would be given.

## Water Supply by a Railway Company.

Mr. Justice Swinfen Eady had before him for several days recently a case in which a claim was made by certain plaintiffs against the Great Western Railway Company for a declaration of the plaintiffs' right to a good and adequate supply of water fit for drinking purposes to their school at Malvern Link, under covenants of 1863 and 1869 binding the defendants to make such supply "so far as practicable from the spring or springs in their tunnel under the Malvern Hill, so far as the supply at such spring or springs will permit," and for this purpose to "lay down and at all times thereafter maintain and provide such pipes, machinery, and apparatus as shall be sufficient for the purpose." The water supply, having been found contaminated, had been cut off by the plaintiffs in 1907 so far as concerned the house; and they claimed an injunction to restrain a breach of contract and damages. The defence was that the covenants were *ultra vires*, and that the water was required for the purposes of the railway. The evidence showed that a great deal of water was allowed to run to waste. His Lordship decided that if the true construction of the covenants was that it bound the defendants in perpetuity to supply water fit for drinking, with the obligation of laying pipes and mains, and to obtain and convey the water for all time, he was satisfied, having regard to the evidence, that they could only do so at great expense, and by depriving themselves of necessary water, that it would be *ultra vires*. But this was not the true construction. They were only bound to supply the water otherwise running to waste, as they had done, and therefore there was no breach. He preferred to decide the question on this ground. The action failed, and must consequently be dismissed with costs.

**Sale of Cambridge Gas Stock.**—Last Wednesday, Messrs. Wright and Scruby sold by auction £100 of original consolidated stock of the Cambridge Gas Company, carrying a dividend of 10 per cent., at £232 per £100 of stock; and £380 of consolidated "B" stock of the same Company (7 per cent.) at £154 to £156 per £100.

**Theft of a Gas-Meter.**—At the Plymouth Police Court, a few days ago, Frederick Pepper, described as a printer, of no fixed abode, was charged with stealing a prepayment meter containing 10d., the property of the Plymouth and Stonehouse Gas Company. A policeman met the prisoner carrying something bulky wrapped in a bag, and asked him what it was. He replied that he believed it was a slot gas-meter, judging by the rattle of money in it; and he added that a man had asked him to carry it. He was locked up on suspicion, and subsequent investigation showed that the meter had been taken from a house near the place where prisoner was found with it. Pepper, who had previously been convicted of theft, was sent to prison for three months with hard labour.

<sup>\*</sup> See "JOURNAL," Vol. LIII, p. 907; Vol. LIV, p. 84.



## SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER in the chair.

The SECRETARY (Mr. F. M'Leod) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting. The seal of the Company having been affixed to the Register of Proprietors, the report and accounts (which have already appeared in the "JOURNAL") were taken as read.

The CHAIRMAN: I have now to move the reception and adoption of the report and the accounts for the past half year. You have all received a copy of these; and I have no doubt therefore you will, as usual, dispense with the formality of having them read. (Hear, hear.)

## THE DIVIDEND.

I was asked the other day why we proposed to pay a dividend at the odd rate of £5 9s. 4d. per cent. I think most of you here are familiar with the working of the sliding-scale; but, for the benefit of those who are not, let me remind you that Parliament, in return for the money you have invested in the business, has given you the sole right to supply gas within a given area (a defined one) of South London, and allows you to pay a dividend of 4 per cent. upon your capital as long as you charge 3s. 1d. per 1000 cubic feet. For every penny below this figure, you are entitled to pay an extra 2s. 8d. per cent.; and as the price is now 11d. below the standard, your dividend is eleven times 2s. 8d. above the standard. This accounts for the odd figures of £5 9s. 4d. This dividend has been fully earned; and, as the report tells you, the profits of the half year allow us to increase the money we have in hand to carry forward to the next account by the sum of £12,900. There is one other matter pertaining to the capital, which I ought to mention. The charge under this head has increased by some £18,000, made up of the various items appearing under their respective headings. We have gained between 5000 and 6000 additional consumers in the half year; and the money has been required to provide the pipes necessary to give them a supply of gas, as well as meters, stoves, and fires. So much for the Company's capital and interest. The remainder of the report deals chiefly with working results.

## INCREASED BUSINESS.

The half year under review has been progressive, rather than eventful. Although in too many parts of South London trade is still stagnant, yet in others it shows signs of some improvement, especially in the outer suburbs, where fewer "To Let" boards are certainly being exhibited. But a revival of trade would be of little use to us unless we obtained our share of the increased business which followed. Here, I am glad to say, our excellent outdoor staff has done good service. We have in the past few years completely reorganized this department of our undertaking; for changed conditions have made it increasingly necessary to sell gas on business lines, instead of on monopoly ones; and the fact that we have improved our gas sales to the extent of over 4 per cent. proves, I think, that we are doing so. Lest the figure may not seem as satisfactory as it really is, may I say that the increase would provide for the entire consumption of such important towns as Middlesbrough, Eastbourne, Ipswich, Tynemouth, Wigan, York, Hastings, and others. This will give you some idea of our business increasing over 4 per cent. While dealing with this subject, it may not be inappropriate if I refer to a matter about which one or two of our shareholders have asked questions.

## ELECTRICITY IN WORKING-CLASS DWELLINGS.

You will have noticed several references lately in the Public Press to the operations of an undertaking which has been started to supply electricity and electric fittings to the houses of the working classes in South London. You may have thought that many hundreds of houses had been, or were being, fitted up on this new plan; but we at present have been able to find only one—a sample or show one. The idea is to dispense with meters, so that you pay according to the number of lights in use. This, I may say, was the arrangement in vogue in the early days of gas lighting, before meters had been invented. It is proposed that the landlord should collect the money in respect of the fittings' hire once a week with his rent. Let me tell you what happened to one of the Municipal undertakings in South London who built model workmen's dwellings from which gas-pipes were excluded. The tenements would not let because of the absence of this modern convenience, and, at last, they had to approach the Gas Company for supplies. These were eventually put in by special arrangement, owing to the increased cost of cutting through the concrete and solid floors of the modern erections. Well you know there is something bright and cheerful about a flame. Whether in a flat-flame or an incandescent burner, or even in an oil lamp, there is something sparkling and brilliant which is absent in the rival illuminant; and I do not think that the working classes of South London are likely to add to the normal gloom of their surroundings by acquiescing in an experiment such as that proposed. And, what about the cooking, the boiling, and the baking, which is so large a part of our slot-meter users consumption? The fact is, however, that the electrical industry of the country is not in a flourishing condition; and one cannot be surprised at even endeavours of this character being made to obtain a little more custom.

## THE COAL QUESTION.

The report goes on to refer to our coal supply. You will remember that when I addressed you last August upon this subject, I expressed apprehension of what might happen when the Eight Hours Act came into force in the North of England. I am sorry to say there has been a realization of those fears; and, bad it not been that we were warned in time and arranged to lay in an unusually large stock of coal, the consequences might have been very serious. Whatever the result may be—and a settlement does not yet seem to be in sight—the cost to this

Company of the operation of putting the Act into force in the particular district from which our coal mainly comes, has been a considerable one. We have had for some weeks past a great deal of trouble in getting our coal picked and clean. It has been very dirty; and we have made complaints about it. Yesterday, I saw, personally, the fitter of one of the largest collieries; and he said: "Things are in such a disturbed state that, although we know the picking is badly done, we dare not say a word about it, or the men will leave their work." I know something about that condition of affairs, as I experienced it in 1889; and I am quite sure his policy is the right one. They have got to rub along as best they can; and we have to do the best we can with the coal we get. This is one result of putting the Eight Hours Act into force.

## THE PORT OF LONDON ACT.

Not only this; but I must here ask your patience while I refer to another legislative enactment (the Port of London Act of 1908) which has a very important bearing upon our coal supply. A reference to this does not appear in the report, as it was hoped the proposal to which I am about to refer would not have been persisted in. You may remember that the object of the Act was to place under one authority the management of the River Thames and the various docks; and, subject to any exemptions that might be desirable, to raise, by means of rates on goods, a sufficient sum to enable the deficit to be met. Then the Board of Trade put forward an estimate made by their experts for the Committees of both Houses of Parliament, that the entire moneys to be raised, not only from dues, but including new works and the registration of craft, would be £180,000 per annum, and that a due of one shilling in the £100 would be necessary to raise £150,000. The Act specifically says that the port rates on goods not entering the docks—that is, as distinct from dock rates—shall not exceed  $\frac{1}{3000}$ th of the aggregate value. On coal, this would be about 0.5 of a penny per ton. But the schedule proposed by the Port of London Authority has lately been issued; and they propose a maximum figure of 3d. per ton. This is out of all proportion to the value of the material we are dealing with. A half-penny per ton would mean to this Company £2500 a year. So that they are asking for power, if they think fit, to impose a maximum of £15,000 in respect of dues. The hardship of it is that we have got all our wharves and our deep-water jetties for unloading coal, we have every facility for doing our work, and yet we are asked to pay this unreasonable amount for those who have not done so in the past. We have instructed Counsel to oppose the suggestion as strongly as possible. An inquiry is to be held at the end of this month under the presidency of Viscount St. Aldwyn; and Counsel have been instructed to appear for us and to resist them to the utmost degree.

## WORKING RESULTS—RESIDUALS.

Well, I am afraid I have dealt rather fully with coal; and I will now direct your attention to the working results. Of these, the most satisfactory feature is the increased yield of gas from our raw material. Of the many problems with which we have to deal at our various gas-making stations, the carbonizing of our coal is the most important; and the results show how earnestly our engineering staff has devoted itself to the problem. Perhaps the improvement will be more clear if I say that ten years ago the figure was under 9400 cubic feet; so that the improvement is at the rate of 25 per cent. In the matter of other residuals, the least satisfactory feature is in the return from coke, which is £27,655 less than in the corresponding period. We have not been able to depend upon the cement industry, as formerly, to take our surplus production; and we have therefore had to look abroad for another market. At the same time, we feel that much may be done at home to popularize its use. We have borrowed the idea from America of selling small quantities in paper bags; and, although we cannot hope to do such a large business in this way as with our penny-in-the-slot meters, it would seem that in some districts the volume of trade to be done is not insignificant. Next to coke, our most important product is ammonia; and I am glad to say the return from it maintains its satisfactory position. Tar has suffered somewhat by reason of the low price of pitch, which is the largest residual from its distillation. According to the published returns, there is considerable shrinkage in the quantity exported. No doubt it is largely due to the increasing use of tar for road making, which has resulted in taking a good deal of pitch off the market.

## CARBONIZING.

Wear and tear has been heavier; the increase arising chiefly out of repairs to coal-handling and carbonizing plant. The new methods of working referred to earlier have enabled a considerable reduction to be effected in the cost of carbonizing—viz., £7449; and we have not yet reached high-water mark in this respect.

## DISTRIBUTION.

Distribution cost is also higher; but this is the outcome of present-day business requirements. The consumer wants more from us than a mere supply of gas; and, to meet a growing demand, we have had to decentralize to a considerable extent both our offices and our staff. Our local offices are increasingly popular, and are, without doubt, a great convenience to consumers. I am pleased to say that loss by robbery from slot-meters has sensibly diminished; the figure in the balance-sheet of £361 compares with £465 a year ago. We must give the police some of the credit for this; and the assistance they have given has been very helpful.

## STREET LIGHTING—INVERTED BURNERS.

I must detain you a few minutes about paragraph 6. Some years ago, we were able to make an arrangement with the various local authorities, by which the street-lamps were converted from flat-flame to incandescent burners. The cost of carrying out this work was spread over several years, and has only been recently completely repaid. You may remember that at our last meeting I was able to tell you that, by



means of inverted burners, a contract for lighting the streets of a suburban borough council has been secured, though they themselves owned an electric supply undertaking. We thought it would be good policy to offer to alter the public lamps in our own district to the newer form of inverted burners. About 2000 are already in use; and, by reason of their increased light and reduced cost, giving complete satisfaction. I am pleased to say that orders for some thousands more are now in hand.

#### DEATH OF A DIRECTOR.

Now, having regard to the extraordinary meeting which follows this one, I do not think I need at present say anything upon paragraph 7 of the report, which refers to the death of Mr. Cardwell and the necessity of appointing a successor.

#### CO-PARTNERSHIP.

Paragraph 8 deals with the question of co-partnership. Our co-partnership continues to be an increasing source of strength to the Company in all its dealings, whether with employees or consumers; and it is pleasing to note that during the past year seven other companies have followed our example and initiated schemes based very much upon our own experience. In this connection, there is an item in the balance-sheet account No. 12, on the bottom at the right-hand side, which I ought to explain. The amount of workmen's savings and bonus deposited with the Company figures at £15,000 odd, compared with £37,000 a year ago. The explanation is very simple. It is that we have more largely invested the money; and it has in consequence been taken out of the business.

#### THE LIVESEY MEMORIAL STATUE.

Before I conclude, I should like to say a word about the Livesey memorial statue. This has now been successfully cast; but not yet delivered by the founders. Mr. F. W. Pomeroy, the Sculptor, suggested that if it were exhibited in the forthcoming exhibition of the Royal Academy at Burlington House it would give many an opportunity of seeing the work who otherwise would not be able to do so. The Board approved of the suggestion, and gave the required permission; and I feel sure the work will be of great interest to the many thousands who visit that exhibition.

#### ADOPTION OF THE REPORT AND ACCOUNTS.

I now beg to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. John Ewart) seconded the resolution.

The CHAIRMAN said that if any shareholder would like to make any observation, they would be very pleased to hear him.

#### REMARKS BY SHAREHOLDERS.

Mr. GORDON said that after the long and interesting address which they had heard from the Chairman, it would be useless to comment upon the accounts. He should, however, like to make some remarks on the reserve fund; and he wished to know why the fund had not been invested. At the opening of 1908, the fund was £186,000. Of this, £86,000 was not fully invested. At the close of 1909, it was £184,000, of which the greater part, or £94,000, was not invested, and only £90,000 was invested. A reserve fund invested in the Company's business could not be at once realized—in fact, could not be identified; and the consequence was that if the fund was not separately invested it lost its value for the purpose of the undertaking to which it owed its origin. However, he did not think it necessary to move an amendment, because the proprietors had every confidence in the Board, and he knew that any remarks made by them would receive due consideration. He urged the Board to invest the reserve fund; it was not merely advisable or convenient, it was obligatory. He was not an expert in this matter; but they had experts present in the person of the Company's Auditors, who would perhaps favour the meeting with their opinion upon that point.

The CHAIRMAN: If there are no other remarks, I will reply to those of Mr. Gordon. We have followed the practice for many years past of using the reserve fund in our business. If we had not had this money, we should have had to borrow very largely to replace it. Furthermore, I might say that, by reason of not having invested it, we have saved the result of the very large depreciation which has taken place in money that we have invested. You will remember that last half year we had to write-down to a very considerable extent two of our funds on account of the heavy depreciation which had taken place in their value by reason of the fall in the value of investments. And, owing to the fact that we had this money not so invested, but were using it in our business, we were saved the unpleasant duty of writing down to a much larger extent. We are much obliged to Mr. Gordon for raising the question, and it shall have our consideration. I need hardly say that, as far as we can see now, the procedure followed for many years past has been a satisfactory one.

The resolution was carried unanimously.

#### THE DIVIDEND.

The CHAIRMAN: I have now to move: "That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." I have already dealt with this when going through the accounts and the report; and I need not say anything further, except to express my belief that you will all feel that you are thoroughly entitled to the dividend which Parliament gives you on the present price of gas.

Mr. HENRY AUSTIN seconded the resolution; and it was carried unanimously.

#### RE-ELECTION OF THE CHAIRMAN.

Mr. JOHN EWART: I have to move "That Mr. Charles Carpenter be re-elected a Director of this Company;" and I do so with great pleasure. Mr. Carpenter was elected a Director a little more than a year ago, to fill the vacancy caused by the death of Sir George Livesey; and on the retirement of Mr. Morton, who temporarily filled that position, he was appointed Chairman of the Board by his colleagues. Mr. Carpenter now comes up in the ordinary course for re-election. It was no light task, as you can imagine, to follow so strong and able a

Chairman as Sir George Livesey; but Mr. Carpenter has filled the position to the entire satisfaction of his colleagues and in the best interests of the Company. He has shown great tact and ability, as well as a sound and independent judgment in discharging the duties of his office; and he has had the loyal support of the staff. No friction or difficulty has arisen; and the working of the Company has proceeded so smoothly that it is difficult to realize that another hand has been at the helm. I believe that every department of the business is in as efficient, or a more efficient, state than ever previously in the history of the Company.

Mr. ROBERT MORTON: I have much pleasure in seconding the motion. It is quite true what Mr. Ewart has said with regard to Mr. Carpenter; and all his colleagues will, I am sure, endorse what he has said.

The CHAIRMAN: When, a little more than a year ago, you elected me to complete the term of office left unfinished by the late Sir George Livesey, I told you, in expressing my gratitude to you for it, that I would do my best to carry on the traditions he had handed on to me to maintain the integrity of the Company which he had done so much to raise to the position it now occupies. By your vote of to-day, you have granted me the longest tenure of office which the law allows; and I look upon that as your recognition of my efforts in the difficult task I have undertaken. I thank you heartily for this renewal of your confidence.

#### ELECTION OF AUDITOR.

Mr. EDGAR said he had much pleasure in moving: "That Mr. Thomas Spooner Soden be re-elected an Auditor of this Company." Mr. Soden had been connected with the Company for a great many years; and he hoped they would re-elect him.

Mr. GEORGE HOWLETT seconded the motion. He said Mr. Soden was a very old friend of the Company, and a very old Auditor. His office was not a mere sinecure, but required real good work not done in a perfunctory manner. The audit had been carried out to the entire satisfaction of the proprietors, and, no doubt, that of the Directors. There was no company in London better served in the audit of its accounts than the South Metropolitan Gas Company.

The resolution was passed unanimously.

Mr. T. S. SODEN: I have to thank you for re-electing me Auditor of the Company. With regard to the observations of the proprietor who spoke about the reserve fund, I think it is a very fortunate thing that we have not gone on investing. Otherwise, we should have had a large amount to write off. The other day, I was discussing with a very experienced man with regard to the reserve fund of another company; and he said that he had noticed during the last nine or ten years that sound investments had gone down in value; and it was a very good thing that money had not been put into these concerns.

The CHAIRMAN: That concludes the business of the ordinary meeting.

#### Extraordinary General Meeting.

The CHAIRMAN: The next business, ladies and gentlemen, is the election of a Director in the place of the late Edward Henry Cardwell; and for this purpose an extraordinary meeting has been summoned, in accordance with our Act of Parliament. No man could have been more respected by his fellows than was Mr. Cardwell—a thorough English gentleman in the best, and, in fact, in every sense of the word. The Board have spared no pains in their endeavour that his successor should be in every respect a fit and proper person; and they, in the end, unanimously supported the candidature of Mr. Kenneth Phipson Hawksley. Mr. Hawksley is a member of the firm of civil engineers of that name, who, for at least three generations, have been engaged in the construction, financing, and management of gas and water undertakings; so that he brings to the Board an experience that cannot fail to be most useful. Moreover, the honour of the position is a greater attraction to him than its fees; so I think I have said enough to show you that he is just the sort of man we want. By your election of Mr. Hawksley, you will not only give a seat at this table to a suitable Director, but you will be forwarding a policy upon which Sir George Livesey laid great stress in the later years of his life—viz., the selection as your Directors of men who, by their experience and training, were most capable of promoting the interests of the undertaking with which they were associated.

Mr. JOHN EWART, in seconding the resolution, said: I most cordially support all that the Chairman has said with regard to Mr. Hawksley's qualifications.

The resolution was carried unanimously.

The CHAIRMAN: I think I ought to explain that Mr. Hawksley has been, unfortunately, called away to Spain on a professional engagement; and, therefore, he is not able to be present this afternoon to return thanks for his election. You must wait till next half-yearly meeting before you can have the pleasure of making his personal acquaintance—those of you who do not know him now.

Mr. CHARLES HAWKSLEY: In the absence of my son, who has had the honour of being elected a Director, I should like to offer, on his behalf, his very grateful thanks to you, Sir, and your Co-Directors, and also the shareholders, for having done him the honour to place him on your Board. It is an honour he will greatly appreciate; and he will, I am sure, devote his services to the best interests of the Company.

The CHAIRMAN: That concludes the business of the extraordinary meeting.

#### VOTES OF THANKS.

Mr. GEORGE HOWLETT: I do not think we should break up this meeting without passing the usual, and, I think, the very necessary, vote of thanks to the Chairman, the Board, and the Staff. That is, I believe, generally taken as two resolutions; but, at any rate, I move a vote of thanks to the Chairman and Board for taking charge of the Company's affairs and bringing them to such a successful issue. One proprietor spoke of the reserve fund. I feel perfectly certain that if we leave that where it is in the hands of the Directors it will be as successful in the future as it has been in the past. Of course, the Board will discuss it, and no doubt the question asked will be answered at the next half-yearly meeting. We have a reserve fund; and there was no trouble about getting at it when we spent it all over



the strike some years ago—it turned up automatically without any trouble. I have no doubt, if it is your desire that it should be invested in gilt-edged securities, there will be no difficulty in getting rid of the stock in which it is invested. This is in the lap of the gods for the future; but I have no hesitation in saying that if it remains where it is, we, as shareholders, have nothing to do but congratulate ourselves with regard to all matters in connection with the Company. We know the Chairman, and his cleverness and ability, backed up by the Board of Directors who know their business. They have been at it for many years; and if they don't know it now, they never will. Hence the security of the Company as it stands to-day.

Mr. H. WEST seconded the motion.

The resolution was carried unanimously.

The CHAIRMAN: On behalf of myself and colleagues, I thank you very heartily for this vote of thanks. You have an admirable Board, who not only discuss without fear or favour the various matters with which we have to deal, but we are thoroughly united in our desire for the welfare of the Company; and, for myself, I cannot be too grateful for the loyal support they have given me on every occasion. Before I sit down, you will perhaps allow me to propose a vote of thanks to the Staff and workmen for the attention they have given to the Company's business. Mr. Gibb, who represents the engineering side, and will make "his first appearance" to-day, I am happy to say, has fully justified the expectations we formed of him. And Mr. M'Leod, who represents the commercial side of our undertaking, I cannot speak of too highly; he has been through the mill in the broadest and truest sense of the word, and his technical knowledge has been of great service to him in the position he occupies.

Mr. W. DOIG GIBB (Chief Engineer): Mr. Chairman, ladies and gentleman, I have been here for too brief a time to be able to give you much information about the business of your great Company; but it may interest you to know that, coming as a stranger among you, I have been cheered and encouraged by one thing, and that is, to find your Chairman not only a highly-trained and technical man who knows every hole and corner of your property, but a gentleman ready and willing to impart his information to others, and to help me to try and be as efficient as he was when he filled a similar position to mine. As regards co-partnership, it may interest you also to know that, coming among you as I have done and gaining experience for the first time, I can assure you that there is an *esprit de corps*, a good feeling of happy brotherhood among the men and the officials such as I have not experienced to a similar extent in other works where co-partnership did not exist. On behalf of myself and my brother officers, I beg to thank you for this vote of thanks. My brother officers are true co-partners, for they are working hand in hand with me. With the Chairman's help and your sympathy, I hope I may be in the future an efficient link in the chain of the Company's success.

Mr. M'LEOD: I must thank you, Sir, for your generous reference to the staff, including myself; and I thank you all, ladies and gentlemen, for your cordial endorsement of the Chairman's words. After what Mr. Gibb has said, I need add nothing to emphasize what you must by this time have realized—that the whole of our staff, including every grade, and all the men, are united in their desire to further the interests of the Company, which really means yours and ours. I can assure you that every official is keenly alive to the necessity of being intelligent and efficient to that end. They do their best; and I am sure there is not a staff in the country that could be better manned and who could work with more loyal intelligence than our officers do. That this will continue, I feel confident; and, in their name, I thank you very sincerely for your kind vote.

## BRENTFORD GAS COMPANY.

The Half-Yearly Ordinary General Meeting of the Company was held last Friday, at the St. Ermin's Hotel, Caxton Street, S.W.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

### THE RESULTS OF THE HALF YEAR—A HIGH MAKE.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was glad to be able again to give a good record both of working and of results. The sum of the half-year's working was that there had been sold 21 million cubic feet more gas; and this had been accomplished on a saving in coal and oil of £10,113. No doubt the proprietors would agree with him that this showed satisfactory management. Its results enabled the Board, with a profit of £42,691 added to the amount brought from last half-year's accounts, to recommend the dividends notified in the report. To give more precise details of the accounts, the actual saving of coal and oil was due largely to an increased sale of gas per ton; the amount sold per ton being 11,028 cubic feet, compared with 10,770 cubic feet during the corresponding half of last year. The actual make per ton was 12,096 cubic feet. Purification had cost less; and carbonizing wages had increased by only £59. On the other hand, coke, despite the increased sale of  $\frac{3}{4}$  cwt. per ton of coal—due to improved working at Southall—showed a decreased revenue of £2500, in consequence of the lower prices ruling when the contracts were made. He need hardly tell the proprietors that coke was very often a fleeting difficulty. It was a market they could not control. The price was low when the contracts were made; but now—and every gas company probably found the same thing—they had yards practically empty of coke, and in many cases contractors calling out for supplies. Then, in continuance of the policy outlined on former occasions, it would be seen by the accounts that the expenditure on wear and tear of works and machinery was still in excess of the average; but he believed he had gone into the matter thoroughly at previous meetings, and so perhaps he need not again enter on a justification of this very necessary expenditure. It might be, however, that the proprietors would be glad to have some idea as to what was likely to be further spent. To run a gas-works profitably nowadays, it was necessary to have up-to-date plant and machinery, and the gas industry was especially up-to-date with invention; so that

an active management could not afford, at any time, to rest on its oars and to congratulate itself upon having a complete machine. Subject, however, to this proviso, he was glad to give the proprietors a hope that the works in two years' time, so far as present intentions in regard to their reconstruction were concerned, would call for little further expenditure other than ordinary wear and tear.

### COMPLETE FREEDOM.

And when this large outlay had been met, they would very readily turn to a policy that was always present in their counsels as an important object—that was, the reduction of the price charged for gas. This question of the reduction of the price of gas was one of the most important with which they had to deal. He would go so far as to say that he ventured to think that all the obligations imposed upon them with regard to the testing of gas for illuminating power, or (it might be in the future) calorific power and even that watchdog the sliding-scale, might perfectly well be left out of Acts of Parliament altogether. What he meant by this was that the policy of the Directors must always be to send out the best gas they could (especially in these days of sharp competition), and at the lowest possible price. To this end, he need not tell them they kept the works in thorough manageable order, and this was one of the main things to which they constantly turned their attention. The price of gas was now 2s. 9d.; and they looked forward to the time when they would be able to reduce it.

### MISCELLANEOUS POINTS.

Then the proprietors would like to learn something as to prospects. The Company had a splendid district, and a developing one. There was one very good feature in these days in connection with all gas undertakings, and that was the very great output of stoves. These had the one considerable advantage that they operated on the daylight consumption, whereas in former days they had a lot of plant lying idle in the daytime. Gas-stoves contributed to altering this; and so they fostered this branch of the business as much as possible. Then, as the proprietors were aware, the Directors issued the other day £30,000 of new stock, and it was readily taken up, and at good prices. A rather gratifying feature, he thought, was that the stock was taken up very largely by local people. All they wanted now was good "gas weather." The weather had not been particularly propitious to gas undertakings during the past half year. But he thought the Company would show better results still in two years' time than it did now; and he believed they would do exceedingly well in the coming year. As a matter of fact, the increase in consumption had not been so great in the past half year as had been the case with some other companies, nor as great as they might have hoped for. It was not quite 2 per cent. But there was this remarkable feature about it. Comparing the past half year with the corresponding period of the year before, they had in 1908 the Franco-British Exhibition, which then did very well for the Company. They did not do so well through the exhibition last year; but they looked forward to a large increase through the Japan-British Exhibition. There was this remarkable point about the increase last half year—that whereas it was not quite 2 per cent. in the half year, the increase on the second quarter was nearly 4 per cent. The second quarter about synchronized with the time the exhibition closed, so this indicated that the exhibition had an effect upon the rate of increase in the first quarter. The increase from Jan. 1 to Feb. 5 this year had been at the rate of about 5 per cent.

Mr. R. J. N. NEVILLE seconded the motion. He remarked that the Board, as a whole, were confident that the expenditure which they were now incurring was being spent in the most economical manner, and for the very best of all possible purposes—viz., the cheapening of the price of gas, in order to extend, in the largest measure, the consumption of gas throughout the district. They had in Mr. Johnston an excellent and efficient engineer, whose ideas were entirely up-to-date, and who enabled the Board, if he might say so, to "skim the cream" of the new ideas which were continually coming forward. He had introduced to the Board an enormous number of pieces of reconstruction and remodelling which would be, in course of time, taken in hand, and the Board were convinced they were on the right tack.

Mr. RAND inquired whether the coalite process was likely to cheapen the cost of gas.

The CHAIRMAN said he did not think it was likely to cheapen anything, unless it was the sale of coke. He did not, however, like to give any definite opinion upon it; but he should say that it would not injure their coke sales. It would be quite easy for them to adopt a somewhat similar process if there was a demand.

Mr. RAND explained that he referred to the manufacture of gas.

Mr. NEVILLE: The make of gas per ton of coal is so small that it would not pay us.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. NEVILLE, dividends were declared at the rate of 5 per cent. per annum on the 5 per cent. preference stock, at the rate of  $12\frac{1}{2}$  per cent. per annum on the consolidated stock, and at the rate of  $9\frac{1}{2}$  per cent. per annum on the new 1881 stock—all subject to income-tax.

Moved by Colonel A. H. W. COWIE, and seconded by Mr. H. H. BATTEN, the retiring Directors—Mr. Ulick J. Burke, Mr. R. J. N. Neville, and Mr. D. Milne Watson—were re-elected.

Proposed by Mr. T. WILKINS, and seconded by Mr. PERCY ADAMS, the Auditors (Mr. Monier F. Monier-Williams and Mr. Alfred Bevis) were re-appointed.

### The Standard Burner Bill.

A Special General Meeting was then held for the consideration of the following resolution: "That this meeting having considered the Bill now pending in Parliament intitled 'A Bill to provide in the case of certain gas companies for the adoption of the "Metropolitan" argand burner No. 2 as a standard burner in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them and for other purposes,' hereby approves



the same, subject to such additions, alterations, and amendments as Parliament may see fit to make therein."

The SECRETARY having read the notice convening the meeting, The CHAIRMAN moved the resolution, remarking that, as the proprietors were aware, the Company, together with others, proposed to introduce a Bill in Parliament to alter, or at all events to settle and determine, the class of burner by which the gas was to be tested. The Company's present obligations, as regulated by their Act of 1868, required the testing-meter to be furnished with an argand 15-hole burner and a 7-inch chimney, or other approved burner and chimney. But there were no words in the Act prescribing by whom the "other" burner was to be approved; and the position was therefore ill-defined and uncertain. It was very desirable, as notably for purposes of comparison between the gas of different companies, that one uniform burner should be prescribed. The Board of Trade Committee which held an inquiry some time back as to this and other matters made certain recommendations, which led to the adoption by the authorities of the Carpenter "Metropolitan" burner No. 2; and since 1905 Parliament had prescribed the use of this burner in the case of no less than 62 companies and 16 local authorities. He might remind the proprietors that, in the City of London Gas Act, 1868, the principle was laid down that "the burner should be such as shall be most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." And the new burner complied with this very principle. He could not quite understand how any opposition could be offered by the local authorities. The Directors had not heard of any petition being put in from their district; and, in fact, they knew one or two of the District Councils were not likely to take any action. The Directors, under all the circumstances, thought it desirable to join with other companies in the promotion of the Bill, in order that the testing of their gas should be on the modern and approved lines.

Mr. R. J. N. NEVILLE seconded the motion, which, after a short conversational discussion, was unanimously carried.

On the proposition of Mr. T. WILKINS, seconded by Mr. NUNN, a hearty vote of thanks was passed to the Chairman and Directors. A similar acknowledgment was also made of the services of the chief officials and staff generally, on the motion of Mr. GEORGE BIRD, seconded by Mr. S. RICHMOND. The CHAIRMAN responded for himself and colleagues; and Mr. MANN and Mr. JOHNSTON for themselves and their respective staffs.

### NEWPORT (MON.) GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday last week—Dr. H. MELVILL BREWER in the chair.

The SECRETARY (Mr. T. H. Hazell) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended Dec. 31, was presented. The report opened with an expression of the Directors' regret at the death of Mr. Richard Laybourne, who was for 24 years a Director, and for the last ten years the Chairman, of the Company. Major J. C. Rennie Brewer had been elected a Director in his stead. During the six months there had been an extension of the Company's area of supply to the populous district of Rogerstone. The accounts showed that the revenue in the six months had been £39,647, and the expenditure £31,538; leaving £8109 to go to the profit and loss account, the balance on which available for distribution was £10,390. Out of this, the Directors recommended the payment of the statutory dividends.

The CHAIRMAN, in moving the adoption of the report, referred in feeling terms to the irreparable loss the Company had sustained by the death of his predecessor in the chair; and he proposed a resolution of sympathy with the late Mr. Laybourne's bereaved family. [The shareholders signified their approval by rising.] Proceeding to deal with the half-year's working, the Chairman said it had been satisfactory, as was shown by the accounts. The expenditure on capital account had increased, mainly owing to the extension of the supply to Rogerstone, where gas had been installed in preference to electricity, which was originally proposed there. The revenue account showed an increase in the consumption of gas by 5 per cent.; being 174 million cubic feet, against 165 millions in the corresponding period of 1908. Coke showed an improvement of £260, and tar of £180. The fittings account also showed very favourably; radiator heaters and gas-fires being two items that were growing rapidly. The profit balance for the half year was £8109, against £7995 this time last year. The Works Thrift Society was doing well. Its funds, representing the savings of their employees, showed an increase in deposits of about £300; and upon these there was allowed interest of 4 per cent. against 2½ per cent. allowed by the Post Office.

Mr. T. G. CARTWRIGHT seconded the motion; and it was carried.

A dividend at the rate of 5 per cent. per annum was then declared for the past half year.

A vote of thanks having been accorded to the Chairman, Directors, and officials,

The CHAIRMAN returned thanks.

The SECRETARY also acknowledged the vote, and stated that during the 24 years Dr. Brewer had been a member of the Board the business of the Company had increased two-and-a-half times.

The ENGINEER (Alderman Canning), replying on behalf of his department, said he could assure the Directors and shareholders that in the Crindau works, which had been largely remodelled, they possessed one of the most modern gas-works in the kingdom. The works were extending daily, and there was no doubt there would be a great deal of work before the Board in the future.

This brought the business of the ordinary meeting to a close.

A Special Meeting was then held to consider the Gas Companies Standard Burner Bill (No. 3), of which the Company are one of the promoters. Mr. Canning explained the scope of the Bill; and, after a few questions had been answered, it was sanctioned.

At the meeting of the Bridgnorth Town Council last Tuesday, it was reported that the make of gas last year was 28,439,000 cubic feet, which exceeded the previous highest record by 441,000 cubic feet.

### SOUTH SUBURBAN GAS COMPANY.

#### Half-Yearly Report and Accounts.

The following is the report of the Directors of the Company for the six months ended Dec. 31, which, with the accounts for this period, will be presented at the half-yearly general meeting next Friday.

The consumption of gas shows an increase of 3.41 per cent.—the largest which has been experienced by the Company for several years. Consequent upon this increase, the receipts for gas are nearly equal to those for the corresponding half of last year, notwithstanding the reduction in price of 1d. per 1000 cubic feet, which took effect from the 1st of July last.

Owing chiefly to more favourable contracts, there is a saving in the cost of coal, although a greater quantity had to be used in order to meet the larger demand for gas. The expenditure, however, on repairs and maintenance of works and plant, and distribution charges, has exceeded that of the corresponding half year; and rates are also £202 more. On the other side of the account, the receipts for coke and tar show substantial increases; and there is a satisfactory addition of £209 to meters and stoves at rent.

After providing for the debenture interest, and including the balance of £10,269 brought forward from last half year, the balance available for dividend is £29,084; and the Directors recommend the payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock (this being the full dividend arising from the reduced price of gas, and authorized under the provisions of the sliding-scale)—carrying forward to next half year £10,442.

The Directors report with much satisfaction an unprecedented and sustained demand for gas-fires and gas-heaters of various kinds for domestic use. They regard this as a very encouraging result of their efforts to popularize this use of gas among the consumers, and as unmistakable evidence of the growing appreciation of gas as a heating agent. In fact, for all purposes for which heat is required in the household, gas is not only the most convenient and the most adaptable form of fuel, but it is also the cheapest, taking into account its cleanliness and the small amount of attendance required by it.

The accounts accompanying the report show that the total expenditure on capital account at the close of the year was £805,058, or £26,305 less than the receipts, inclusive of the premium capital—£831,363 in all. The principal items of expenditure were £1330 on new buildings and plant and £701 on new and additional gas-stoves. The revenue from the sale of gas was £82,214; the rental of meters and stoves produced £6578; the sale of residuals, £27,435; and a small item of rents brought up the total receipts to £116,307. The following were the principal items of expenditure: Manufacture of gas (including £45,560 for coal and £12,915 for maintenance of works and plant), £65,111; distribution, £16,205; management, £5535—rents, rates, and taxes (£4979)—miscellaneous items bringing up the total to £94,651. Among these items is a sum of £1700 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £21,650; and the amount applicable for dividend is £29,084.

The statements as to working show that 63,500 tons of coal were carbonized in the half year. The quantity of gas made was 735,917,000 cubic feet, of which 682,442,000 cubic feet were sold and 691,371,000 cubic feet were accounted for. The residuals were: Coke, 762,000 cwt., of which 149,528 cwt. (estimated) was used in manufacture; breeze, 15,571 yards; tar, 639,635 gallons; ammoniacal liquor, 16,432 butts—the make of sulphate of ammonia being 656 tons.

### CROYDON GAS COMPANY.

#### Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the sales of gas in the six months ended the 31st of December exceeded those in the corresponding period of 1908 by 5.54 per cent.; and that the number of consumers increased by 1177. There was a satisfactory extension of the use of gas for cooking and heating, particularly for the latter purpose. The number of stoves on hire was increased in the half year by 444 cookers and 1117 fires; while 43 and 440 respectively were sold to consumers—making a total increase of 2044. The system of giving free attention to incandescent burners, which was commenced in October, has been much appreciated by the consumers. The number of premises at which these burners are regularly attended to by the Company increased in the three months from 800 to 2025.

The accounts accompanying the report show that the total revenue was £119,379, of which £86,610 was derived from the sale of gas, £9253 from rental of meters and stoves, and £23,591 from the disposal of residuals. A sum of £58,013 was expended on manufacture, and £17,391 on distribution; rent, rates, and taxes came to £4480; management cost £4337; and the total expenses (inclusive of £600 for the co-partnership scheme) were £89,456. The balance carried to the profit and loss account is £29,923; and the amount available for distribution is £30,089. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,624, and leave a balance of £7475.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 43,225 tons of coal and 524,910 gallons of oil were used during the half year to manufacture 677,032,000 cubic feet of gas, of which 636,451,200 feet were sold and 643,858,400 feet accounted for. The estimated quantities of residuals produced were: Coke, 25,935 tons; breeze, 5666 tons; tar, 551,327 gallons; ammoniacal liquor, 1,152,823 gallons—the make of sulphate being 414 tons.



## BOURNEMOUTH GAS AND WATER COMPANY.

## Half-Yearly Report and Accounts.

In the report which the Directors of the Bournemouth Gas and Water Company will present at the half-yearly meeting next Friday, they state that the sales of gas in the six months ended Dec. 31 last show a substantial increase by comparison with the corresponding half of 1908; and there was a satisfactory increase in the water-rental. Coal cost less; but the proceeds of the sales of residuals showed a small diminution. The accounts accompanying the report note that the revenue from gas was £50,992, and from water £19,324; the total receipts being £68,572. The expenditure (including £980 for the co-partnership scheme and expenses) was £61,596; leaving £26,976 to go to the profit and loss account; compared with £24,654 at the end of December, 1908. The balance available for distribution is £44,743; and the Directors recommend the payment of dividends (less income-tax) for the half year at the rates of 6 and 7 per cent. per annum on the preference and "B" ordinary shares respectively, and at the rate of 15 per cent. per annum on the original capital of £50,000. These dividends will amount to £16,913, and leave an amount of £27,830 to be carried forward.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager, 21,850 tons of coal, 221 tons of cannel, and 408,143 gallons of enriching oil were used in the production of 403,125,000 cubic feet of gas, of which 363,400,574 cubic feet were sold and 374,635,854 cubic feet accounted for. The residuals produced were: Coke, 13,267 tons; breeze, 1631 tons; tar, 243,367 gallons; and sulphate of ammonia, 197 tons.

## PORTSEA ISLAND GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday—Mr. R. EDGCOMBE HELLYER in the chair.

The SECRETARY (Mr. H. A. Stibbs) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended Dec. 31, was presented. The Directors expressed the deepest regret at the loss of their much-esteemed colleague Sir John Baker, M.P., who, as a Director for 37 years and Chairman for 16 years, had rendered services of inestimable value to the Company. The former Deputy-Chairman (Mr. R. E. Hellyer) had been elected Chairman, and Mr. F. M. Aylen Deputy-Chairman; while Colonel C. L. Owen, who had resigned his position as an Auditor, had been elected a member of the Board. The past half year had been one of steady progress. The general demand for gas had been maintained; and the number of consumers had again appreciably increased. The removal of the Jetty at the Flathouse works, which was required by the Admiralty, had been effected; and in its stead, a travelling crane, with elevating and conveying plant, had been installed. It was anticipated that the new method of discharging and loading vessels at these works would not entail any additional cost to the Company. The gratuitous inspection and adjustment of the consumers' incandescent burners at regular intervals had been considerably extended; and the greatly increased lighting efficiency thus afforded was much appreciated. A scheme for the superannuation of the officers of the Company had been established on a mutually contributory basis. It came into operation at the commencement of this year. The Engineer and General Manager (Mr. J. D. Ashworth) reported that the buildings and plant at the several stations, and also the mains and meters, had been adequately maintained, and were in efficient working order. The accounts accompanying the report showed that the revenue for the half year amounted to £113,773, and the expenditure to £94,682; leaving £19,091 to go to the profit and loss account, on which there was a balance of £40,582 available for distribution. This enabled the Directors to recommend the declaration of dividends for the six months at the rate of 13 per cent. per annum on the "A" and "B" shares, 12 per cent. per annum on the "C" shares, 10 per cent. per annum on the "D" and "E" shares, and 5 per cent. per annum on the stock—all less income-tax; leaving a sum of £22,650 to be carried forward to the next accounts.

The CHAIRMAN, in moving the adoption of the report, prefaced his remarks on the half-year's working with a tribute to the memory of the late Chairman, and to the invaluable services rendered by him in the management of the Company. Commenting on the other matters mentioned in the report, he remarked that the new coal-handling plant at the Flathouse works had been in use for several weeks, and was affording entire satisfaction; and though it had been adopted as a necessity, consequent upon the removal of the jetty, a saving in the cost of working was anticipated from its introduction. Turning to the accounts, he pointed out that though, owing to the lower prices obtainable, the revenue from the sale of coke and tar in the past six months had been less than for the corresponding period of last year, the receipts from the sale of gas and from other sources had increased; and with the considerably reduced cost of fuel and the saving effected in labour, the balance carried to the profit and loss account was £19,091, compared with £17,766 in 1908, though £2200 was charged against the current half year's revenue for extraordinary renewals.

The DEPUTY-CHAIRMAN (Mr. F. M. Aylen) seconded the motion.

A SHAREHOLDER referred to the decrease in the receipts from the sale of the residuals named by the Chairman, and expressed some doubt as to the present position and future prospects of the Company.

The CHAIRMAN was able to prove very clearly that such pessimistic views were absolutely groundless.

The report and accounts were then adopted with one dissentient.

The retiring Directors and Auditor having been unanimously re-elected,

Mr. A. BOOKER proposed that the Directors' remuneration be increased to 1500 guineas per annum, free of income-tax. He pointed

out that by the absorption of the Portsea Island Gas-Fittings Company, Limited, the Gas Company had benefited largely; but that while the emoluments of the Auditor and officials had been made good, the Directors were £150 out of pocket, owing to the loss of their fees—the personnel of the two Boards being identical. After remarking on the recent growth of the Company, the speaker gave the rate of remuneration paid by other undertakings of similar magnitude, and showed that, by comparison, the Directors of the Portsea Company were inadequately paid for their services.

Mr. T. BRADDOCK seconded the motion, which was strongly supported by Mr. ERNEST EDMONDS.

A direct negative was proposed, as was also a reduction of the present fees by £100. Neither, however, was seconded; and, after some discussion, the motion was carried.

The meeting terminated with the customary vote of thanks to the Chairman and Directors, and also to the officers and staff, to which the CHAIRMAN replied.

## PROVINCIAL GAS COMPANIES.

## Launceston Gas Company's Increased Profit.

The report submitted to the annual meeting of the Launceston Gas Company yesterday week stated that it had been found necessary to replace one of the gasholders which had been in use since the establishment of the works, at a cost of £365. Great attention had been paid to the matter of leakage, with the result that it had been considerably reduced. This, together with a larger sale of gas, enabled the Directors to show an increased profit. A dividend of 7s. per share was recommended. The Chairman (Dr. W. F. Thompson) said Messrs. Willey and Co. were consulted with reference to the condition of the holders, and recommended that one be turned into a tar-tank, while another was fit for nothing. In replacing it, the Directors adopted the least expensive plan. The quantity of coal carbonized was 1457 tons, as compared with 1706 tons the previous year, which showed that the attention paid to the matter of leakage had had its effect. The Directors had considered the question of applying for a Provisional Order, and were almost unanimously in favour of it. Whether it should be for gas only, or for gas and electricity, would be considered later. The cost of coal during the past year had been £1403, compared with £1734 the previous year; and the total expenditure was £2709, as against £2872. The income from the sale of gas was £2659, as compared with £2563. In reply to a question, the Chairman said the wages of the men had been increased because they asked for it; no application was received from the Manager. Mr. Hoare proposed that the salary of the Manager be taken into consideration; and this was agreed to. Mr. Treleven, jun., remarked that the question of a reduction of the price of gas would receive the attention of the Directors.

## Improved Carbonizing Results at Littleborough.

The half-yearly meeting of this Company was held on Thursday, the 27th ult.—Mr. J. C. Hudson presiding. The balance-sheet submitted showed a falling off in receipts from gas sales, being £4387 compared with £4501, due to the recent reduction in price. The actual consumption, however, showed an increase of 2½ per cent., which was considered satisfactory, taking into account the depressed state of trade. Residual products realized £1229, against £1140; and the balance of net profit, subject to dividend, was £2861, compared with £2747 last year. A dividend of 10 per cent. per annum was declared. Improved carbonizing results were again reported; the average yield of gas per ton of coal being 11,136 cubic feet against 10,990 cubic feet. The total quantity of gas made during the twelve months ended Dec. 31 was 68½ millions, which is a record. The sales of gas have increased 25 per cent. during the last five years, despite the fact that the district has not developed, and that most of the mills and works have adopted during that period high and low pressure incandescent lighting; resulting in many cases in 30 to 50 per cent. reduction in consumption. Satisfactory increases were reported in the use of gas for domestic and trade purposes; while the popularity of the slot-meter was proved by the increasing demand for it, as well as by the higher consumption per meter, due to further facilities for the supply of cooking appliances, and also to the cash discount recently granted. Satisfaction was expressed by the shareholders at the sound financial condition of the Company; and thanks were given to the Directors, the Manager and Secretary (Mr. S. E. Halliwell), and the staff.

## Malton Gas Company and their Assessment.

The report presented at the half-yearly meeting last Wednesday of the Malton Gas Company stated that the revenue account showed a profit of £1636 on the six months' trading. The balance standing to the credit of the profit and loss account, including £2016 brought forward, and after payment of the interest on the mortgages, is £3693. The Directors recommended the payment thereof of a dividend at the rate of 6 per cent. for the half year, free of income-tax—making 12 per cent. for the year. The total revenue for the half year was £5209. In moving the adoption of the report, the Chairman (Mr. H. W. Pearson) remarked that the accounts were satisfactory. One point to which he wished to draw special attention was the action of the Assessment Committee of the Malton Union. The Company had made an appeal to them to reduce their assessment. There had been no reduction on the assessment on the works, &c., notwithstanding that, by reason of the Company having lost the lighting of the streets, they had had to write off about £600 as loss on capital and sale of plant, &c., caused by such deprivation. After the employment of two experts, the Assessment Committee had practically agreed to the claim of the Company that some reduction in the assessment was necessary. In fact, they met the Company very nearly in their demand. But, singular to say, a short time after this, the Assessment Committee served a notice on the Company that they proposed a very large increase of the assessment—actually above what they had appealed against in the first instance. This was altogether inexplicable. The Company would most strenuously resist the proposed increase in the assessment, and would go to Quarter Sessions and fight it out. The report was adopted, and the dividend declared.



## BRISTOL GAS COMPANY'S BILL.

## Opposition by the Corporation.

At the Meeting of the Bristol Corporation last Tuesday, the report of the Parliamentary Bills Committee with reference to the Bill of the Bristol Gas Company, which was noticed in the "JOURNAL" last week (p. 377), was brought up.

Alderman PEARSON, in moving the adoption of the report, said the Committee had dealt with the Bill from the point of view of the ratepayers and the consumers. The Corporation had no concern with the gas undertaking, which could take very good care of itself. In order that the Council might better appreciate the attitude taken up by the Committee, he would put before them broadly the position occupied by the Gas Company. The Company was formed to give, and they had the sole right to give, the public a supply of gas. This conferred on them, for all practical purposes, a monopoly in the supply of gas in the city. In consideration of having this monopoly, the Company had been put under certain restrictions. They were limited in the dividend they could pay and in the reserve they might create. The first departure from this position occurred in 1891, when the Company promoted a Bill to give them power, among other things, to split their stock, which meant that they doubled the amount of their existing stock, upon which they paid one-half of their former dividend. The amount of the stock was consequently increased from £511,250 to £1,022,500. This was apparently a domestic concern; but it enabled the Company to create an additional £50,000 of reserve before the consumer obtained a penny in the way of a reduction in the price of gas. The Committee had considered the present Bill from this point of view. One of the main features to which they had directed their attention was the proposal made for raising money to pay off the debenture holders by agreement; and the Committee thought that this might operate badly for the consumers. Then there was the somewhat important clause (No. 12), which dealt with the creation of what was called the second reserve. It amounted to this—that the Company asked leave to create a reserve which would be an additional one. Then they went a step farther, for this reserve was not to be raised upon actual capital subscribed, but upon the amount subscribed *plus* the premiums which had been paid on the sale of stock. This would, of course, increase the amount of reserve which it would be possible to raise under the clause. There was also the question as to the quality and the mode of testing the gas. He might say he had learnt with considerable surprise that sulphur in gas, so far from being injurious, was a thing rather to be desired, and that it should not be considered an impurity unless it took the shape of sulphuric acid. The Company also seemed to vary very materially the mode of testing, which at present was comparatively easy and quickly done, whereas their proposal would make it more lengthy and difficult; and he believed that if the system suggested was carried out, it would be practically impossible for the Corporation to proceed against the Company for not supplying gas of the proper quality. At present, the gas was tested, and found to be either good or bad. Under the proposed arrangement, they could take the average of a three days' test. He thought this was a matter which would require attention. The Company asked leave to lay pipes in streets not dedicated to the public use. He did not object to this, as his ambition was to see gas or electricity in every street in the city. But he thought the pipes in streets not dedicated to the public use should be laid subject to the approval of the Corporation officials, as these streets would subsequently become public thoroughfares. Nor was there any objection to the power sought to lay pipes for general purposes, if they were placed in positions approved by officials of the Council. Dealing with the stand-by clause, he said the reason the Committee opposed this being in the hands of the Company while it was being allowed in the case of the electricity undertaking was that the Electricity Committee undertook to manufacture and supply, and they could not store. Therefore when they undertook to furnish a supply they must have machinery to cover the maximum demand reasonably expected to arise. In the case of the Gas Company things were different, as their maximum was limited to their capacity to store. The Committee considered it would be unwise to place the Company in a position to say, for instance, to an electricity consumer: "If you want gas for cooking, you shall not have it unless you give up your supply of electricity, or pay us what we consider to be a fair interest on the money we spend to give you this supply." No doubt they would have an opportunity of discussing matters before the question came to the Committee of the House of Commons; and the Parliamentary Bills' Committee would be prepared to listen to any explanations that might be offered.

The report was adopted.

## Meeting of the Gas Company.

The Annual General Meeting of the Gas Company was held last Thursday—Alderman J. W. S. DIX, the Chairman, presiding.

The SECRETARY (Mr. John Phillips) read the notice convening the meeting; and the report and accounts for the year ended Dec. 31 were presented. The Directors expressed their pleasure in reporting that the revenue account, after paying the yearly maximum dividend on the general capital stock and interest on the debenture stock, showed a profit balance of £929; and they felt that this result fully justified the position they took in 1907 in refraining from raising the price of gas, notwithstanding the large increase in the cost of coal. The profit and loss account showed a balance of £14,262 carried forward to the credit of the next account. The Directors recommended a dividend for the six months ended Dec. 31 at the rate of 5 per cent. per annum, subject to the deduction of income-tax.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was pleased that the Company had been able to pull through the coal boom and not raise the price of gas. They had done this, and without egotism he thought he might claim credit for the officials for the way in which they carried on the Company's business. The increase in it was most marked, and in directions beside that of lighting. In 1888, they commenced hiring-out cookers; in 1892, they had 2196 out; and in 1909, this number had increased to 41,500. Prepay-

ment meters were adopted in 1891, when they had 20 out; whereas to-day there were 21,997 fixed. This enormous increase, he was happy to state, was still continuing; and he ventured to think that the time was not far distant when there would be scarcely a house in Bristol in which a gas-cooker would not be in use. Gas-fires were also exceedingly useful, and made a great deal less work for servants. The shareholders had before them a statement of the progress which had been made by the Company during 47 years, so they could judge for themselves of its extremely satisfactory position.

Mr. FENWICK RICHARDS (Deputy-Chairman) seconded the motion; and it was carried unanimously.

The retiring Directors and Auditor having been re-elected, the dividend recommended was declared.

A Special General Meeting was then held to sanction the Bill of which the Company have given notice, by which they seek power to raise an additional £400,000 of capital.

Mr. T. D. SIBLY, the Solicitor of the Company, having read the provisions of the Bill,

The CHAIRMAN, in answer to questions by shareholders, said the new capital would be used for extensions from time to time as found necessary, and the proposed addition should be sufficient for many years to come. It would be possible to apply some of the new capital for providing increased storage capacity, if it was required; but at present they were very well off in this respect. There was some threatened opposition to the Bill; but this was generally expected. The Company, he claimed, were entitled to the consideration of the consumers and ratepayers of Bristol for the way in which they had discharged their responsibilities. Opposition might possibly come from the municipal authorities; but there would be a conference, and the objections would doubtless be whittled down. If not, the Company were prepared to go to the House of Commons and say they were asking only for what was reasonable, and what they must have if they were to go on with their business. He could say that there would be no attempt to refuse to supply gas for cooking at places where electricity was used for lighting. The Directors recognized that electricity had its province as well as gas, and there was scope for both.

The promotion of the Bill was unanimously approved by the shareholders, and the proceedings terminated.

## WICKLOW COUNCIL AND THE GAS COMPANY'S BILL.

## Suggested Agreement.

A Special Meeting of the Wicklow Urban District Council was held on Monday last week to consider a report by a Committee of the entire Council on the subject of the Wicklow Gas Bill, and to hear the views of the Directors of the Gas Company with reference to the proposals of the Council.

The Committee recommended that consent should be given to the passing of the Bill subject to the following modifications: (1) That the standard price should be fixed at 4s. 4d. per 1000 cubic feet; the prices charged to consumers for the next three years to be reduced to 4s. 4d. for lighting, 4s. for cookers, and 3s. 8d. for power. (2) That all future mains be laid at a depth of 2 ft. 6 in. where practicable, and, except where rock is met with, the depth not to be less than 1 ft. 6 in. from the top of the socket to the surface of the roadway; no public mains to be laid between the 1st of April and the 1st of October without the written consent of the Council. (3) That a purchase clause be inserted in the Bill empowering the Council to purchase the interests of the Gas Company in the works at any period during the three years following the passing of the Bill. (4) That the Council's Solicitor be requested to instruct Parliamentary Agents to draft and submit clauses embodying these recommendations to the promoters and to the Council for approval. (5) That the additional capital is not to exceed £4000.

Mr. G. W. Anderson, a Director of the Gas Company, said his co-Directors were quite in agreement with clauses 2, 3, and 5. With regard to clause 3, it was understood that purchase would be by arbitration under the Land Purchase Act. Clause 1 was the *crux* of the whole Bill. The Gas Company were prepared to accept 4s. 6d. as the standard price of gas; and if the Council amended the clause accordingly, the Company would be agreeable to have it put in the Bill. They would also agree to reduce the price to 4s. 9d. for three years. The reason they would do so was that, so far as they could see, the extra cost of opposition would mean an expense of £200 or £300 on the Company; and the consumers might as well have the benefit of this as the London lawyers.

After some discussion, it was decided to adopt all the recommendations of the Committee except the first, which was amended as follows: "That the standard price of gas named in the Bill be fixed at 4s. 6d.; the price to be charged to consumers for the next three years following the passing of the Act shall not exceed 4s. 9d. for lighting, 4s. 5d. for cookers, and 4s. 1d. for power. The whole resolution to be subject to the Gas Company agreeing to the clauses to be prepared by the Council's agents."

## Reductions in Price.

The price of gas at Bournemouth will be reduced by 2d. per 1000 cubic feet as from the 25th prox. The Coleraine Urban District Council have, on the recommendation of the Gas Committee, reduced the price of gas from 3s. 6d. to 3s. 4d. per 1000 cubic feet to all consumers except those using gas for power purposes, the charge for which will be lowered to 2s. 11d.; and they have allowed a rebate of 5 per cent. to all consumers of 250,000 cubic feet and upwards per annum. The new rates will come into force as from the 1st of April. The Exeter Gas Company announce a reduction from 2s. 9d. to 2s. 7d. per 1000 cubic feet in the price of gas for general purposes, and of 1d. per 1000 cubic feet from the prices now paid for gas used by engines; in both cases to operate as from Christmas last. The Wandsworth and Putney Gas Company have reduced their price by 1d. per 1000 cubic feet, making it 1s. 10d.



## GAS COMPANIES (STANDARD BURNER) BILL.

The question of opposing or supporting the proposal contained in the above-named Bill has been much under discussion lately in the districts served by the Gas Companies associated in promoting it; and we give an epitome of the proceedings in some of the most prominent places.

### Plymouth.

A report on the proceedings of the conference of local authorities affected by the Bill was presented to the General Purposes Committee of the Plymouth Town Council last Tuesday. The Town Clerk and the Electrical Engineer (who has control of the public lighting) attended the conference of local authorities held in London last month as representatives of the Plymouth Corporation. In their report, they stated that the number of authorities who sent delegates to the conference was fully representative of the districts affected. They then set forth the purpose of the Bill, and stated that the substitution of the proposed new standard burner would effect a reduction in the quality of the gas now supplied to Plymouth of from  $1\frac{1}{2}$  to 2 candles, and that the consumers of gas for lighting purposes would be prejudiced to this extent. Those who employed gas for cooking, heating, and motive power would, they said, also be prejudiced (by reason of the fact that the calorific value of gas of low illuminating power is less than that of gas of higher illuminating power), and such consumers must accordingly use more gas to obtain the same heat or power. No provision was made for any equivalent for this, or any reduction in price. The reporters gave the text of the resolutions passed by the conference, and then pointed out that, as the time for petitioning against the Bill would expire on the 19th inst., it was obvious that if the Corporation should decide to petition, they would be able to do so with greater force in association with the other authorities affected than on their own account. They added that the cost of opposition or negotiation as the case might be would be quite insignificant; and that the resolutions had been so framed that the expense of opposition would cease if and so soon as terms were arranged. The Committee decided to present a petition against the Bill. Reference was made to the fact that the Gas Company had hitherto dealt with the matter in a friendly way; and it was decided to suggest to the Company that Plymouth should be omitted from the Bill, in order to avoid further controversy.

Mr. J. H. S. May, the Deputy-Chairman, presided at a special meeting of the Plymouth and Stonehouse Gas Company held last Thursday for the purpose of sanctioning the promotion of the Standard Burner Bill. Mr. J. Shelly, the Solicitor to the Company, read the Bill, and briefly explained its legal effect. The Chairman, in moving that sanction be given to the promotion of the Bill, explained that under the old Acts of Parliament a standard burner for testing gas was adopted when the illuminating power was from 16 to 20 candles. In more recent times, upon the introduction of incandescent lighting and the great increase by all classes in the use of gas for cooking and heating, it was found that it was more to the public advantage to make a gas of lower illuminating power; thereby enabling the gas to be supplied at a lower price than would otherwise be possible. It was now well known that 14-candle gas gave precisely the same illuminating power with the incandescent mantle as 18-candle gas. By a recent Act, and as the result of negotiations with the Plymouth Corporation, the illuminating power of the gas was agreed to be 14 candles—a standard which had been adopted in several other towns. It was discovered, however, in London and other places where the lower candle power had also been adopted with parliamentary sanction, that the test-burner of the old pattern, while very suitable for testing gas of 16 candles and upwards, did not give a true result when gas below this power had to be tested. The South Metropolitan Gas Company went to Parliament, and, after careful investigation, and the consideration of expert evidence by a Committee, it was decided that a new burner should be adopted as a standard for testing the gas of low candle power. This burner—the "Metropolitan" argand No. 2—had been adopted by that Company, by the Gaslight and Coke Company, and by a considerable number of other gas companies and corporations, with the sanction of Parliament and of the municipalities concerned. An effort was now being made to have this standard burner adopted generally, so that the testing of gas throughout the country might be as far as possible uniform. Until recently, they had not been aware that there would be opposition to this on the part of the municipalities. They now knew, however, that it was to be offered; but they hoped it would not be persisted in. It should be remembered that if any small saving were made by the Company as a result of the adoption of the new standard burner, fully four-fifths of the benefit would, under the sliding-scale arrangement, go to the consumers in a reduction of the price of gas. The illuminating power of the gas supplied in Plymouth would continue to be 14 candles, as fixed by their present Act of Parliament, to which the Municipality assented. There were 61 gas companies and 15 local authorities owning gas-works already using the new burner. Mr. H. Wilcocks seconded the motion; and, after a few observations by shareholders, it was carried unanimously.

### Exeter.

At a meeting of the Exeter City Council last Wednesday, the Parliamentary Committee recommended that, in order to protect the interests of the inhabitants of the city, it was advisable that the Council co-operate with the other local authorities in opposing the Gas Companies Standard Burner Bills intended to be introduced into Parliament in the ensuing session, and that for this purpose a petition against Bill (No. 3) be presented to Parliament. They had also decided that the Town Clerk should issue the requisite statutory notices of a special meeting of the City Council for the determination of the presentation of a petition against the Bill, and the incurring of the requisite expense. Mr. Munro having moved the adoption of the report, Mr. Glanfield said he did not see the use of spending a lot of money to oppose the Bill. There were several corporate bodies who were opposing the Bill; and they might be right, because they might have some grievance against the local gas company, or they might want some concession. But in the case of Exeter he did not see that they had any grievance nor did the Parliamentary Committee make out a case. They did not give any reason why the Council should go to the expense of opposing the Bill,

which was an endeavour to obtain for the consumer the benefit of the best and fairest test-burner. The use of the new burner would tend directly to cheapen gas; so that they would not be doing a good turn, but rather a bad one, for the general public. The general consumers were in the habit of using incandescent mantles instead of the old-fashioned flat-flame burner; and therefore, if they could get a cheaper gas, it was for the public benefit for them to get as cheap a commodity as possible. Therefore there was no reason to oppose the Bill, because, after all, it would be a public matter, and be legislated upon in Parliament. If the Council had a grievance, or wanted any concession from the Company, they would be within their rights in opposing the Bill. He proposed that the matter be referred back to the Committee. There was no seconder of this proposition, so it fell to the ground, and the recommendation of the Committee was adopted.

### Hastings.

At the meeting of the Hastings Town Council on the 4th inst., the Public Lighting Committee reported that some time since they received a letter from Mr. C. E. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, on the subject of a Bill which certain gas companies intended to promote with the object of obtaining power to substitute, for gas-testing purposes, the "Metropolitan" argand burner No. 2 for the burners prescribed by the companies Acts. The Committee subsequently received from Mr. Botley a print of the Bill, and, having had letters from other local authorities affected by it, they deputed the Chairman (Mr. Blackman), Alderman Chesterfield, and the Borough Engineer to attend a conference of local authorities interested in this and two other similar Bills, held at Westminster Palace Hotel, on the 27th of January. The conference passed resolutions to the effect that the Bills should be opposed, and that the local authorities within the areas affected by the Bills should be asked to petition against them. The grounds upon which experts had advised that the Bills should be opposed were that the substitution of the proposed new burner for the existing statutory burners would effect a reduction in the illuminating power of gas now being supplied; that the reduction would affect adversely every type of burner employed for illuminating power purposes; and that consumers who used gas for cooking, heating, and motive power would also be adversely affected by the change. The Committee, being decidedly of opinion that the Bill should be opposed by the Council, had authorized the Town Clerk to take all necessary steps in the matter. Mr. Blackman, in moving the adoption of the report, said that, unless opposition was offered to the scheme, they, as gas consumers, stood to lose. The cost of the petition would be about £17; and it had to be lodged by the 19th inst. The Council could decide later what course they would adopt. Mr. Whitlock seconded the motion; and the report was adopted without discussion.

At the meeting of the London County Council last Tuesday, it was decided, without discussion, to oppose the Bill, and to charge the expense to the county fund. Resolutions to oppose have also been passed by the Corporations of Guildford, Ipswich, Maidenhead, Newport (Mon.), Southampton, and Swansea, as well as by the Walton-on-Thames Urban District Council.

## EXPLOSION AT THE COATBRIDGE GAS-WORKS.

### Purifiers Wrecked.

About ten o'clock last Thursday night, a violent explosion of gas occurred in the purifier-house at the Coatbridge Gas-Works. The house was an iron structure, and contained four purifier boxes, 24 feet square, which were erected in 1896. There was a chamber 6 feet in depth below the purifiers, which rested upon dwarf walls. The explosion occurred in this chamber; and so great was its force that it lifted the purifier-boxes, completely wrecking them, and entirely destroying the purifier-house, besides doing much damage to the engine-house and the Manager's office. At the time of the explosion, the stokers for the night shift had just gathered about the retort-house. One of them, named James Scott, who was outside the retort-house at the time, was lifted over a fence 6 feet high, and was badly cut and bruised. He was taken to the hospital. There was no other personal injury. The explosion created much alarm in the town. The sound of it was heard a considerable distance, and there was much destruction to windows in the neighbourhood of the works; the glass in several hundreds having been broken. After the explosion the retorts were drawn, and other precautions taken to prevent mishap to the gasholders, which had, fortunately, escaped unscathed.

On Friday, the Directors met, and arrangements were made for the purification of the gas by the use of milk of lime in a tower scrubber, by which means the manufacture of gas was enabled to be proceeded with. Arrangements are also being made with all haste for the reconstruction of the purifying plant. The cause of the explosion has not so far been discovered.

### Extensions of the Sutton Gas-Works.

The Directors of the Sutton Gas Company have decided to instal a bench of seven Klönne regenerative settings of eight retorts in each, 22 in. by 16 in. by 22 ft. long, to be operated by De Brouwer stoking machinery, including a bench of seven existing settings in the same retort-house. At a meeting of the Board last week, contracts were placed for the retort bench and settings and for the coal-handling plant. Messrs. Cockey and Sons, of Frome, will erect the steelwork and retort-bench mountings, including overhead coal hoppers. The De Brouwer stoking machinery, with the coke-handling plant, will be placed with Messrs. W. J. Jenkins and Co., of Retford. Each bench will be capable of making 9 million cubic feet of gas per day; so that the capacity of the house will be increased to 2 millions per 24 hours, and the whole of the operations, from the delivery of coal into works to coke on bank, will be mechanical. The work will be carried out in accordance with plans and specifications prepared by and under the supervision of Mr. G. Mead-Robins, M.I.Mech.E., the Engineer of the Company, and Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, the Consulting Engineer.



## GAS AND BYE-PRODUCTS IN THE UNITED STATES.

In previous issues of the "JOURNAL," reference has been made to the particulars relating to the production of gas and residuals in the United States in the years 1907 and 1908 which Professor E. W. Parker, of the United States Geological Survey, has published, through the Department of the Interior, as an advance chapter of the Mineral Resources of the United States for 1908. An abstract of this chapter was made for the "American Gaslight Journal" by Mr. H. Thurston Owens, and it furnishes the following statistics.

During the year 1908, there were nearly 157,000 million cubic feet of artificial gas produced, which was sold for some \$133,000,000; being an increase of \$7,000,000, over 1907. To this should be added upwards of \$37,000,000 received for bye-products.

The number of coal and water gas companies reporting shows a decrease in the former and an increase in the latter, as follows:—

Type of Works.	1907.	1908.	Inc.	Dec.
Coal gas . . . . .	516	506	..	10
Water gas . . . . .	520	552	32	..
Total . . . . .	1036	1058	22	..

The decrease in the number of coal-gas companies has been going on since 1904, when there were 534 companies reporting. However, the output from coal-gas works showed approximately the same percentage of increase as that from water-gas works—viz., 9 per cent. The business depression was plainly shown in the output of the retort-oven plants, for these showed a loss of 21 per cent. The total increase for all was  $7\frac{1}{2}$  million cubic feet, or 5 per cent., as will be seen from the following figures (thousands of cubic feet):—

	1907.	1908.	Increase.
Coal gas—			
Retort-ovens . . . . .	20,516,731	16,205,925	4,310,806*
Gas-works . . . . .	34,302,954	37,355,888	3,052,939
Water gas—			
Gas-works . . . . .	94,634,620	103,347,497	8,712,877
Total . . . . .	149,454,305	156,909,310	7,455,003

\* Decrease.

In spite of a loss in the output of coal gas of more than  $1\frac{1}{2}$  million cubic feet, there was an increase in the amount received, owing to an increased price per 1000 cubic feet. The totals are as follows:—

	1907.	1908.	Increase.
Coal gas . . . . .	\$36,462,304	\$37,227,901	\$765,597
Water gas . . . . .	90,173,112	96,343,221	6,170,109
Total . . . . .	\$126,635,416	\$133,571,122	\$6,935,706

In calculating the average price received per 1000 cubic feet sold, the Government has bulked the retort-oven and the gas-works coal gas; so that these figures give no indication as to the average price received for high-grade gas. The figures for water gas, however, show the ever-downward trend of the price of this commodity.

	1905.	1907.	1908.
Coal gas . . . . .	0.81	0.67	0.70
Water gas . . . . .	1.00	0.95	0.93

The proportion sold for illuminating and fuel purposes shows that, while there was a loss in the sales of coal gas for fuel, this was offset by the gain in water gas. The striking feature, however, is the gain of upwards of 7 per cent. in the sales of gas for illuminating purposes.

Year.	Kind of Gas.	Illumination.	Fuel.	Total.
1907	.. Coal	30,256,774,000	24,662,911,000	54,819,685,000
1907	.. Water	71,931,612,000	22,703,008,000	94,634,620,000
1908	.. Coal	32,485,571,000	21,076,242,000	53,561,813,000
1908	.. Water	76,804,546,000	26,542,951,000	103,347,497,000
1907	.. Both	102,088,386,000	47,365,919,000	149,454,305,000
1908	.. Both	109,290,117,000	47,619,193,000	156,909,310,000

The gas unaccounted for still reaches enormous totals, but with a decided decrease in quantity and a larger decrease on a percentage basis; the totals being given as follows:—

	1907.	1908.
Coal gas . . . . .	3,422,861,000	3,382,856,000
Water gas . . . . .	7,505,225,000	6,889,706,000
Total . . . . .	11,928,116,000	10,272,562,000

In point of sales, New York leads all the other States in coal gas; but it is second to Pennsylvania in the sales for fuel purposes. Sales of 1000 millions or more are recorded in thirteen States. The average price received for gas in 1908 was 70 c. per 1000 cubic feet; ranging from 47 c. in Pennsylvania to 208 c. in California and Oregon. For illuminating purposes, the average was 73 c.; ranging from 35 c. in Wisconsin to 209 c. in California and Oregon. The latter also leads in the price received for fuel gas, with 206 c.; while the average in the lowest (Pennsylvania) was only 13 c.

More than one-third of the water gas sold in America is credited to New York; and fourteen States sold upwards of 1000 million cubic feet. The average price received for water gas was 93 c.; but in only eleven States was the average less than \$1—New York being the lowest, with 84 c. Comparing the price received for gas for fuel purposes with that for illumination, the fuel gas commanded a higher price—viz., 98 c.—against 92 c. for illuminating gas. Taking individual States, in five the price was the same for both gases, and in ten the price for fuel gas was higher.

The residual products show a loss in value of nearly \$10,000,000, almost wholly due to the greatly diminished business of retort-oven

plants. In the matter of coke, the quantity shows a loss of 23 per cent., and the value 29 per cent. The total sales are as follows:—

	1907.	1908.	Decrease.
Coke, in short tons. . . . .	8,093,144	6,253,125	1,840,019
„ value . . . . .	\$30,332,644	\$21,507,045	\$8,825,599
Tar, in gallons . . . . .	117,991,777	110,430,663	7,561,114
„ value . . . . .	\$2,993,568	\$2,766,700	\$226,868
Anhydrous ammonia, in lbs. . . . .	37,560,858	30,615,835	6,945,023
„ value . . . . .	\$2,601,057	\$2,065,169	\$535,888
Ammonium sulphate, in lbs. . . . .	48,882,237	44,093,437	4,788,800
„ value . . . . .	\$1,525,472	\$1,322,807	\$202,665
Total value . . . . .	\$37,452,741	\$27,661,721	\$9,791,020

The quantity of coal carbonized in 1908 was greater than that for 1905, but was  $2\frac{1}{2}$  million short tons less than for 1907. The proportion used in gas-works increased from 35 to 38 per cent.

	1907.	Per Cent.	1908.	Per Cent.	Decrease.
Gas-works . . . . .	4,030,974	35	3,553,920	38	476,154
Retort-ovens . . . . .	7,460,587	65	5,699,058	62	1,761,529
Total . . . . .	11,490,661	..	9,252,978	..	2,237,683

The yield of coke in short tons sold, shows a decrease of from 70.7 per cent. in 1907 to 63.9 per cent. in 1908; and the price has also fallen from \$3.75 to \$3.44 per ton. The loss occurred in the retort-oven product, which sold for only 1 c. more per ton than the gas-works coke.

	1907.	Price.	1908.	Price.	Decrease.
Gas-works . . . . .	2,510,106	\$3.45	2,051,899	\$3.43	458,207
Retort-ovens . . . . .	5,583,038	\$3.86	4,201,226	\$3.44	1,381,812
Total . . . . .	8,093,144	\$3.75	6,253,125	\$3.44	1,840,019

The figures for yield of gas are, to say the least, startling, as, according to the statistics, there was 2000 cubic feet more gas sold for every ton of coal carbonized in gas-works in the year 1908 compared with the previous year.

	1907.	1908.
Gas-works . . . . .	8512	10,511
Retort-ovens . . . . .	2750	2,844

The sales of tar show that the product of gas-works was the only one indicating an increase, though the quantity produced by water-gas works remaining unsold, added to that sold, would also show an increase. Two fields where tar could be sold to advantage—briquetting and road surfacing—remain practically undeveloped; and Mr. Thurston Owens thinks these will undoubtedly receive more attention than has hitherto been the case. The figures of the sales of tar are (in gallons):

	1907.	1908.	Decrease.
Retort-ovens . . . . .	53,995,795	42,720,609	11,275,186
Coal-gas works . . . . .	49,581,965	58,541,220	8,959,255†
Water-gas plant . . . . .	14,414,017	9,167,834*	5,246,183
Total . . . . .	117,991,777	110,430,663	7,561,114

\* In addition, 5,559,199 gallons were produced but not sold. † Increase.

## COST OF GAS AND ELECTRIC LIGHTING.

"The Times" Contributor Replies to Mr. Hanbury Thomas.

The Engineering Supplement to "The Times" last Wednesday contained the following reply by their contributor to the letter of Mr. Hanbury Thomas, given in the "JOURNAL" last week (p. 372).

Mr. Hanbury Thomas particularizes too much to prove his case with regard to the relative cost of gas and electric lighting. He must not confine the comparison to towns in the coal area or to seaside places supplied by water-borne coal. Nor should he rest his case on the experiments of a "responsible electrician," made with a few lamps. I could equally well quote against him the conclusion of Sir William Preece, that one can arrive at the price per unit at which electric light would cost the same as gas, in every-day use, by dividing by six the cost of gas per 1000 cubic feet. This was in the days of the carbon filament lamp; and therefore it follows that with the metal filament lamp one would have to divide by two or three to arrive at the necessary result. Hence in Sheffield consumers could well afford to pay 5d. per unit, and still spend no more than they would on gas.

But, surely, the only test is whether the public approve of electric light sufficiently to adopt it extensively and to an increasing degree. Therefore the fact that there are about 25 million electric lights in use in this country, that the capital sunk is something like £80,000,000, and that these figures are increasing by leaps and bounds, is more convincing than any arguments in water-tight compartments. Similarly, it is obviously unfair to compare the cost of lamp renewals with mantle renewals, when the latter are carried out under a maintenance scheme. If a tungsten lamp is "nursed," it will burn for 3000 hours (say, three years), and costs 2s. 9d.; this is equivalent to the cost of mantle renewals at Sheffield for three years with mantles at 3d.

As regards the question of reflection and concentration, Mr. Hanbury Thomas is evidently unacquainted with the latest developments in "Holophane" lighting, by which the best general effects are obtained by fixing the electric lamps on the ceilings of the rooms. When he can show me that gas can be treated in the same way, under equal conditions of safety and convenience, I will admit that the light from a gas-fitting (not gas *per se*) is subject to the same physical laws as that from an electric lamp.

With reference to the questions of ventilation and the products of combustion, if people will close up all windows and doors, or builders provide no means of escape for foul air, it is certain that the conditions are worse with gas than with electric light; and the latter must not be blamed for the emanations of human beings. Mr. Hanbury Thomas must not ask us to believe, in spite of his ingenious arguments, that the added carbonic acid gas from gas lighting is an improvement to the



atmosphere, or that the moisture due to the combustion of gas is desirable, from the point of view either of the decorations of the room or of its occupants. Surely, therefore, electric lighting must take precedence over gas lighting also from the hygienic point of view. It neither gives off moisture to destroy the decorations, nor carbonic acid gas, which, though it may be a desirable diluent in the eyes of some men of science, enters to only a very small extent into Nature's original prescription for that atmosphere which is indispensable to our existence.

The same number of the Engineering Supplement contained the following editorial remarks on the correspondence.

It has reluctantly to be confessed that the correspondence which has recently appeared in our columns in regard to the relative costs of gas and electric lighting reveals at least as much of the misplaced ingenuity that occasionally masquerades as commercial shrewdness as it does of the desire for truth directed towards accurate knowledge. The champions of gas as an illuminant declare that the idea that carbonic acid is itself poisonous has long been abandoned; but in condemning their adversary, they do not hesitate to cite the report of a Medical Officer of Health who discovered that the air in an electrically lighted council chamber contained "four or five times more carbonic acid gas" than did the air outside. How are the general public to be guided by such statements? In the absence of evidence as to the proportion of carbonic acid gas in the atmosphere outside, such testimony is valueless. Again, the advocates of electricity as an illuminant bring forward comparative instances, in the shape of quarterly bills for gas and for electricity, to indicate that, under practical conditions and in similar circumstances, except that the light is alleged to be better in the electrical case, the cost is from 25 to 50 per cent. in favour of electric lighting. To this the votaries of the gas industry reply with a flat denial; and they support their contention by another set of quarterly bills, in which gas appears to save a proportion even greater than that claimed by their competitors for electric lighting. We have published the letters because they are characteristic of methods which are scarcely worthy of the great organizations that control the progress of illumination in this country. The gas industry has at its command some of the foremost chemists and physicists of our time. The electrical industry is blessed with an unrivalled wealth of means for precise measurement. The public, therefore, have a right to ask for a truce to loose statements; and engineers will do well to see that their reports and papers are not misrepresented by the departments responsible for sales.

## THE GASLIGHT AND COKE COMPANY'S PROGRESS.

### An Appreciative Review of the Position.

There appeared in last Wednesday's "Financial Times" an article dealing with the Gaslight and Coke Company which sets forth the improved position of affairs in so clear and well-reasoned a manner that we are taking the opportunity of reproducing it. Additional interest is lent to the article by the fact that it follows so closely upon the half-yearly meeting of the Company.

The vital importance of personality in the administration of joint-stock enterprises of magnitude has been often demonstrated, but rarely more strikingly than in the recent history of one of our most important Metropolitan undertakings—the Gaslight and Coke Company. The proprietors of this Company, at their half-yearly meeting last week, expressed their satisfaction with the accounts laid before them, and with the Governor's statement as to future prospects. But we doubt if many, or any, of the proprietors (present or absent) clearly realized the magnitude of the change that has taken place in the position and prospects of their undertaking, or the extent to which that change is due to one dominant personality—that of Mr. Corbet Woodall, the Governor of the Company. On Jan. 1 last, the Company extended the area of its operations by the absorption of the district of the West Ham Gas Company; and the present is therefore a fitting opportunity for reviewing the progress of the Gaslight and Coke Company under the management that has rescued it from the difficult and insecure position it occupied a few years ago, and placed it in the far sounder and more hopeful position in which it now stands.

Not many years ago, it will be remembered, the Gaslight and Coke Company stood seriously discredited in the eyes of the local authorities and of Parliament, which repeatedly rejected the Bills it presented for increased capital powers, and eventually caused inquiry to be made into its administration by a Special Committee (presided over by Sir James Rankin), which reported unfavourably to the management. The Company, moreover, was highly unpopular with the public, who regarded it as an unprogressive, uncommercial, and arbitrary concern, with which they had as little to do as possible; while, naturally, the management was unpopular with shareholders, who saw their property depreciated and their dividends diminished. Now, after a few years of changed administration, all this has been altered. Last session saw a Bill for the extension of the Company's operations into the West Ham district, for the adjustment of the Company's standard illuminating power to modern conditions, and for other useful purposes, passed by Parliament, with the City Corporation and the London County Council—keen critics in former years—freely consenting. The Company is now regarded as an up-to-date, business-like, and obliging firm, conducting its affairs on thoroughly commercial lines; and people are therefore willing to deal with it freely, while the shareholders are rejoiced to see their stock substantially enhanced in value and their dividends rising—surely, if but slowly, as befits an undertaking that is still overweighed with capital. The change in the attitude of the investing public towards the Company cannot be more strikingly illustrated than by the fact that, while the dividend on the ordinary stock has only risen from £4 8s. to £4 13s. 4d. per cent. in the past seven years, the market price of the stock has risen from 85 to 105 in the same period.

That the Company is still overweighed with capital is proved by the

fact that the capital expended per million cubic feet sold in the case of this century-old undertaking is at least 50 per cent. in excess of that which has been expended by more modern companies. The following table shows that during the past four years this problem has been tackled in no uncertain fashion:—

Capital Expended in Relation to Gas Sold.

Year.	Gas Sold in Millions of Cubic Feet.	Capital Expended to Dec. 31 Less Redemptions.	Capital per Million Cubic Feet of Gas Sold.
1897 . . . . .	21,023	12,387,613	589
1902 . . . . .	21,034	13,012,055	619
Increase over 1897 . . . . .	11	624,442	—
1905 . . . . .	21,018	13,350,087	633
Increase over 1902 . . . . .	— 16	338,032	—
1909 . . . . .	22,540	13,434,590	596
Increase over 1905 . . . . .	1,522	84,503	—

Here we see, up to 1902, a reckless increase in capital expenditure, with a stagnant business. Then, up to 1905, a modified rate of increase in capital, with the business going slightly back, instead of forward. Finally, during the past four years, virtually no addition to capital, with a substantial advance in sales. Practically all the ground lost in the preceding eight years was recovered in the last four; and there is every hope that, with a progressive commercial policy bringing a steady increase in sales, while rigid control is kept over capital expenditure, the capital cost per million cubic feet of gas sold will go lower and lower in the future.

While the capital account has been thus soundly treated, the general financial position of the Company has also been greatly strengthened, despite several reductions in the price of gas, as will be readily seen from the next table.

Reserves.

At Dec. 31.	Undivided Profit, Redemption, Reserve, and Insurance Funds.	Suspense Account for Expenditure on Automatic Meter Supplies.	Net Reserves less Suspense Account.
1897 . . . . .	£ 129,362	£ 281,446	— 152,084
1902 . . . . .	210,727	111,918	98,809
1905 . . . . .	338,292	62,355	275,937
1909 . . . . .	661,797	nil	661,797

Improvement in reserves since 1897 . . . . . 813,881

This tremendous improvement in the Company's financial position has been accompanied by continuous advance in methods of manufacture, which have not only materially cheapened production, but have also put the Company's works into a position to cope with increased business in the future without increased capital expenditure. This is clear from the following comparison of the gas made and the raw materials from which it was produced during the past half year and the same half of 1905.

December Half Year.	Gas Made. Millions of Cubic Feet.	Coals Carbonized. Tons.	Oil and Spirit Used. Gallons.
1905 . . . . .	11,236	832,989	8,228,142
1909 . . . . .	12,110	805,265	7,251,759
	Inc. 874	Dec. 27,724	Dec. 976,383

It may be added that the expenditure on maintenance (including re-modelling) of works and plant during the past four years (£1,504,000) has been heavier than in any preceding similar period—further evidence of a wise policy, which will bear good fruit in the future.

An important feature in the Company's recent history is the introduction last year of a liberal system of co-partnership, whereby practical proof is given of the coincidence of interests of capital and labour. A bonus of nearly £39,000 was given last June to the staff and workmen of the Company to inaugurate the system—being the amount they would have received if the plan had been in force for the preceding two years. During the past half year, a further sum of £13,000 was set aside on account of co-partnership, which promises to do much towards the elimination of the possibility of trouble between employer and employed, and to produce better working results by the increased energy and zeal of the individual workers.

The history of the Company in the past few years may then be briefly summarized as follows:—

- 1.—A stagnant, unpopular business transformed into a progressive, well-regarded undertaking.
- 2.—Capital account rescued from a most dangerous position and policy, and reserves strengthened by £800,000.
- 3.—Cost of manufacture reduced by improved engineering and adequate expenditure on reorganization and remodelling of works.
- 4.—Price of gas reduced from 3s. to 2s. 8d. per 1000 cubic feet—this being discounted to the extent of 1d. by the re-introduction of meter-rents.
- 5.—Employees made shareholders.
- 6.—Dividend increased from £4 8s. to £4 13s. 4d. per cent.
- 7.—Price of ordinary stock raised from 85 to 105.

It is common knowledge in the gas world, but is not generally known by either the gas consuming or the investing public, that the credit for this revolution—for revolution it truly is—in the position of



the Company is due to the initiative and to the administrative, as well as technical, abilities of the present head of the Company, Mr. Corbet Woodall; and it is but just that this fact should be put on record, for the financial benefit of the change, alike to the consumer, the shareholder, and the employee, has been enormous. The reductions in the price of gas represent (roughly) £300,000 a year to the consumers; a rise of twenty points in the ordinary stock represents £3,000,000 to the holders; and co-partnership will mean £30,000 a year and upwards to the employees. Mr. Woodall joined the Board of the Company towards the end of 1897, eventually becoming Governor in February, 1906; and he has since devoted himself to the restoration of the Company's fortunes—already commenced under his influence—in which task he has been ably seconded by the General Manager (Mr. D. Milne Watson) and the other members of the staff he has gathered around him. On the result Mr. Woodall is to be warmly complimented; and the consumers, the shareholders, and the employees—a trio of parallel interests—are to be congratulated.

## PAISLEY CORPORATION GAS UNDERTAKING.

### Additional Capital for Extensions.

On Thursday last, an inquiry was held by Sheriff Kennedy, in the Sheriff Court at Paisley, in regard to an application to the Secretary for Scotland by the Provost, Magistrates, and Councillors of the Burgh of Paisley for a Provisional Order authorizing them to borrow £60,000 for the purposes of the Paisley Gas Acts. The Town Clerk (Mr. Frank Martin) appeared on behalf of the Council.

The Town Chamberlain (Mr. R. Thomson) explained the financial position of the gas undertaking. He said the Gas Company was formed in 1823, and by an Act passed in 1870 the control of the undertaking was vested in the Corporation. The latter had obtained several Provisional Orders for borrowing a total sum of £115,000. The capital expended was £177,842; and there had been spent out of the surplus profits £25,047—making in all £202,889. There had been paid from time to time out of surplus profits £83,055 for public improvements; while there had been transferred to the credit of the electricity accounts £18,758 to meet debit balances. No calls had, however, been made upon the gas revenues for the electricity account since 1904, when the undertaking became self-supporting. The Corporation were empowered to charge 4s. 2d. per 1000 cubic feet for gas; but they had fixed the price at 2s. 3d. In his opinion, there was ample security for the loan.

Mr. George R. Hislop, the Gas Manager, said he had held this position for 45 years. The present application had been made in consequence of a report submitted by him to the Corporation in November last, in which he stated that certain extensions would have to be made during the next seven years. The improvements would consist of a retort-house and retorts, at an estimated cost of £5580; coal bunkers and conveyors, £1200; additional ammonia still and condenser, £550; extension of the coal-stores with elevated railway, £4800; extension of 14 and 16 inch mains, £1000; new workshops, £1200; additional exhausters, £600; additional section to washer, £350; carburetted water-gas plant, £7600; two additional purifiers, £1600; and main-pipes, cooking-stoves, and meters, £35,520. All the extensions were, in his opinion, absolutely necessary. Last mid-winter they had only a 10½ per cent. reserve of output, and this was dangerously low for a commercial town. Storage of coal was also becoming a serious matter, as in December last they had only eight days' requirements; and with the miners not working at the New Year holidays, they had to adopt stringent measures to keep up the supply of gas. The new storage would give them accommodation for 3300 tons of coal, equal to 41 days' requirements at the present rate of consumption; and the carburetted water-gas plant would provide a good stand-by in emergencies such as fog, intense cold, &c.

Provost Muir Mackean and Mr. P. K. Millar, the Convener of the Gas Committee, concurred in the evidence given as to the necessity for the enlargement of the works.

Sheriff Kennedy remarked that he was quite satisfied with the evidence.

There were no objectors; and the inquiry closed.

**Demand for Coke at Barry.**—The Barry Gas and Water Committee were informed at their last meeting by Mr. T. E. Franklin, the Gas Engineer and Manager, that an excessive demand for coke still continued, and they had on occasions to decline to book further orders; the coke being taken away almost as soon as it was made. Mr. J. T. Hogg, the Chairman of the Committee, remarked that he was satisfied the time had come when they should raise the price of coke, for there was no place in the country where it was sold so cheap. It should have some relation to the price of coal. The Committee agreed to increase the price 1d. per cwt.

**Instow Water Supply.**—An inquiry was held at Instow, North Devon, last Thursday week, by Mr. A. W. Brightmore, a Local Government Board Inspector, relative to an application made by the Barnstaple Rural District Council for power to borrow money for the purpose of providing a water supply for Instow. Evidence was given by residents in the district as to the need of a better supply. It was stated that not only was the development of Instow retarded by the inadequacy of the present service, but that in times of drought the inhabitants had difficulty in obtaining water. Two schemes were put before the Inspector. One, proposed by the Barnstaple Water Company, is the subject of an application by them to Parliament, and would necessitate the laying of about six miles of mains; while the other provides for the carrying of water from Northam, on the opposite bank of the River Torridge, where there is a supply in excess of the needs of the inhabitants. Mr. C. E. R. Chanter, the Chairman, and Mr. J. P. Finch represented the Water Company; and Mr. Thornton, who prepared the Northam scheme, explained the proposal. After hearing the evidence, the Inspector visited the Northam Urban District Council's water-works, and next day inspected those of the Water Company.

## BELFAST GAS-WORKS EXTENSION.

### A Site Recommended.

It may be recalled that for a considerable time past discussion has been rife in Belfast with regard to the most suitable site on which to erect new works to cope with the increasing demand for gas. Ultimately, it was decided to seek the assistance of experts; and Mr. Charles Hunt, of London, and Mr. W. R. Herring, of Edinburgh, were appointed to report upon the matter, with the assistance of two local building experts—Mr. W. H. McLaughlin and Mr. J. W. Stewart. This they have now done; and their conclusions were laid before the Council in committee last Tuesday, after having been submitted to the Gas Committee earlier the same day. After some discussion, it was resolved—"That the report be received, printed, and circulated among the members of the Council, and that a special meeting of the Council be called for an early date to consider it." Subsequently the report was published *in extenso* in the local Press; and the main portions of it we now reproduce.

### THE QUESTIONS SUBMITTED.

Your Committee were good enough to put before us, for our guidance, certain questions which you desired us to answer, these being—

- 1.—(a) Is any extension of the present gas-works necessary? (b) If so, what provision should be made for the future, having regard to the capacity of the existing works, the present rate of increase of consumption, and the possibility of the future development of other undertakings for the supply of light, heat, and power?
- 2.—What is the smallest area of land that should be acquired for the new works per million cubic feet daily capacity, having regard to local circumstances and economical working? Also, so that comparisons can be made as to the relative values of the different sites, prepare estimates of the following—
- 3.—The cost of constructing foundations to works level on each site.
- 4.—The cost of coal-handling plant to each site.
- 5.—The cost of coal conveyance to each site.
- 6.—How the income from sales of coke and other residuals will be affected at each site.
- 7.—How the cost of production of gas will be affected by any other consideration peculiar to some of the sites and not common to the whole.

### ANSWERS TO THE QUESTIONS.

We submit our answers to these questions as follows:—

- 1.—(a) Provision for meeting the future demands for gas is now an urgent necessity, in view of the fact that the earliest date on which new works can be brought into operation is the winter of 1914-15, by which time, estimating the increase at only 3½ per cent. compound (whereas the increase during the past ten years has been 4'25 per cent.), every retort on your present works, including the retort-house under interdict, will be in use, together with all the carburetted water gas to meet the maximum demands of the winter of 1913-14.

We made a careful examination of, and investigation into, the condition and producing capacity of your present works; and it is only right to say that the operations are carried on with very considerable difficulty and some danger, owing to the extremely congested condition of the works, and that the operatives are subjected to conditions which at the present day are looked upon as both unnecessary and undesirable in the operations of gas manufacture.

The congestion has been inevitable owing to the continued extension of the works on the limited area of land available; and your position has been made worse by the interdict which has been granted against the ordinary use of the new retort-house. This retort-house will now have to be used to an increasing extent each winter until additional manufacturing plant is provided elsewhere; and though the arrangement which has been provided for carrying off the smoke from this house seems likely to prove successful, the position can hardly be regarded as satisfactory, because, in the event of the whole of the retorts in the house being used at one time, this cannot but materially add to the general congestion and discomfort of the operatives owing to the limited coke storage ground in its immediate vicinity. Practically speaking, however, its producing capacity will be your only source of additional supply from the present time until new plant can be brought into operation for the winter of 1914-15, because carburetted water gas has been made this winter to the full extent of the plant, though costing, according to last year's accounts, much more than coal gas; and the only other retorts available are a few in the older section of the works, which were recently under repair.

The gasholder accommodation is also much below what is considered safe; being equal to only 57 per cent. (or 6,183,000 cubic feet) of the maximum day's output of 10,699,580 cubic feet (1908). By 1914, it will be only equal to 49 per cent. of the maximum day's output. It would not be possible to carry on the gas supply of Belfast with so little storage, but for the large production of carburetted water gas.

### PROVISION FOR THE FUTURE.

As to (b)—What provision should be made for the future, regard being had to "the capacity of the existing works, the present rate of increase of consumption, and the possibility of the future development of other undertakings for the supply of light, heat, and power?"—attention may be directed to the increase in the consumption of gas which has taken place since the introduction of electricity, which has been, and continues to be, by far the most important rival to gas. The latest Board of Trade returns, which are for the year 1908-9, show a total gas consumption in the United Kingdom of 173,957 million cubic feet, as compared with only 57,876 million cubic feet in the earliest (1882) returns. In Belfast during the last ten years (1899 to 1909), the consumption, notwithstanding the competition of electricity, has risen from 1306 million cubic feet to 1927 million cubic feet, or 47'68 per cent.; and this corresponds very nearly with the growth of the maximum weekly output, which was 45'7 per cent. in the same period. It is true that electricity shares with gas the favour of the public both for



light and power, and is therefore to a certain extent lessening the rate of increase of gas consumption; but, on the other hand, the comparatively low price at which you are now able to supply gas cannot fail to enable your undertaking to hold its own against either electric light or "power" gas, while additional consumption is to be looked for from the continued increase of population, and the further employment of gas for cooking and heating purposes. As regards the latter, the great success of your recent gas exhibition shows that there is a large and hitherto only partially developed field in this direction. Estimating the future increase at  $3\frac{1}{2}$  per cent., the annual output of gas will have reached about 2541 million cubic feet by the earliest time that new works can be completed—namely, 1914, if parliamentary sanction be obtained in 1911—and we are of opinion that within the ensuing fourteen years, or (say) by 1928, an increase of not less than 62 per cent. may with confidence be anticipated. This, on the above output of 2541 million cubic feet, would mean an additional output to be provided for of about 1575 million feet, to which has to be added the extra coal gas (say, 450 millions) that would have to be produced in order to reduce the production of carburetted water gas to 25 per cent. of the total, as determined by your Committee. This brings the total to 2025 million feet, the equivalent of which would be a productive capacity of rather more than 10 million cubic feet per diem, though, as a matter of course, only a portion of this would be immediately required.

It is, moreover, certain that the savings to be effected in the cost of manufacture by the adoption of modern plant would be so great as to render the continuance of the present system undesirable—not to say impossible—for any length of time; and we are strongly of opinion that it will be more advantageous to eventually transfer the whole of the manufacture to a new site than to attempt to modernize the existing works by reconstruction. This should, at all events, be kept in view, though it need not be immediately decided upon. Should such a course be followed, most of the gasholders would remain as at present; but the frontage to Ormeau Road and along the river, being no longer required for gas purposes, would form a valuable asset to set against the cost of a new manufacturing site.

We recommend, therefore, the securing of as large a site as may be available, subject to the conditions being suitable; and that a commencement be made as soon as possible by the provision of works capable of producing not less than 5 million cubic feet per diem of coal gas, and the transfer of 25 per cent. of carburetted water-gas plant; to be increased in coal-gas sections of 5 million feet, with its proportion of carburetted water-gas plant, as required.

2.—From 2 to 2½ acres per million cubic feet daily capacity is the smallest area of land that should be acquired, having regard to the configuration of the site, railway or water facilities, or other circumstances. This is exclusive of what may be required for residual works.

THE EIGHT SUGGESTED SITES.

3.—In conjunction with Messrs. M'Laughlin and Stewart, and accompanied by the City Surveyor and the Gas Engineer (Messrs. Cutler and Sharpe), we made a careful inspection of eight sites available at the present time for gas-works purposes. Of these, however, we consider three to be ineligible—namely, the Bigger estate, because there is no possibility of access to it by either rail or water; the Ormeau Park and Glentoran, because the Glentoran portion is not, in our opinion, suitable for the construction of gasholders; and the Abattoir, because it is much too limited in area to afford more than very temporary relief. The remaining sites under consideration are Ormeau Park, Donegall Road, Cranmore, Twin Island, Brickfields.

We examined very carefully the comparative estimates of values prepared by Messrs. Cutler and Sharpe, and found them to be quite accurate on the basis on which they are made. Our examination, however, of the sites, and the further information we found it necessary to obtain with regard to the subsoil of two of them, have led us in one or two cases to somewhat different conclusions as to cost of excavations and foundations and the quantity of filling-in required. Our modifications are embodied in the revised estimates herewith scheduled, to which, for the sake of convenience, are added all other items of cost incidental to each of the sites. They have been prepared for the requirement of a coal and carburetted water gas plant for a daily production of 13½ million cubic feet; the area of land required in each case of necessity varying slightly according to configuration of the site, railway accommodation needed, and other circumstances.

COMPARATIVE EXPENDITURE.

Comparative Estimates of Cost of Preparing Sites to Surface Levels for Coal and Carburetted Water Gas Plant, Equal to a Production of 13½ Million Cubic Feet per 24 Hours.

	Ormeau Park.	Donegall Road.	Cranmore.	Twin Island.	Brickfields.
Area required . . . . .	27 acres	30½ ac.	30 ac.	32½ ac.	26½ ac.
Cost of site . . . . .	£	£	£	£	£
Cutting, filling-in, foundations, and embankment, and pitching where necessary . . . . .	22,060	14,855	4,200	24,375	9,937
Dredging berth, and capitalized cost of keeping same open . . . . .	26,632	25,674	37,209	43,253	27,746
Jetty . . . . .	*5,000	..	..	..	†5,500
Bridge . . . . .	3,500	..	..	11,000	3,500
Approach and way-leaves . . . . .	10,000	..	..	..	..
Culverting river . . . . .	3,000	..	6,390	..	..
Roads . . . . .	—	120	500	..	..
Gas, tar, and water mains . . . . .	1,267	..	2,640	..	..
Sewers (including capitalized cost of pumping) . . . . .	4,990	9,830	13,155	16,570	7,685
	..	..	191	1,396	190
	£75,540	£50,479	£64,285	£96,594	£54,558

\* Capitalization at 2½ years. † Capitalization at 25 years.

4.—Cost of Coal-Handling Plant.—We take this to mean the cost of plant necessary to be provided for delivering coal upon the site.

Ormeau Park . . . . .	£8,000
Donegall Road . . . . .	13,000*
Cranmore . . . . .	13,000*
Twin Island . . . . .	8,000
Brickfields . . . . .	8,000

\* Includes locomotives and rails.

5.—We give below the cost per ton of coal delivery on to the site, exclusive of sea freight: Ormeau Park, 11d.; Donegall Road, 1s. 3½d.; Cranmore, 1s. 3½d.; Twin Island, 2½d.; Brickfields, 12d. As regards Twin Island, a saving is anticipated in sea freight, as compared with the other sites, of from 1½d. to 3d. per ton, owing to the possibility of prompter discharge. It should also be possible, with the facilities that will have to be provided, to reduce the cost of unloading such coal as may be required for the existing works.

6. Tar.—Each of the sites under consideration would be at a disadvantage as regards the disposal of tar, since this would have to be conveyed to the distillery adjoining the existing works. For the purpose of expressing this disadvantage, we have included under the head of "Cost of gas, tar, and water mains," the cost of a pipe from each site to convey the tar to the existing distillery.

Ammonia.—We assume that a sulphate of ammonia plant will form a part of the new gas-works, wherever erected, in which case a substantial addition to the revenue from ammonia may be anticipated. The Twin Island site offers exceptional advantages in this respect, since sulphate of ammonia could be shipped from there to the principal markets abroad, without cost for rail or river carriage.

Coke.—The intended reduction of the proportion of carburetted water gas to be produced when the new gas-works are brought into operation will increase the quantity of coke made for sale, and will in all probability result in a reduction of its selling price. The loss from this, however, can hardly be greater—and will probably be less—than that which is at present incurred by the excess cost of carburetted water gas; and, apart from it, we see no reason to apprehend loss in the disposal of coke from any of the sites under consideration. All the sites—with the exception of Ormeau Park—are at a greater distance from the centre of the city than the existing works; but experience has shown in similar cases that such new conditions are hardly less favourable than the old, and may become more favourable by the opening up of additional markets.

7.—There does not appear to us to be any consideration, other than such as have been dealt with in our previous answers, peculiar to some of the sites and not common to the whole, by which the cost of production of gas would be affected; but we may point out that the Twin Island site would offer exceptional economy as regards delivery of constructional materials for the building of works.

GENERAL CONSIDERATIONS.

The initial capital outlay required at each site varies from highest to lowest to the extent of £46,115; but such a variation is of little moment in comparison with the possibility of saving in the cost of coal conveyance. Were it not for the disadvantage under which it labours in this respect, and for its somewhat limited area, the Ormeau Park site would, in our estimation, stand first in the list of sites—its proximity to the existing works being a decided advantage. At the same time, it must be admitted that its selection for gas-works purposes, in view of its surroundings, would be somewhat difficult to justify before a Parliamentary Committee, having regard to the alternative sites at your disposal.

Taking the difference in cost of coal delivery between this and the Twin Island site at 8½d. per ton, the adoption of the latter would mean a saving in the first year of fully £4250—sufficient to pay interest and sinking fund of 5 per cent. on an excess expenditure of £85,000; whereas only £21,045 would be required compared with Ormeau Park, or £39,670 if the whole cost of the Twin Island site be included.

This estimate of saving is based on the assumption that advantage would be taken of the immediate provision of a 5 million cubic feet coal-gas plant to work this on completion to its fullest extent, as far as the consumption may admit, in preference to keeping on the old works during the summer months, in which case from 120,000 to 130,000 tons would be carbonized at the new works during the first year. When the second 5 million cubic feet coal-gas plant is brought into operation, the saving in cost of coal conveyance should exceed the above figure by at least 50 per cent.

The comparison would be still more favourable to Twin Island if made with any of the other sites under consideration, because the cost of coal conveyance is greater to these sites than to the Ormeau Park site. In our opinion, the Gas Committee are very fortunate in having at their disposal a site so eminently suitable for gas-works purposes, and at the same time so free from liability to objection as the one at Twin Island. We have given very careful consideration to the only difficulty to be apprehended in connection with this site—namely, that of foundations; but full provision has been made for this in our estimates, and, accordingly, we have no hesitation in recommending its adoption.

We have already shown that the saving in the cost of delivering the coal to the Twin Island site will be sufficient during the first year of operation to pay interest and sinking fund charges upon the entire capital involved in the purchase of the site and the provision of foundations for the plant and appliances. We may further say that, in our opinion, the saving that can be brought about in the cost of manufacture by a well-planned works, fitted with modern appliances, will also be sufficient to pay the interest and sinking fund charges on the constructional work it is suggested should be established upon the site.

Southampton Corporation and the South Hants Water Company's Bill.—At the meeting of the Southampton Town Council last Wednesday, it was decided, on the recommendation of the Parliamentary Committee, who presented a voluminous report on the subject, to oppose the Bill of which notice has been given by the South Hants Water Company, and to take steps, at the earliest practicable opportunity, to obtain power to purchase the Company's undertaking.



## POSITION OF THE METROPOLITAN WATER BOARD.

## Possible Levy of a Deficiency Rate.

At the Meeting of the London County Council to-day, the Local Government Records and Museums Committee will submit the following report on the finances of the Metropolitan Water Board.

With regard to certain questions which have recently been put at meetings of the Council as to an alleged deficiency on the revenue and capital accounts of the Metropolitan Water Board, and the possibility of a deficiency rate being levied, we are giving careful consideration to the whole subject from the point of view of the possible effect on London rating.

The present position appears to be that the Metropolitan Water Board's accounts showed a deficiency of £25,280 in 1908-9, and that the estimates for 1909-10 showed a further deficiency of £75,400; and the possibility that the estimates for 1910-11 may show another deficit makes it necessary that the position so disclosed should receive the attention of the Council, as the principal rate-raising authority and also as a large ratepayer, in regard to its effect upon local rating and local taxation generally in London.

By section 15 of the Metropolis Water Act, 1902, the Board are empowered to levy a rate to meet any deficiency in its revenue. The deficiency would first be apportioned among the districts represented on the Board according to the rateable value of all premises supplied with water, whether for domestic, trade, or any other purposes. The amount so apportioned between the districts would be raised as rate in the usual way. This would give rise to many difficulties and anomalies. The incidence of a deficiency rate would necessarily differ considerably from that of the charges for water supplied. Incidentally, it would fall upon most ratepayers who are not water consumers, while certain others who are water consumers would escape from it. But what is of great importance from the London point of view is that, while the existing charges for water unduly favour extra-London districts at the expense of London, the levy of a deficiency rate would accentuate the present inequalities, as an even greater proportion of the new burden would have to be borne by the London ratepayers.

The Metropolitan Water Board has not yet resorted to such a rate, but it is evidently fully alive to the financial position with which it is confronted. It has decided, since the matter was referred to us, to institute an inquiry into the whole subject. On Jan. 28, 1910, the Board instructed its Finance Committee to prepare and submit a full report on the financial position of the Board, comparing the position of the undertaking at the present time with that of the late Metropolitan Water Companies; and before reporting fully upon the matter, we propose to await the issue of that report.

There are, however, certain features of the case which have an important bearing on the question of the need for levying a deficiency rate, but with which the Metropolitan Water Board may perhaps not deal, except at the instance of the Council, or unless further statutory powers are conferred upon the Board. We refer particularly to the inadequate contribution to the revenue of the Board which is made by the extra-London districts. It appears that London contributes to the domestic water-rate of the Board at least 50 per cent. per head of population more than the outside districts, involving a very large additional burden upon London. Though we do not suggest that population is a suitable basis for water charges, this fact is some indication of the prejudicial effect upon London of the existing basis of charge for domestic supply.

The basis of charge is not arrived at under the same law in London and the outside areas. The Valuation (Metropolis) Act, 1869, provides for quinquennial revaluation of all the properties in London. As an example of the importance of this revaluation to the Metropolitan Water Board, we may mention that the last quinquennial revaluation in London had the effect of increasing the Board's income by about £55,000 (less losses on collection), without any increase in expenditure. Outside London there is no regular revaluation of properties, and consequently no guarantee that the standard of assessment is kept up to date; nor is there any periodical increase of revenue from this cause. At the time of the passing of the Metropolis Water Act, 1902, it was estimated that the rateable value of premises for poor law purposes in extra-London was, on an average, 15 per cent. lower than the London standard. Before the Metropolitan Water Board (Charges) Act, 1907, the Board had power itself outside London to fix the basis on which it should charge. By that Act it was deprived of the power, and the immediate loss of revenue amounted to £26,800. The ultimate loss was more than this; and there seems little doubt that, if the standard of assessment were the same in extra-London as within London, the Board's revenue would benefit to the extent of between £40,000 and £50,000 a year. Such an additional income would have gone far to ease the financial position.

Having regard to these facts, we are of opinion that, before resorting to any remedy such as the levy of a deficiency rate, which would still further increase London's proportion of water charges, effective measures should be taken to render those charges more uniform and equitable in their incidence. The Council has already taken some steps to bring this matter to the notice of the Metropolitan Water Board. In 1907 it suggested that, pending an amendment of the law of valuation, the Board should use such powers as it possessed to bring about equality of valuation between London and extra-London; but, so far as we are aware, nothing has been done in the matter.

We suggest that the Metropolitan Water Board should be approached again on the subject, and urged to consider seriously these aspects of the case in connection with the investigation which it is about to undertake. We recommend—(a) That in the opinion of the Council the investigation about to be undertaken by the Metropolitan Water Board as to its financial position should include inquiry into the effect on income of the use, as the basis of charge for domestic supplies, of rateable value determined according to two different standards of valuation respectively for London and the other districts within the Board's area. (b) That the foregoing resolution be communicated to the Metropolitan Water Board.

## NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

The explosion in the Coatbridge Gas Company's works, mentioned in another column of the "JOURNAL," is a disappointing one; and to none will it be more so than to Mr. T. Wilson, the Manager of the works. I understand that such a complete wreck as there has been of the purifier-house has never been witnessed by anyone who has seen this one. In considering the matter of this explosion, it is not to be forgotten that the whole of the Coatbridge district is honeycombed with underground coal, iron, and clay workings, and that stability in any structure upon the surface of the ground is scarcely to be looked for. Only a year or two ago, Mr. Wilson stated, at a meeting of gas managers, that he never required to pump a street syphon. Bad as the accident has been, in the destruction of material, it is a satisfaction to know that the supply of gas to the town was not interrupted. The Directors at once made temporary arrangements for the purification of the gas; and they are already moving in the matter of having the purifiers re-erected.

The Gas Committee of the Dundee Town Council on Monday considered the clauses of their proposed Provisional Order, by which it is desired to secure additional borrowing powers, rearrange the sinking fund, create debenture stock, make consumers liable for the money in prepayment meters, protect gas appliances hired out from the landlords' hypothec, get power to lay pipes in streets not dedicated to public use, and to secure powers in connection with several other matters. The Town Clerk said that these matters were non-controversial. Another question had been mentioned, which was the possibility of getting a contribution from the gas undertaking towards the relief of the rates; but it was thought that this might be taken up when the estimates for lighting were being framed. Mr. Mechan asked if the gas undertaking could not make a contribution to the Common Good. The Town Clerk replied that he did not know if this could be done; but the rates were liable for the gas undertaking. Treasurer Soutar said this was a non-controversial Order, to be carried through without opposition. Its main purpose was to increase the borrowing powers; but certain quasi-financial matters had been put in. To get a payment by the Gas Department to the Common Good was far too big a question to be incorporated in the Order. The matter was allowed to drop; the suggested clauses being generally approved. Next day, in a column of specially contributed articles which are published from time to time in the "Dundee Advertiser," there was one which stated that, on the face of it, it seemed a reasonable proposal that the Gas Department, now that it was in a flourishing condition, should make a contribution to the Common Good. The rates, in the last resort, were responsible for the gas undertaking; and this might justly be held to involve a reciprocal obligation on the part of the Gas Department to help the rates. The Common Good certainly needed some assistance. The account was considerably overdrawn, and there did not seem much chance of it being squared in the ordinary way. But evidently there were difficulties to be met, and the Town Council were not prepared for controversy in this matter. If the gas affair were to get into a bad condition, there would be no controversy about the rates having to help; but evidently there was to be when it was in a position to give aid to another department, when that other department was in trouble.

Last Tuesday, in the Hamilton Town Council, the Gas Committee reported that complaint had been made to them by residents in the neighbourhood as to a nuisance caused by smoke and dust from the gas-works, and that claims were intimated by two occupiers for damage done to clothing on their bleaching greens. The Committee instructed the Town Clerk to reply repudiating liability, and intimating that everything possible was being done to avoid complaints. There was a discussion in the Council upon this report; and the subject was sent back to the Committee for further consideration.

A new Manager for the Sanquhar Gas-Works entered upon his duties on Dec. 18 last; and at a meeting of the Town Council the other day it was reported by the Gas Committee that from that day down to Jan. 3 there had been an average yield of gas of 8120 cubic feet per ton of coal carbonized, as compared with 7120 cubic feet in the corresponding period—an increase of 1000 cubic feet per ton of coal, which was considered very satisfactory.

The Corporation of Dumfries this week let the contract for the building of a new retort-bench, with the ironwork, stage floors, coal breaking and handling plant, and charging and discharging machinery, including motive power, and also the roofs for the retort-house and coal-stores, to Messrs. Robert Dempster and Sons, Limited, of Elland, at the price of £11,600.

The annual dinner of the employees in the Distribution and Fittings Departments of the Edinburgh and Leith Gas Commission was held in Milne's Hotel, Edinburgh, last night—Mr. W. R. Herring, the Engineer, in the chair. The company numbered about ninety. The toast of "The Edinburgh and Leith Corporations Gas Commissioners" was proposed by the Chairman, and responded to by Judge Inches. Judge Bryson proposed "The Distribution and Fittings Departments," for the former of which Mr. A. Masterton responded, and for the latter Mr. J. S. Miller.

In connection with the gas transfer which is in progress at Fraserburgh, a special meeting of the Town Council was held yesterday, at which Provost Finlayson intimated that a remonstrance signed by 21 ratepayers had been lodged against the resolution of the Council to adopt the Burghs Gas Supply Act. This would necessitate their going through the procedure of taking a poll by plebiscite. If a requisition were made to him, he would call a special meeting for the purpose of explaining to the public the object of the Council's resolution.

The purifying plant in the Peterhead Gas-Works is at present being very largely extended. The last extension was effected in 1886, when the annual output of gas was under 16 million cubic feet. The plant then installed was capable of dealing with 166,000 cubic feet per 24 hours. During the present winter it has been necessary, on some days, to force as much as 250,000 cubic feet through. The need for extension was thus clamant. To enable it to be effected, the Corporation bought adjoining properties, consisting of a row of shops and dwelling



houses, a fish-curing yard, and stables, at a total cost of £1210. The tenement is to be remodelled; the dwelling-houses being intended as residences for Corporation servants. As the output of gas in the current year is anticipated to be about 52 million cubic feet, it is obvious that a very great increase in purifying capacity was required. The plant—designed by Mr. W. Ritchie, the Manager—consists of four boxes with two tiers of grids; the lower tier bearing oxide of iron and the upper one lime. The capacity will be equal to 750,000 cubic feet per day. The Contractors are Messrs. Henry Balfour and Co., Limited, of Leven, Fifeshire; and the cost will be £1199. The existing plant is to be retained for use in summer. Since Mr. Ritchie was appointed Manager at Peterhead, four years ago, the consumption of gas has been greatly extended, owing to the vigorous manner in which the use of gas cooking and heating apparatus has been pushed; and it is gratifying to know that within the past three years the price of gas has been reduced by 6d. per 1000 cubic feet.

After a lapse of twenty-five years, the reunion of the employees in the Dundee Corporation Gas Department was resumed last night. Mr. A. Yuill, the Engineer, presided over a large attendance in the Kinnauld Hall. He explained that in 1885 the annual make of gas was 390 million cubic feet, and that it was now 875 millions; while the price had declined from 3s. 6d., with meter-rent equal to 2d. more, to 2s. 3d. per 1000 cubic feet. The capital per million cubic feet had declined from £900 to £433; while now cookers and all cooking appliances were given on loan free, and gas-fires were hired on reasonable terms. In 1885, the coke made amounted to 11,500 tons; it was now 56,500 tons a year. In regard to public lighting, there were no statistics available so far as 1885 was concerned; but between 1901 and 1909, the cost of public lighting had diminished from £9097 to £8871, while the lighting power had gone up from 50,000 to 220,000 candles. In the twenty-five years the number of employees had risen from 287 to 350, and the weekly wages bill from £335 to £513. The average weekly wage in the year 1885 was 22s. 6d.; and it was now 29s. 4d. Considering the great reduction in the price of gas, and the generally excellent condition of the works, he did not think consumers would grudge the employees that increase. Ex-Bailie High, the Convener of the Gas Committee, also addressed the meeting. An excellent musical programme was gone through.

**Progress of Chard Gas Undertaking.**—Explaining the borough accounts for the past year to the members of the Chard Town Council, Mr. C. F. Spencer, the Accountant, remarked that, as gas-works arbitrations were now-a-days, the Council's policy in purchasing the gas undertaking was amply justified. It had been suggested that the Council paid too much for the works; but if they took the profits which had accrued since the purchase in 1905, and compared them with those of the last few years of the old Gas Company, they would see how amazingly the Corporation had increased them. They had augmented the sale of gas and reduced the leakage, while production cost the old Company nearly 1s. per 1000 cubic feet more than it was costing the Corporation. He found that in 21 towns of about Chard's size, Chard stood fourth. He congratulated the Council on the really excellent financial position the borough was in.

CURRENT SALES OF GAS PRODUCTS.

**Sulphate of Ammonia.**  
The week opened with a dull tone; but in the latter half there has been improved demand, occasioned by the fact of dealers covering their February requirements, and some further direct orders from consumers abroad coming on the market. Although the home trade is still a negligible quantity, the position has become very firm again; and the nearest values at the close are £11 13s. 9d. per ton f.o.b. Hull, £11 15s. to £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. For March and April delivery, £11 16s. 3d. per ton f.o.b. Leith is reported as having been paid; but although makers are willing to make some concession for May and June, buyers still hold aloof for these later months. It has also transpired that there are sellers for July-December shipment at £11 12s. 6d. per ton f.o.b. at the best ports without finding an outlet.

**Nitrate of Soda.**  
On increased business, quotations have been advanced to 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality, on spot.

**Tar Products.**  
The markets for tar products have been steady throughout the past week. Pitch maintains its price, and some quantity has been sold on the west coast at 31s. 6d. f.o.b.; while at ports on the east coast, where there is a very favourable rate, even better prices have been paid. Some quantity was sold in London at 31s. Creosote remains steady and well sold in London, and this is also the case in the Midlands while in the North the market is still dull. Benzol, 90 per cent., is in good demand for prompt delivery both in London and the North. Fifty-ninety per cent. benzol is scarce; but at present buyers will not pay the price asked. Toluol is in good demand. Solvent naphtha is very firm indeed both in London and the North. Heavy naphtha is quiet, and there is not much business doing. Carbolic acid is steady; but consumers appear disinclined to pay the prices asked by makers. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d. ex works. Pitch, London, 31s. to 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7½d.; North, 6½d.; 50-90 per cent., casks included, London, 7½d. to 8d.; North, 7½d. to 7½d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

**Sulphate of Ammonia.**  
This article has been steady during the past week. In London, the principal Gas Companies quote £11 17s. 6d. to £11 18s. 9d.; while outside makes upon Beckton terms remain about £11 8s. 9d., and f.a.s.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 412.

Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,474,000	Stk.	Oct. 14	4	Alliance & Dublin Ord.	86 88	..	5 13 8	4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	10 5
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0		Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	Oct. 28	6½	Bombay, Ltd.	6-6½	+	5 4 0	1,235,000	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
40,000	5	"	6½	Do. New, £4 paid.	4½-4¾	..	5 6 8	561,000	"	"	10	Liverpool United A.	227-229	..	4 7 4
50,000	12	Aug. 26	15	Bourne- mouth Gas B 7 p.c.	20½-30½	+1½	4 18 4	718,100	"	"	7	Do. B	16-16½	..	4 2 10
311,810	10	"	7	and Water Pref. 6 p.c.	15½-15¾	..	3 16 2	306,083	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
75,000	10	"	6	Brentford Consolidated	25½-259	+2	4 16 6	75,000	5	Nov. 26	6	Malta & Mediterranean.	42-5	..	6 0 0
380,000	Stk.	Aug. 12	12½	Do. New	192-194	..	4 17 11	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	59-102	..	4 18 0
300,000	"	"	9½	Do. 5 p.c. Pref.	120-122	..	4 2 0	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	+2	3 17 8	541,920	20	Nov. 11	3½	Monte Video, Ltd.	122-133	..	5 5 8
205,250	"	"	5	Brighton & Hove Orig.	218-221	..	5 19 7	1,775,892	Stk.	July 29	4½	Newcastle & G'tesh'd Con	107½-108½	..	4 0 8
220,000	Stk.	Sep. 10	11	Do. A Ord. Stk.	154-157	..	5 1 1	529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
246,320	"	"	8	British	42½-43¾	..	4 11 11	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13½	..	5 3 8
109,000	Stk.	Oct. 14	10	Bromley, A 5 p.c.	119-121	..	4 19 2	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	138-140	+1	5 14 4
165,700	"	"	4½	Do. B 3½ p.c.	89-91	..	4 18 11	60,000	53	Sep. 10	13	Ottoman, Ltd.	68-68½	..	6 5 6
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	31,800	50	"	13	Portsea Island A.	137-139	..	4 19 0
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8	60,000	50	"	10	Do. B.	129-131	..	4 19 3
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14½-14¾	..	4 14 11	100,000	50	"	12	Do. C	122-124	..	4 16 9
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	114,800	50	"	10	Do. D and E.	102-104	..	4 16 2
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	398,490	5	Oct. 28	7	Primitiva Ord.	78-78½	..	4 14 11
100,000	10	"	—	Do. 4½ p.c. Pref.	54-54½	..	—	488,900	100	Jan. 27	5	Do. 5 p.c. Pref.	52-54	..	4 10 11
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 6	1,900,000	100	Dec. 1	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	80-82	..	5 9 9	312,650	Stk.	Oct. 14	8	River Plate Ord.	17½-17¾	+½	4 10 2
157 157	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½-110½	..	4 10 6	250,000	10	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
1,493,280	Stk.	Aug. 26	5½	Commercial 4 p.c. Stk.	109-111	..	4 13 8	62,500	50	"	6	San Paulo, Ltd.	142-153	..	5 4 11
560,000	"	"	5	Do. 3½ p.c. do.	105-107	..	4 13 6	125,000	10	Jan. 3	5	Do. 6 p.c. Pref.	112-124	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Do. 5 p.c. Deb.	50-51	..	4 18 0
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	269,984	"	"	10	Sheffield A.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 9	523,500	"	"	10	Do. B	233-235	..	4 5 1
493,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	Do. C	233-235	..	4 5 1
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/9 4	South African	124-124½	..	7 16 11
145,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	98-100	..	5 0 0	1,895,445	Stk.	Jan. 13	3	South Met., 4 p.c. Ord.	119-121	+1	4 10 4
486,093	10	Jan. 27	12	European, Ltd.	24-24½	..	4 18 0	209,822	Stk.	Aug. 26	8	Do. 3 p.c. Deb.	82-84	..	3 11 4
354,060	10	"	12	Do. £7 ros. paid.	184-188	..	4 16 0	605,000	Stk.	"	5½	South Shields Con. Stk.	160-162	..	4 18 9
15,141,545	Stk.	Feb. 10	4½	Gas 4 p.c. Ord.	103½-104½	+½	4 9 3	60,000	"	"	5	S'th Suburb'n Ord. 5 p.c.	122-124	+2	4 11 3
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	117,058	"	Jan. 13	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
3,799,735	"	"	4	and 4 p.c. Con. Pref.	102-104	..	3 16 11	502,310	Stk.	Nov. 11	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,193,075	"	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6½	Southampton Ord.	110-112	..	4 9 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	453,940	"	"	5½	Tottenham A 5 p.c.	133-135	+1½	5 1 9
62,590	"	"	6½	Do. do. 5 p.c.	119-121	..	5 7 5	149,970	"	Dec. 29	4	Edmonton 4 p.c. Deb.	110-112	+1½	4 15 11
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	178-18	..	6 2 3	182,380	10	Dec. 29	8	Tuscan, Ltd.	92-99	..	8 4 2
131,090	Stk.	Sep. 10	6½	Ilford A and C	145-147	+1	4 8 5	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,783	"	"	5	Do. B	108-110	..	4 10 11	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	112-114	..	4 7 9
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	Aug. 26	6½	Wands- B 3½ p.c.	142-144	..	4 12 0
								79,416	"	Dec. 29	3	worth 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."      † Next dividend will be at this rate.



London £11 8s. 9d. to £11 10s. In Hull, business has been done for inferior makes at £11 12s. 6d., and best makes have been declined at the same figure. In Liverpool, £11 15s. to £11 16s. 3d. is asked, and in Leith £11 16s. 3d. to £11 17s. 6d. In Middlesbrough, £11 17s. 6d. is quoted, and business has been done for prompt delivery at £11 16s. 6d. The market closed firm, and inquiries are good for prompt delivery.

### COAL TRADE REPORTS.

#### Northern Coal Trade.

There is now a fuller supply both of gas and steam coals; and this has made the prices for some classes of coal easier. In steam coals, the output has been good, and the rather limited arrivals of steamers have made the market quiet. Best Northumbrian steams are from 11s. to 11s. 3d. per ton f.o.b.; second-class steams are from 10s.; and for steam snalls, from 5s. 6d. to 6s. 6d. is now quoted—the output of the latter class being more ample. In the gas coal trade, more of the pits have been at work in the last few days, and thus some of the arrears of delivery are being made up. Prices are a little quieter in consequence; and Durham gas coals may be quoted from 10s. 6d. to 11s. 6d. per ton f.o.b. for the usual classes, according to quality. For "Wear" specials, up to 12s. is quoted. There has been very little of late done in contracting for forward supplies, owing to the unpromising prospect that the trade had before it; but now that there is at all events more settlement, it is expected that some of the orders will soon come into the market. At the same time, higher freights may make the quotations for coal more, so that contracts will not be quite so easy to conclude as they were a few months ago—a statement that is especially applicable to best gas coal. Coke is firm; and good gas coke is from 13s. 6d. per ton f.o.b. in the Tyne or Wear.

#### Scotch Coal Trade.

The coal market shows no change, except that ell for shipment is in better demand. Other sorts are in request, but prices are unaltered. Quotations are now: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 303,754 tons—a decrease of 1383 tons upon the preceding week, but an increase of 63,857 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,324,385 tons—an increase of 241,106 tons upon the corresponding period.

Serious Leakage at the Walshaw Dean Reservoir.—At their last monthly meeting, the Halifax Town Council sat in Committee to authorize the Water Committee to carry out certain works recommended by the Engineers to remedy the leakage at the Walshaw Dean reservoir. These works are to sink a trench alongside the puddle trench of the embankment, to ascertain what clay has been washed away, and to fill up the cavities found with concrete. The possible cost, it was stated, might be £40,000. Authority for the work was given.

Pontefract Water Supply.—The Pontefract Town Council have decided to spend £2200 in making another borehole at the Roall Water-Works, and in deepening those already existing. It was stated at the meeting that they were "on the eve of a crisis," and unless immediate steps were taken a serious stoppage in the supply might occur. The numerous frost bursts a week ago actually caused a stoppage in the higher parts of the town. The Committee had gone carefully into the matter, and proposed this scheme, which would render unnecessary any large expenditure at Roall for a long time to come.

Penistone District Council and the Gas-Works.—The proposed purchase of the undertaking of the Penistone, Thurlstone, and Ox-spring Gas Company by the Penistone Urban District Council has aroused considerable interest throughout the district; and on Friday the Thurlstone Urban District Council held a special meeting to discuss the question. The Penistone Council are asking the Thurlstone Council not to oppose their application to Parliament for an Act to empower them to purchase; and the terms on which the latter authority would consent to this were considered at some length. The Clerk presented a draft agreement, and it was unanimously decided to forward it to the Penistone Council.

Co-Partnership in the Walker and Wallsend Gas Company.—At the annual general meeting of the Walker and Wallsend Union Gas Company last Friday, the Chairman (Mr. C. J. Potter), in moving the adoption of the report, which was noticed in the "JOURNAL" a fortnight ago, said the revenue account for last year resulted in a gross profit of £11,923, which showed an increase of £229, and the profits were the largest on record. Referring to the co-partnership scheme, he said the bonus to the employees to be invested in the Company's stock amounted to £354. The employees of all grades were quite contented; and the advantages of the system appeared to be fully recognized by the Directors, officials and workmen alike. The report was adopted.

Well-Deserved Recognition.—The Southend Water Company are promoting a Bill to extend slightly the limits of supply, to sanction and confirm the construction of certain existing works, to authorize the construction of new works, to raise additional capital, and for other purposes. In due course the draft was considered by the Law and Parliamentary Committee of the Town Council, who suggested certain amendments, and recommended the Council to oppose the measure. When the report containing this recommendation came before the Council, Alderman Brightwell said there would be no necessity to oppose the Company in Parliament. The Council would be able to come to satisfactory terms long before the parliamentary stage was reached. Alderman Francis said they had been given no information on the subject, and would, therefore, be voting in the dark. To this, Alderman Brightwell replied: "Well, all I can say is that the Company having served the borough so thoroughly well in the past, the Council are not disposed to hamper them in any way. But it has been suggested that, if we want any concessions, now is our time. There may be minor questions which will crop up; but we do not anticipate anything whatever of a serious nature." The report was adopted.

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Manufacture, and embodies  
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experience in Radiator  
Construction.

**JOHN WRIGHT & CO.,**  
The Radiator Experts,  
Essex Works, BIRMINGHAM.



### Pontefract Corporation Finances.

There was held yesterday week an adjourned special meeting of the Pontefract Town Council, to receive the reply of the Borough Accountants (Messrs. Lowden and Gibson) to criticisms which have recently been passed, and further to consider the position and conduct of the gas undertaking. The statement of the Accountants showed that in connection with the gas-works about 36 books were kept; and no complaint as to inadequacy had been made by the professional Auditors, except lately as to the want of a proper "stores account." The Elective Auditor also made no suggestion; and the usual Government returns were always readily prepared. As to the system of audit, each accounting officer of the Corporation had always been held personally responsible to the professional Auditors; and the Accountants had not considered it part of their duty to check the details of slot-meter consumption, the register of which was kept at the gas-works by a clerk, under the direct control of the Manager. Mr. Archer, after criticizing these observations in a long speech, proposed the adoption of the recommendations of the Gas Committee that a gas expert be called in to examine the works and report, and an expert accountant to establish a satisfactory system of book-keeping. The motion was seconded by Alderman Grandidge, and carried; the only opponent being Alderman Wordsworth, who claimed that the expense was unnecessary. Mr. Archer next moved that a Borough Accountant should be appointed to devote his whole time to the service of the Corporation, and that the Finance Committee be instructed to take steps to give effect to this resolution. Alderman Wordsworth seconded the motion, which was carried practically without discussion.

**Gas Supply of St. Etienne (Loire).**—The Municipal Council of St. Etienne, in the department of the Loire, have decided to carry on, as from Jan. 1, 1911, the gas supply of the town through the medium of a concessionary—the Council retaining a financial interest in the undertaking. St. Etienne is a town of about 146,000 inhabitants, situated in the centre of a coal field some 32 miles south-west of Lyons; and it is one of the places included in the group served by MM. P. de Lachomette et Villiers.

**Witney Gas Company, Limited.**—The half-yearly meeting of this Company has just been held, and the report of the Managing-Director (Mr. Arthur L. Leigh) showed a very satisfactory result. The coal carbonized was 588 tons, the gas made 7,144,000 cubic feet, the gas sold 6,584,000 cubic feet, and the unaccounted-for gas 560,000 cubic feet, or 7·8 per cent. The gas made per ton of coal was 12,150 cubic feet, and the gas sold 11,200 cubic feet. As a result of this, the balance-sheet showed by far the largest profit earned in any half year. The increase in the sales of gas over 1908 was 5·7 per cent. During the six months, a Parkinson and Cowan retort-house governor and a non-seal arrangement in the hydraulic main were in use, in addition to other improvements in the method of working, including one of Mr. Frank Leigh's patent automatic pressure-changers for the station governor—see p. 442.

**Barry Gas-Works Extension.**—On the 2nd inst., Mr. M. K. North, Local Government Board Inspector, held an inquiry respecting the application of the Barry Urban District Council to borrow £2200 for extensions at the gas-works, and £5000 for fittings, meters, &c. It was stated by Mr. T. E. Franklin, the Gas Engineer and Manager, that he estimated a profit of £400 per annum as the result of installing a sulphate plant. The steam-boilers wanted renewing; the present boilers having been in use since the concern was taken over in January, 1894. The Council also asked, in regard to the amount sought to be borrowed for fittings, that the repayments should extend over a period of fifteen years, not ten as hitherto—this period being too short.

**Improved Public Lighting of Sabden, near Blackburn.**—The scheme of the Sabden Parish Council for the lighting of the streets was brought into operation last Friday evening. The gas is supplied by the Padiham Urban District Council; and the work of carrying the gas over the Black Hill—a distance of three miles—and erecting and fitting up the lamps has been carried out by Mr. A. J. Harrison, the Gas Engineer and Manager to the Council. More than seventy years ago, the main street of the village was illuminated with coal gas; and Sabden had the distinction of being the first village to be so lighted in Lancashire, if not in England. The lighting at that time was carried out by the old Calico Printing Company, and was done for their own convenience, to facilitate communication between the various parts of their works, which at that time ran night and day. Many years ago, however, the firm ceased street lighting, and since then the Parish Council have tried oil-lamps and acetylene lamps, but with only moderate success. The present scheme, by which the streets are illuminated with the most improved type of incandescent gas-lamp, is very successful; and it has been hailed with satisfaction by the entire village community.

**Quality of Southport Gas.**—At the meeting of the Southport Town Council last Tuesday, Alderman Griffiths, in moving the adoption of the minutes of the Gas Committee, said the Manager (Mr. John Bond) had reported on the question of the Committee fulfilling their statutory obligations to the users of gas. Under the Order of 1902, the standard illuminating power was fixed at 16 candles; and under the Act of 1871, if the Committee failed to supply gas of less than 16-candle power they were liable to be prosecuted. The average result of 24 testings of the gas during the past month was 16·64 candles; and the average of four tests made in Birkdale was 16·24 candles. It was just possible that for an hour or two the illuminating power might be below 16 candles; but this was not a breach of their Order. On no occasion had any of their testings shown that they were not giving to the consumers what they were bound to do. Birkdale had statutory authority to make them pay if they did not do the right thing. The Gas Committee had that afternoon decided to appoint a Sub-Committee to go into this question and submit a report, as they were determined to demonstrate to those who used their gas that they were being supplied with good gas. Every complaint regarding the gas had the personal attention of the head of the department.

In

OCTOBER, 1907,

and since then, we have  
consistently advertised that

Our "A. B. C." Gas Fires

5 DESIGNS, 14 SIZES,

Have Wearing Parts—Front, Burner, Guard, Brick, &c., Removable by  
Hand and Interchangeable, Fire with Fire.¶ The demand has grown larger every year, and this season our sales  
for these Fires are **100 per cent.** more than any previous year.

"MERIT WILL TELL."

THE RICHMOND GAS STOVE &amp; METER CO., LTD.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.  
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.



**Daylight Saving Bill.**—A letter, signed by a large number of peers, Members of Parliament, clergymen, doctors, lawyers, and members of municipal bodies has been sent to "The Times," regretting that the Select Committee of the House of Commons to whom the Daylight Saving Bill was referred recommended that it should be proceeded with no further, and expressing the opinion that the conclusions of the Committee of 1908 in favour of the Bill were sound. The signatories point out that resolutions in support of the measure have been passed by 120 corporations and town councils, representing a population of more than 15 million, 46 chambers of commerce, 100 societies and institutions, and 39 trade unions. They further point out that a similar Bill introduced into the Legislative Assembly of Victoria, Australia, has been reported to the House within the last few weeks by a Select Committee with a recommendation that it should be passed into law.

**Check on Extensions of Electricity Mains at Hastings.**—On the strength of applications by two residents, the Electricity Engineer of the Hastings Corporation recently submitted a scheme for extensions of two mains involving an expenditure of £892; but he pointed out, in justification, that there was a possibility of getting other customers, while 15 gas-lamps on the route could be converted into electric lamps. A member (Mr. Cox) opposed the extension when it came before the Town Council. He said it was one of the greatest mistakes they had made when they passed a resolution sanctioning the conversion of gas-lamps to electric lamps wherever mains were laid, as they were thus sacrificing a good light for what was nothing better than a rushlight. There was not the slightest estimate of what amount of current would be taken by the two consumers mentioned; and, with regard to possible future consumers, they had already had some experience of this in Clive Vale. He moved that the matter stand over till a written undertaking had been obtained from intending consumers; and this course was agreed to.

**Electric Light Failure Hinders Production of a Newspaper.**—The following was in the "stop press" news of the Newport (Mon.) "Football Argus" on the 5th inst.: "In consequence of a failure of the electric light in High Street, Newport, part of the work of producing the 'Football Argus' had to be carried out by candlelight. A failure took place between five and six o'clock, and for a time the office, from basement to attic—literary department, composing-room, publishing office, and the front office partially—was in darkness. Candles were obtained as speedily as possible, and work was resumed in their dim light. The electric power was restored after a delay of about five minutes; but it failed again about 6.10 p.m., and work had again to be carried on by candlelight." The Newport Gas Company profited by the occasion of this failure of the electric light to insert a special advertisement in the columns of the "South Wales Argus" illustrating the claim made for gas lighting of "The Light that Never Fails." The advertisement was an illustration of a lighthouse, strongly built on a rock, throwing out its powerful rays over the sea.

**Mitcham and Wimbledon Gas Company.**—At the half-yearly general meeting of this Company next Tuesday, the Directors will report a sum of £16,769 available for distribution; and they will recommend the payment of a dividend at the rate of 5½ per cent. per annum, less income-tax. In addition to the concession to the consumers by a reduction of 2d. per 1000 cubic feet in the price of gas as from Christmas last, the Directors have decided to abolish the charge hitherto made for cleaning incandescent burners, and to give free expert attention thereto, charging only for the materials used.

**The Supply of Gas to Derbyshire Villages.**—In reference to the proposed establishment of a gas-producing plant at Chinley, it is not the Matlock and District Gas Company, as a company, who are dealing with the project, but some people connected with this undertaking. It might be added that certain gentlemen financially interested in the Matlock and District Gas Company were the promoters of the Hather-sage Gas Company—an undertaking which is reported to be making remarkable progress. So far as the Chinley scheme goes, matters are not yet by any means so far advanced as would appear from notices which have been published in the Press.

**Gas Explosion in Selkirk.**—An explosion of gas occurred in the gas-works at Selkirk at three o'clock last Tuesday week, which did a good deal of damage. The explanation is given that, owing to a little extra pressure from the purifier, a seal-pot in the scrubber-house blew out, and that the escaping gas accumulated in the house until it was ignited by a light outside the window. The side of the building—a stone wall—was blown down, and the roof fell in, breaking the piping to such an extent that the making of gas had to be suspended for an hour, until the Manager—Mr. D. Easson—was able to get some bye-passes instituted. There was, fortunately, no injury to any of the workmen.

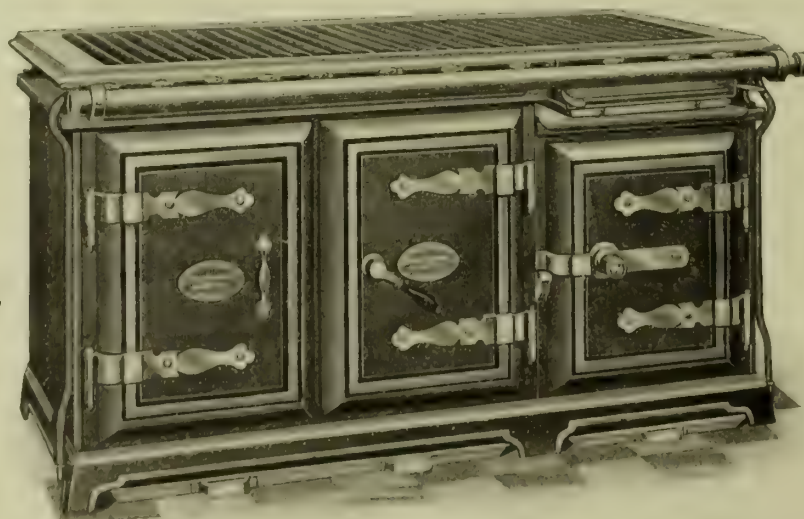
**Peking Water Supply.**—The water-works of Peking, China, which were started about a year ago, have been completed, according to a recent United States Consular Report. The Shaho River, which rises in the hills west of Peking, and is an unusually clear stream, is the source of the supply. The pumping plant at Sunho consists of two centrifugal pumps having a combined capacity of about 5000 gallons per minute. The water is pumped first into three settling tanks, each 60 feet diameter and 16 feet deep, whence it enters ten sand and gravel filters, roofed with concrete. From the pumping-station water is forced through an 18-inch main to a covered reservoir at the Tung-chih-men, the north-east gate of the city. From this reservoir it is pumped into a 180-foot tower, holding 24,720 cubic feet, and thence flows through the city mains. If the tower should meet with an accident, the pumps can force the water to the residences; or should the pumping-station break down, the pumps at Sunho can fill the tower. In case both pumps and tower become unserviceable, the Sunho station can force water to the houses of the consumers. The pressure from the tower is said to be sufficient to throw a fire stream 120 feet high.

## Large Cooker supplied to the **FARNHAM & DISTRICT GAS CO.**

For use at **THE CONVALESCENT HOME, HALE, FARNHAM.**

We have an extensive range of Cooking Appliances suitable for  
**Public Institutions, Boarding Houses,  
Restaurants, Works' Mess-Rooms, &c., &c.**

*Your Inquiries will be esteemed.*



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PARKINSON  
STOVE CO., LTD.**

(Incorporating  
Maughan's Patent  
Geyser Co.),

**BIRMINGHAM:**  
Stour Street,  
Spring Hill.

**LONDON:**  
129, High Holborn.



The Troon Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for telescoping their existing 68 feet diameter gasholder.

We learn from Mr. J. Jowett, the Managing-Director of Coalexld, Limited, that the German and American patents have been accepted, and that the material is being adopted by a larger number of gas-works.

The Directors of the Preston Gas Company reported to the shareholders last Friday that they had decided to put in new carbonizing plant at the Moor Lane works, and had entered into contracts with a view to the installation being completed during the summer.

The Lord Mayor of Liverpool has received a communication informing him that the Prince of Wales accepts the invitation of the Corporation to perform the ceremony of inaugurating the completion of the Vyrnwy Water-Works on Wednesday, March 16. The Water Committee will make arrangements for all the members of the City Council to be present at the function.

The latest novelty in the way of perpetual calendars which has been brought to our notice is one by the Sutherland Meter Company, Limited, of Witton, Birmingham. It takes the form of an excellent model (accurately coloured) of one of the firm's prepayment meters; but where the index and the number of the real meter would appear, apertures are left so as to show the date, day, and month.

While evening service was proceeding at All Saints' Church, Hawk-hurst (Kent), last Sunday week, all the gas-lights suddenly went out, leaving the building in darkness. There was no panic; but the congregation had to be satisfied with the light emitted by a few candles.

A claim has, it is reported, been made by the Sunderland Corporation against Messrs. Laing and Sons, a local shipbuilding firm, for £22,500. Messrs. Laing and Sons, prior to their suspension a short time ago, agreed to take electricity from the Corporation to the amount of £1500 a year for fifteen years. To supply this, the Corporation erected a certain amount of plant; but after the firm had been taking current some little while, the works were closed. At that time, they owed the Corporation about £2000 for current; and altogether it was reckoned that the loss was not less than £4000.

As the result of the enterprise of Mr. C. V. Bennett, the Manager of the Herne Bay Gas Company, a show-room has been opened in the High Street of the town, where the residents are able to inspect artistic gas-fittings, gas-fires, cooker, and other appliances, as well as a selection of the best incandescent gas-mantles. According to a local paper, the "show-room presents a very tasteful appearance, and the whole place is an exhibition of home comforts." Outside are four three-light polished copper Welsbach inverted incandescent lamps, giving a light of 1500-candle power, and greatly improving the appearance of the street at this point.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

DRAUGHTSMAN. No. 5186.  
JUNIOR GAS ENGINEER. No. 5182.  
REPRESENTATIVE (OXIDE). No. 5180.  
SOLE AGENCY (ANTI-CORROSIVE WATERPROOF PAINT).  
No. 5134.  
WORKS MANAGER. No. 5181.

### Situations Wanted.

ASSISTANT-ENGINEER. No. 5177.  
SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.

### Plant, &c. (Second Hand), for Sale.

GASHOLDERS, SCRUBBER, CONDENSER, STATION METER, EXHAUSTER, HYDRAULIC MAIN, PIPES, &c., &c. J. Harper and Co., Willenhall.  
GASHOLDERS, STATION METER, GOVERNOR, AND EXHAUSTERS, &c. Chelmsford Gas Company.  
GAS-WORKS (TWO) COMPLETE. No. 5185.  
PURIFIERS, &c. Swansea Gas Works.  
SCRUBBERS, WASHER, STATION METER, &c. Stockport Gas Department.

### Plant, &c. (Second-Hand), Wanted.

STATION METER. King's Lynn Gas-Works.

### Journals Wanted. No. 5183.

### Stocks and Shares.

EAST HULL GAS COMPANY. March 1.  
HORNSEY GAS COMPANY. March 1.  
SOUTH ESSEX WATER COMPANY. March 1.  
TOTTENHAM AND EDMONTON GAS COMPANY. March 1.

### Meetings.

BROMLEY AND CRAYS GAS COMPANY. Offices, Feb. 22, Six o'clock.  
HARROW AND STANMORE GAS COMPANY. Holborn Restaurant, March 4, Twelve o'clock.

### TENDERS FOR

#### Coal.

DRONFIELD GAS COMPANY. Tenders by Feb. 22.

#### Boiler.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by Feb. 23.

#### Fire-Clay Goods.

CLACTON GAS AND WATER DEPARTMENT. Tenders by March 2.  
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

#### Gun-Metal Fittings.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

#### Gas Oil.

CARLISLE GAS DEPARTMENT. Tenders by Feb. 28.

#### General Stores (Lime, Acid, Compo. Pipes, Oils and Paints, Ironmongery, Books, &c.).

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

### Meters.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

### Pipes, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

### Oxide of Iron.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

### Retort Setting.

CLACTON GAS AND WATER DEPARTMENT. Tenders by March 2.

### Tank for Gasholder.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by Feb. 23.

### Tar and Liquor.

BOLTON GAS DEPARTMENT. Tenders by March 24.  
CARLISLE GAS DEPARTMENT. Tenders by Feb. 28.  
HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 21.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Resists 4500° Fahr. Best for GAS-WORKS.

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Contractors for Complete CARBONIZING  
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MOUNT IRON-WORKS, ELLAND.

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BROTHERTON AND CO., LTD., Ammonia Distillers.  
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SATURATORS and all LEAD and TIMBER  
WORK in Connection with Sulphate Plants.  
We guarantee promptness, with efficiency for Re-  
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Manufactured and supplied by C. BOURNE, West  
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TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National  
Telephone No. 2497.

**JOHN RILEY & SONS, Chemical Manu-  
facturers, Hapton, near Accrington, are MAKERS**  
of Special SULPHURIC ACID, for Sulphate of Am-  
monia Making. Highest percentage of Sulphate of  
Ammonia obtained from the use of this Vitriol, which  
has now been used for upwards of 50 Years. References  
given to Gas Companies.

### WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

**FINEST DUTCH BOG-ORE.**

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,  
Station, or direct into Works, please apply to—  
LONDON OFFICES: 6, LEATHER LANE, E.C.

### TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,  
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.

### SPENCER'S PATENT HURDLE GRIDS.

**THE very best Patent Grids for Holding**  
Oxide Lightly.

See Illustrated Advertisement, Feb. 1, p. 277.

### GAS OILS.

**MEADE-KING, ROBINSON, & CO.**  
Represent the Strongest Independent Re-  
fineries in America; also Petroleum Spirit for Gas  
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and  
11, OLD HALL STREET, LIVERPOOL.

### FIDDES-ALDRIDGE

**SIMULTANEOUS Discharging-Charger.**  
The one Machine which Discharges and Charges  
at One Stroke.

See Advertisement, Feb. 8, p. III. of Centre.

ALDRIDGE AND RANKEN,

39, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams:

"MOTORPATHY, LONDON,"

Telephone:

5118 WESTMINSTER.

### PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS  
ACT, and Decisions thereunder," 1s.; "TRADE  
SECRETS v. PATENTS," 6d.; "DOCTRINE OF  
EQUIVALENTS, Mechanical and Chemical," 6d.;  
"SUBJECT-MATTER OF PATENTS," 6d.  
MEWBURN, ELLIS, & PRYOR, Chartered Patent  
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-  
grams: "Patent London." Telephone: No. 243 Holborn.

### "NUGEPE" GAS PLANT CEMENT.

**JOHN E. WILLIAMS AND CO.,**  
LOWER MOSS LANE,  
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant  
and Sulphate Plant.

For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

**GAS-WORKS requiring Extensions**  
should Communicate with FIRTH BLAKELEY,  
SONS, AND CO., LIMITED, Dewsbury, who make a  
Speciality of Catering for the smaller Gas Concerns.  
Prices Reasonable; quality and results, the best. Satis-  
faction Guaranteed.

### GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.

### OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the

**NEW WESTBURY IRON COMPANY, LTD.**

WESTBURY, WILTS.

### APPLICATIONS FOR APPOINTMENTS.

**DO you appreciate how much success**  
depends on well-considered and lucid present-  
ment of your qualifications? I make a Speciality of the  
Preparation of Applications, and am continually re-  
ceiving complimentary letters from clients. Write now  
for Particulars.  
HERBERT GREATOROX, HACKNEY, MATLOCK.

### MR. W. B. MIMMACK, for many years

Secretary, Manager, and Accountant of the Crays  
Gas Company (111 Millions), now in Amalgamation,  
seeks APPOINTMENT in any or all of these Offices.  
Address No. 5115, care of Mr. King, 11, Bolt Court,  
FLEET STREET E.C.

### ASSISTANT-ENGINEER and Manager,

Excellent Qualifications, Works and Districts,  
SEEKS VACANCY in medium sized Works.

Address No. 5177, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### SOLE Agency to be given away, on

Merchant Terms, of a Reliable ANTI-CORROSIVE  
WATERPROOF PAINT for Iron and Cement Sur-  
faces, for the United Kingdom and some of the Crown  
Colonies. The Paint could be partly Manufactured in  
England. First-Class Testimonials.

Address Applications, with Trade and Banker's Re-  
ferences, to No. 5184, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### A WELL-KNOWN Continental Firm,

Established in 1885, wants a First-Class British  
Firm of Gas Engineers to REPRESENT them in the  
United Kingdom for the Sale of their High-Class  
OXIDE OF IRON for GAS PURIFICATION.

Address No. 5180, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### WORKS Manager Wanted for Meter

Works, thoroughly acquainted with Practical  
and Theoretical Meter, Governor, and Street Lantern  
Making. Must be a thoroughly Experienced Organizer.

Apply, by letter, stating Age, Experience, and Salary  
required, to No. 5181, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### WANTED, a Junior Gas Engineer who

thoroughly understands Photometry. One who  
has had Experience in a Gas Company's Testing-Room  
preferred.

Address, with full Particulars, stating Salary required,  
to No. 5182, care of Mr. King, 11, Bolt Court, FLEET  
STREET, E.C.

### DRAUGHTSMAN Required by a Firm

of Contracting Engineers at their London Offices,  
Experienced in Coal-Conveying Plant and Similar  
Work.

Apply, by letter, stating Age, Experience, References,  
and Salary required, to No. 5186, care of Mr. King,  
11, Bolt Court, FLEET STREET, E.C.

### "JOURNAL of Gas Lighting." Wanted

to Purchase back numbers for May 8, May 15,  
and July 10, 1900; also May 19, 1903.

Address No. 5183, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### WANTED, Second-Hand Station Meter.

About 6000 Cubic Feet per Hour.  
Particulars and Price to SMITHARD, Gas-Works,  
KING'S LYNN.

### TWO GAS-WORKS FOR SALE.

**TWO Village Gas-Works For Sale.**

Situated Five Miles apart.

For Particulars, Apply to No. 5185, care of Mr. King,  
11, Bolt Court, FLEET STREET, E.C.

### GAS PLANT FOR SALE.

**FOUR Cast-Iron Purifiers 8 ft. by 4 ft.**

by 3 ft. 6 in. deep, with Covers and Two Layers  
of Wood Grids. Centre-Valve, 6-inch Connec-  
tions. Newly erected Three Years ago.

SCRUBBER, Vertical, 16 ft. to 18 ft. high by 2 ft.  
6 in. to 2 ft. 9 in. diameter complete, fitted with  
new Elm Grids.

CONDENSER with Vertical Pipes.  
Round STATION METER, with 6 Dial Index.  
Capacity 3600 Cubic Feet per hour. New Drum.

In First-Class Order. Complete with Bye-Pass  
and all necessary Valves coupled to 6-inch Main.  
Also Two 6-inch Bye-Pass PLUG COCKS (now  
Three Years ago) for Two extra Purifiers.

EXHAUSTER for same, Belt Driven.  
HYDRAULIC MAIN, ASCENSION PIPES, and  
Six Tangye's Patent MOUTHPIECES, all com-  
plete with Connecting Pipes, with all details.

Two GASHOLDERS—One with Standards, 15 ft.  
diameter by 12 ft. high approx.; one with  
Ashmore and Pease Chain balanced 13 ft. by  
15 ft. approx.

Only just ceased work.  
Address JOHN HARPER AND CO., LIMITED, Albion  
Works, Willenhall, STAFFS.



## PURIFIERS.

**THE Swansea Gaslight Company have** for Immediate Sale—Four 20 feet Square by 5 feet deep PURIFIERS, with 24-inch Lutes, 18-inch Connections, and Centre Valve Complete. Immediate Removal.

Apply to the MANAGER, Gas-Works, SWANSEA.

## GAS PLANT FOR SALE.

**THE Chelmsford Gaslight and Coke** Company have FOR SALE the following Second-Hand GAS PLANT:—

The whole of the IRONWORK of their Writtle Works, to be Dismantled shortly, including Two Small GASHOLDERS nearly new, also STATION METER and GOVERNOR, only used a few Years.

At the Chelmsford Works, for removal in April or May, Two EXHAUSTERS, of 15,000 and 10,000 Cubic Feet per Hour, respectively, made by Geo. Waller and Son, with all Connections and Valves.

ER. W. SMITH,  
Engineer and Manager.

## COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

## FIRST-CLASS SECOND HAND PLANT.

**THE Committee have for Sale the following PLANT,** together with all Accessories, &c., for which they are prepared to receive OFFERS:—

Two TOWER SCRUBBERS, 30 feet high by 10 feet diameter, with 16-inch Connections.

One STATION METER, capacity 40,000 Cubic Feet per hour, with 16-inch Connections.

One Kirkham, Hulett, and Chandler's "STANDARD" WASHER, capacity 800,000 Cubic Feet per Day, with 16-inch Connections.

The Plant may be Inspected and further Information obtained by Applying to Mr. S. Meunier, Engineer and Manager, Gas-Works, Portwood, Stockport.

Offers, endorsed "Second-Hand Plant," to be sent to the Chairman, Gas Committee, Town Clerk's Office, Town Hall, Stockport.

ROBERT HYDE,  
Town Clerk.

Town Hall, Stockport.  
Feb. 2, 1910.

## THE Haworth Urban District Council

are prepared to receive TENDERS for the Purchase of their Surplus TAR and LIQUOR for the Year ending March 31, 1911.

Tenders to be sent to me, endorsed "Tender for Tar and Liquor," not later than Feb. 21.

WILLIAM ROBERTSHAW,  
Clerk.

Burlington Chambers,  
North Street, Keighley.

## DRONFIELD GAS COMPANY.

**THE Directors invite Tenders for 1200** Tons of Best Screened GAS COAL, to spread over the Twelve Months ending April 30, 1911. The Coal to be Delivered as required.

Tenders to be sent to the Chairman by the 22nd inst., Sealed and Endorsed "Tender for Gas Coal."

HAROLD WHITE,  
Secretary.

Gas Offices, Dronfield.

## CLACTON URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE above Council are prepared to receive TENDERS for RE-SETTING Two Beds of REGENERATIVE RETORTS.**

Copy of Specification and Form of Tender may be obtained of the Council's Consulting Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall Buildings, Clacton-on-Sea.

Sealed Tenders, endorsed "Resetting Retorts," to be delivered to the undersigned not later than Noon on the 2nd of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,  
Clerk to the Council.

Town Hall Buildings,  
Clacton-on-Sea.

## RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE Council are prepared to receive**

TENDERS for the Supply of LIME, ACID, OXIDE OF IRON, RETORTS and FIRE-BRICKS, SILICA BRICKS, OILS and PAINTS, IRON-MONGERY, &c., WROUGHT-IRON TUBES, GAS, WATER, GUN-METAL FITTINGS, GAS-METERS, HAULING, BOOKS, and STATIONERY as may be required for the Year ending the 31st of March, 1911. LEAD and COMPO. PIPES for the Half Year ending the 30th of September, 1910.

Forms of Tender may be obtained (except those for Gas, Water, and Gun-Metal Fittings, Lead and Compo, Pipes, Books, Stationery, and Ironmongery, which will only be supplied to those inspecting the Samples) on Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.

No Form of Tender other than issued by the Council will be considered.

The Contractors will be required to pay the Standard Rate of Wages recognized in the District in each branch of trade.

Tenders, endorsed "Contract No. 1, &c.," as the case may be, to be addressed to the Chairman of the Gas and Water Committee, and sent to the undersigned on or before Ten a.m. on Wednesday, the 2nd day of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,  
Clerk to the Council.

Public Offices, Pentre,  
Rhondda, Feb. 15, 1910.

## SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

**PERSONS desirous of Tendering for the**

Construction of a Masonry GASHOLDER TANK, 105 ft. Diameter and 26 ft. 6 in. Deep, are requested to send their Names and Addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., not later than Wednesday, the 23rd day of February, 1910, together with a Deposit of £33s. (by Cheque) for Copies of Specification, Bill of Quantities, and Form of Tender. The deposit will be returned on receipt of a *bond-fide* Tender.

The Drawings of the proposed Works can be inspected at the Offices of the Surveyor to the Council, Outram Street, Sutton-in-Ashfield.

The lowest or any Tender will not necessarily be accepted.

JOHN D. FIDLER,  
Clerk to the Council.

Council Offices,  
Sutton-in-Ashfield.

## SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

**PERSONS desirous of Tendering for a**

LANCASHIRE BOILER 20 ft. by 6 ft. 6 in., with Steam Piping, &c., are requested to send their Names and Addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., not later than Wednesday, the 23rd day of February, 1910, together with a deposit of £33s. (by Cheque) for Copies of Specification, Drawing, and Form of Tender. The deposit will be returned on receipt of a *bond-fide* Tender.

The lowest or any Tender will not necessarily be accepted.

JOHN D. FIDLER,  
Clerk to the Council.

Council Offices,  
Sutton-in-Ashfield.

## CORPORATION OF CARLISLE.

TO OIL DISTILLERS AND OTHERS.

**THE Corporation of Carlisle are prepared to receive TENDERS for the Supply of about 1000 Tons of GAS OIL Annually for a period of One, Two, or Three Years, commencing on May 1, 1910.**

Specifications and Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Gas Oil," must be delivered at this Office before Five p.m. on Monday, the 28th inst.

The Corporation do not bind themselves to accept the lowest or any Tender.

HAROLD E. BLOOR,  
Engineer and Manager.

Gas Offices:  
Victoria Viaduct, Carlisle.

## CARLISLE CORPORATION GAS WORKS.

TO TAR DISTILLERS.

**THE Corporation are prepared to receive TENDERS for the Purchase of COAL-GAS and CARBURETTED WATER-GAS TARS for a period of One, Two, or Three Years, commencing on April 1, 1910.**

Conditions and Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Tar," must be delivered at this Office before Five p.m. on Monday, the 28th inst.

The Corporation do not bind themselves to accept the highest or any Tender.

HAROLD E. BLOOR,  
Engineer and Manager.

Gas Offices:  
Victoria Viaduct, Carlisle.

## TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

**NOTICE is Hereby Given, that it is the**

intention of the Directors of this Company to SELL BY TENDER, under the Authority of the Tottenham and Edmonton Gas Act, 1906

£30,000 "B" Consolidated Stock.

Minimum price, £111 per £100 Stock.

Tenders will be received up to Five o'clock p.m. on Tuesday, March 1, 1910.

The progressive character of the Company's Business will be seen from the following statement:—

Year ended Dec. 31.	Registered Consumers.	Price of Gas.	Dividend on "B" Stock.
1901	19,040	3s. 4d.	4
1902	22,505	3s. 0d.	4½
1903	27,070	3s. 0d.	4½
1904	32,072	2s. 10d.	4½
1905	37,363	2s. 10d.	4½
1906	41,733	2s. 8d.	5
1907	45,691	2s. 6d.	5½
1908	49,982	2s. 6d.	5½
1909	53,785	2s. 5d.	5½

The full statutory Dividends have been paid for many years.

The price of Gas is now 2s. 4d. per 1000 Cubic Feet, and a Dividend of £5 10s. Per Cent. per Annum may therefore be paid.

Particulars of Sale, with Form of Tender attached, may be obtained at the Head Office of the LONDON and PROVINCIAL BANK, LOVBURY, E.C., or at any of their Branches, or will be forwarded on Application to me.

By order of the Directors,  
E. TOPLEY,  
Secretary.

Chief Offices of the Company,  
High Road, Tottenham.  
Feb. 4, 1910.

## COUNTY BOROUGH OF BOLTON.

(GAS DEPARTMENT.)

## TENDERS FOR TAR.

**THE Gas and Lighting Committee of** the County Borough of Bolton invite TENDERS for the Purchase of the TAR to be produced at their Works.

Further Particulars and Forms of Tender may be obtained on Application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas and Lighting Committee, Gas Offices, Bolton, to be delivered not later than Thursday, the 24th inst.

SAMUEL PARKER,  
Town Clerk.

Town Hall, Bolton,  
Feb. 11, 1910.

## EAST HULL GAS COMPANY.

SALE BY TENDER OF £5000 NEW FIVE PER CENT. ORDINARY STOCK.

**THE Directors Offer for Sale, by Tender,** the above Amount of STOCK, to be issued under the Provisions of the East Hull Gas Act, 1906, and the various Acts incorporated therewith.

Since the year 1867, the Company has paid without intermission the Maximum Dividend allowed by Parliament.

The Dividend is Cumulative—i.e., should the Profits of the Company in any one year be insufficient to pay the Maximum Dividend, the same may be made up out of the Reserve Fund or out of Surplus Profits in any future Year.

Any amount of Stock being a multiple of £5 but not less than £20 may be applied for.

The Stock will be allotted to the Highest Tenders.

A deposit of £10 per Cent. on the nominal amount of the Stock applied for must accompany each Tender, and the Allottees must pay the remainder of the Purchase Money on or before the 31st day of March, 1910.

LAST DAY FOR RECEIPT OF TENDERS, TUESDAY, the 1st DAY OF MARCH, 1910.

Forms of Tender and Particulars of Sale can be obtained at the Local Branches of Messrs. Barclay and Co., Limited, Bankers; or from the Offices of the Company.

By order of the Board of Directors,  
DAVID WOOD,  
Secretary.

Offices: Saint Mark Street,  
Hull, Feb. 7, 1910.

## SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS beg to**

notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
HORNSEY GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED STOCK,  
£6500 FIVE PER CENT. PREFERENCE STOCK,  
AND

£3000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will** SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
SOUTH ESSEX WATER-WORKS COMPANY.

ISSUE OF £20,000 NEW CAPITAL, COMPRISING  
£5000 FIVE PER CENT. MAXIMUM ORDINARY  
STOCK,

£10,000 FIVE PER CENT. PREFERENCE STOCK  
AND

£5000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will** SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

## BROMLEY AND CRAYS GAS COMPANY.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Offices, 156, High Street, Bromley, Kent, on Tuesday, the 22nd day of February, 1910, at Six o'clock p.m. precisely, to receive the Report of the Directors;

the Balance-Sheet certified by the Auditors; to declare a Dividend; to determine the Amount of the Auditors' Remuneration; to elect Three Directors and an Auditor, on retirements by rotation; and to Transact generally the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 7th of February to the 22nd of February, both days inclusive.

By order of the Board,  
HENRY W. AMOS,  
Secretary.

Offices: 156, High Street,  
Bromley, Kent, Feb. 5, 1910.



**HARROW AND STANMORE GAS COMPANY.**  
**NOTICE** is Hereby Given, that the  
 ORDINARY HALF-YEARLY MEETING of  
 the Proprietors will be held at the Holborn Restaurant,  
 218, High Holborn, London, on Friday, the 4th day of  
 March, 1910, at Twelve o'clock precisely, to receive the  
 Directors' and Auditors' Reports; to declare a Dividend;  
 to elect a Director and an Auditor; and to transact  
 any Ordinary Business of the Company.  
 The REGISTER OF TRANSFER BOOKS WILL  
 BE CLOSED from Feb. 26 until March 4, both  
 inclusive.

By order of the Board,  
 J. L. CHAPMAN,  
 Secretary.

Gas Office, Roxeth, Harrow,  
 Feb. 15, 1910.

**CAST-IRON Pipes.** Spigot and Socket  
 or Flanged. Special Quality—9 feet or 12 feet  
 Lengths. When buying, Write us.  
 A. Lowcock, Limited, SHREWSBURY.

**GASHOLDERS**—Splendid 45 feet dia-  
 meter and New STEEL TANK, fixed Complete to  
 Plan and Specification; also 14 feet and 16 feet  
 Diameter GASHOLDERS, with STEEL TANKS. Can  
 be seen temporarily erected. Re-erected Cheap for  
 immediate Sale.  
 FIRTH BLAKELEYS, Thornhill, DEWSBURY.

*Testing Instruments*

ALEXANDER WRIGHT & CO., LD.  
 WESTMINSTER.

**PYROPHORIC  
 GAS LIGHTERS.**

*Genuine Novelty. Selling Splendidly.*  
 "Presto," 7½", as illustrated, retails complete, 1/6;  
 "Pyros," for Shop Windows, 30" long, complete, 4/6.  
 Refills (5000 sparks) 9d. and 1/- each retail.

PAUL METZ (G. L. Dept.), 29, Newhall Hill, Birmingham.

*Just Published. Second Edition. Re-written.  
 Enlarged. 8s. 6d. net.*

## ACETYLENE:

The Principles of its Generation and Use.

By F. H. LEEDS, F.I.C., F.C.S.,  
 Member of the Society of Public Analysts and of the  
 Acetylene Association; and  
 W. J. ATKINSON BUTTERFIELD, M.A., F.I.C.,  
 F.C.S., Consulting Chemist, Author of "The Chemistry  
 of Gas Manufacture."

"Brimful of information."—*Chem. Trade Journal.*

*Just Published. In Cloth. Illustrated. 12s. 6d. net.*

## THE GAS TURBINE

By HENRY HARRISON SUPLEE, B.Sc.

Prospectus is in preparation and may be had post free  
 when ready.

LONDON: CHARLES GRIFFIN & CO., LIMITED,  
 EXETER STREET, STRAND.

**THOMAS DUXBURY & CO.,**  
 16, DEANS GATE, MANCHESTER  
 Gas Engineers' Agents and Contractors for  
 METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND  
 ALL OTHER GAS APPARATUS.

*Inquiries Solicited.*  
 Telegrams: "DARWINIAN, MANCHESTER."  
 Telephone 1806.

**MIRFIELD GAS COAL.**  
**UNEQUALLED.**

Sperm Value 878.85 lbs. per Ton.

*Please apply for Price, Analyses, and Report, to the*  
**MIRFIELD COLLIERY COMPANY,**  
**RAYENSTHORPE, NEAR DEWSBURY.**  
 LONDON: 16, Park Village East, N.W.

*Now Ready, Price 15s., Limp Cloth.*

**TWENTY-NINTH YEAR.**

## ANALYSIS OF THE ACCOUNTS

OF SOME OF THE

### Principal Water Undertakings

OF THE

**UNITED KINGDOM,**

NAMELY:

The Undertakings of the Metropolitan Water  
 Board, and 24 Provincial Water Undertakings  
 FOR THE YEAR 1908-1909.

Compiled by  
**WOOD, DREW, & CO.,**  
 Chartered Accountants.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

## BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and  
 Pelaw Main Collieries,  
**GENERAL ENGINEERS & IRONFOUNDERS.**

Makers of Cast-Iron PIPES and CONNEC-  
 TIONS for Gas, Water, Steam, Electrical,  
 Sanitary, and other purposes; also TANKS,  
 COLUMNS of every description, Hydraulic,  
 Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of  
 our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.

London Offices:

**46, CANNON STREET, E.C.**

Newcastle-on-Tyne Offices: MILBURN HOUSE.

## ALL the BOYS CALORIMETERS

which have been in daily use in  
 all the Official Testing-Stations in  
 London for the last Three Years

WERE MADE BY  
**JOHN J. GRIFFIN & SONS,**  
 — LIMITED —  
**KINGSWAY, LONDON, W.C.**

Those desiring to obtain Gas Calorimeters  
 as used in the Official Testing Places  
 should see that the apparatus bears the  
 name of the Original makers.

*Descriptive Catalogue on Application.*

**NOW READY.**

*Price, Bound in Cloth, 5s. 6d., Post Free.*

— TWENTY-SEVENTH YEAR —

## COMPLETE REPORTS

OF PROCEEDINGS

OF THE

**DISTRICT ASSOCIATIONS**

OF

**GAS MANAGERS**  
**FOR 1909.**

Most of the previous Volumes are still on Sale.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

**TROTTER, HAINES, & CORBETT,**  
**BRETTELL'S ESTATE, LIMITED,**  
**FIRE-CLAY & BRICK WORKS,**  
**STOURBRIDGE.**

Manufacturers of GAS RETORTS, GLASSHOUSE  
 FURNACE & BLAST-FURNACE BRICKS, LUMPS,  
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PIPES and CONNECTIONS, 1½ to 48 inches  
 in diameter, and make and erect to order  
 RETORTS, PURIFIERS, and TANKS, with  
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 GIRDERS, SPECIAL CASTINGS, &c., re-  
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NOTE.—Makers of HORSLEY SYPHONS.  
 These are cast in one piece, without Chap-  
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 and rendering Leakage impossible.

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**GRASSMOOR COLLIERIES,**  
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Rich in Illuminating Power and Yield of Gas.  
 Above the Average in Weight and Quality  
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Maintains a High Standard in Residuals.

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 And LAMBHILL FOUNDRY, GLASGOW.  
 OFFICE: 147, MILTON STREET, GLASGOW.



# GRAETZIN LIGHT

## Important Improvements.



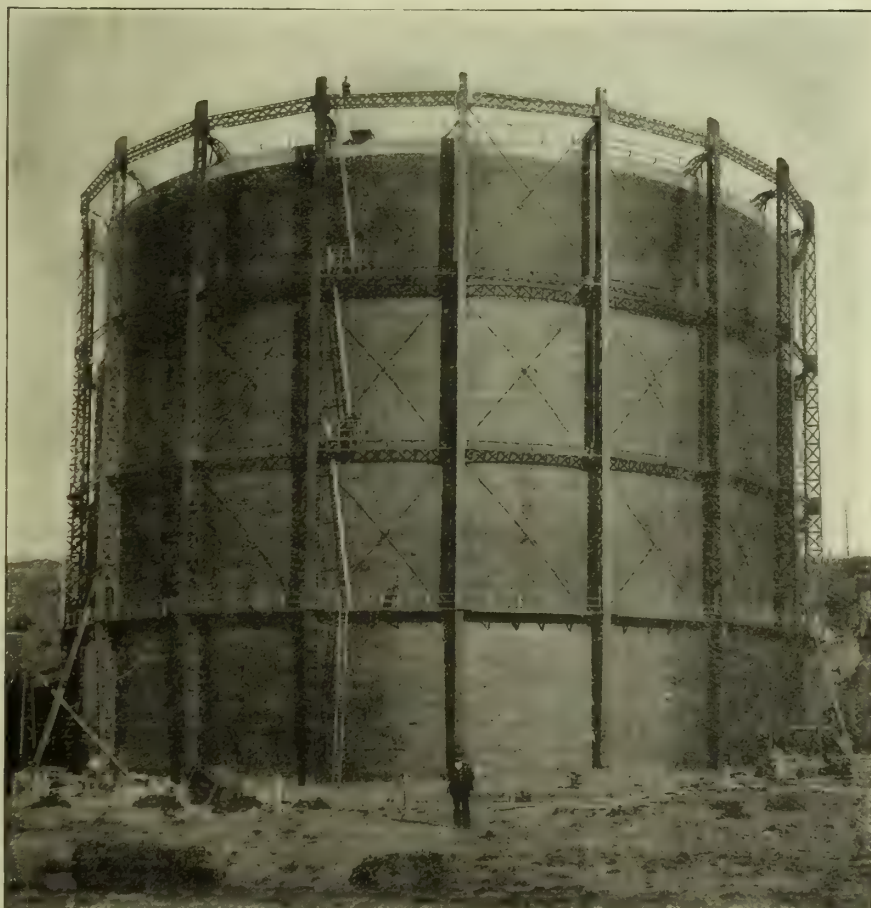
### BURNERS.

1. **20-Candle Power** more light without increase in the consumption of gas.
2. **Patent Gas Adjuster**; cannot get out of order.
3. **Automatic Gas Regulator**, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

Gasholders  
and  
Steel Tanks.  
  
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Condensers.  
  
Scrubbers.  
  
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Steel Work.  
  
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&c.  
  
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Riveted Steel  
Mains.



**SPIRAL  
GUIDED  
GASHOLDERS**

with  
Clayton and  
Pickering's  
Patent Guides,  
or with  
Spiral Plates.

**ORIGINAL  
MAKERS.**

Three-Lift Telescopic Gasholder and Steel Tank, to the Designs of Messrs. CORBET WOODALL & SON, Made and Erected by

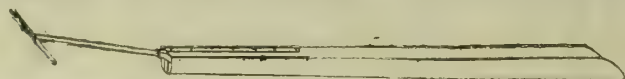
**CLAYTON, SON & CO., LTD., LEEDS,**

For the WELLINGTON GAS CO., Miramar Works, New Zealand. Tank, 152 ft. 6 in. dia. Gasholder, 150 ft. dia. by 30 ft. Lifts.



## STEEL SCOOPS FOR RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.

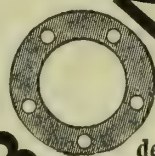


**HENRY SYKES, Ltd., Engineers,**  
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**LARGEST MANUFACTURERS in the UNITED KINGDOM**  
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PATENTEES OF  
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RETORTS.**

**DIBDALE WORKS,**



**DUDLEY.**

**SPECIAL BRICKS  
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RATOR and REGENERATOR  
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Large Stocks of Bricks of all sizes,  
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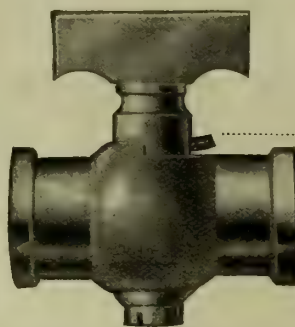
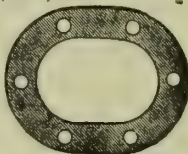


FIG. 1. The Old Style with the  
Old Trouble.  
Note the Pin A.

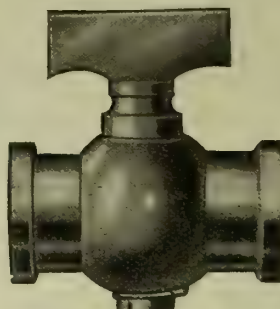


FIG. 2. Evered's Patent  
"Safety Stop." No Pin.  
No trouble.

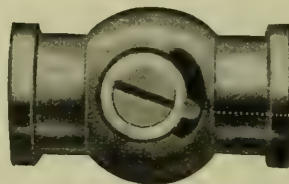


FIG. 3. Underside showing  
"Safety Stop" in lieu of Pin.

## EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

## EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked B, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

**EVERED & CO., LTD.,**  
27 to 35, DRURY LANE,  
LONDON, W.C.

Surrey Works, SMETHWICK.

## MILBOURNE'S PATENT

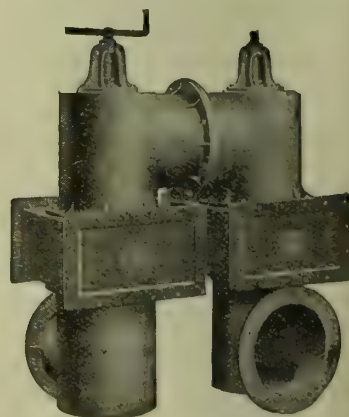
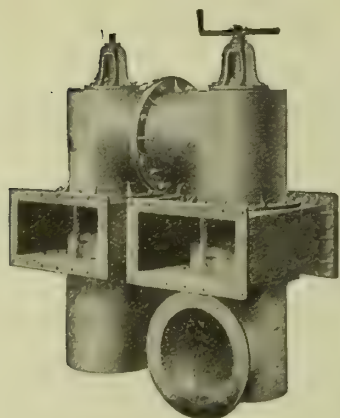
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fixed inside or outside the Purifiers.

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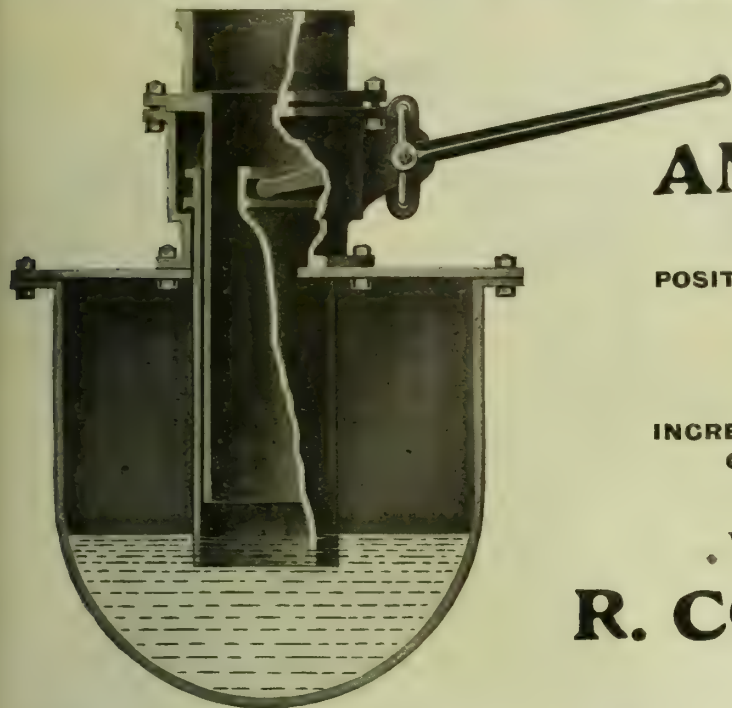
Construction of

## Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings (Patent), New Coke Ovens (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.





## CORT'S PATENT ANTI-DIP VALVE.

### IMPORTANT POINTS:—

POSITIVE IN ACTION,  
ABSOLUTELY SAFE,  
ALWAYS FULL BORE.

### WE GUARANTEE

INCREASED MAKE PER TON,  
GREATER ILLUMINATING POWER,  
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Write for fullest Particulars to—

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

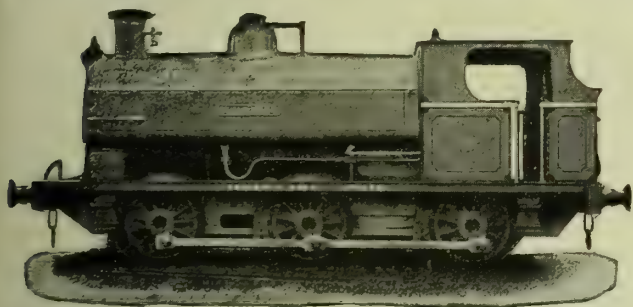
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Telegraphic Address: "WIGAN, BIRMINGHAM."

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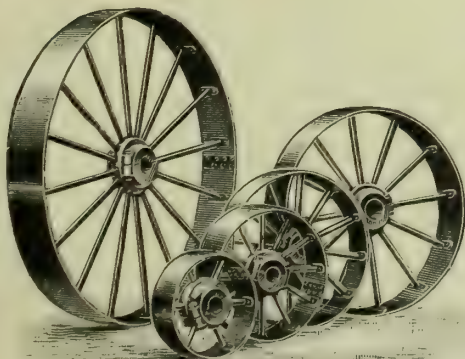
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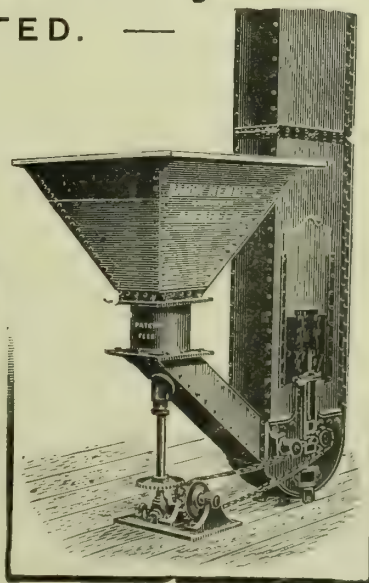
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AND

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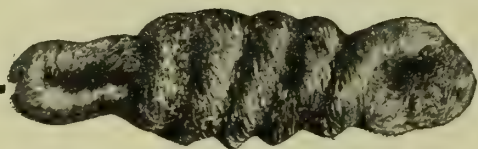


**OUR DISCOUNT SYSTEM GAINS  
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**Greatly increases Sale of Gas.**

*Particulars and fullest description on  
application.*

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## LEAD WOOL

Is sent out in Skeins all ready for use.  
Every Skein of equal weight and length.  
The Lead Wool Joint is built up evenly all the way  
through.  
Lead Wool requires no melting and can be used in  
water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead  
Joints and cost 33½ per cent. less.

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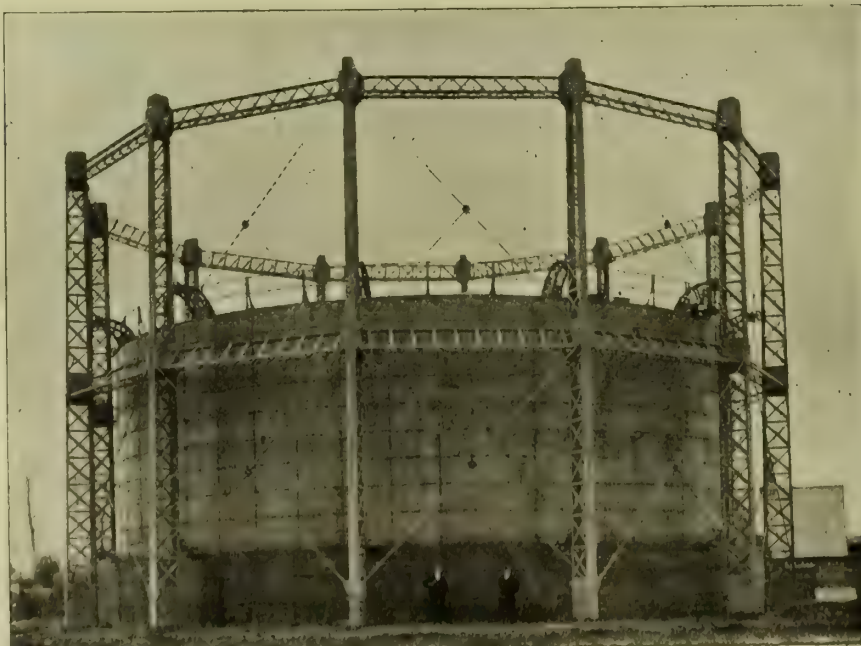


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**FOR**

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**SIX 20 ft. THROUGH RETORT HUNTER-BARNETT PATENT COKE PUSHERS, and**

**SIX ARROL-FOULIS PATENT CHARGING MACHINES capable of charging up to Six cwt. per Mouthpiece.**

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**PART ORDER OF TWENTY-TWO MACHINES**

**For the South Metropolitan Gas Co., presently in hand.**

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**FOR FULL PARTICULARS APPLY TO THIS ADDRESS.**



# SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.  
REGISTERED.

## THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.

**GREATER CONDUCTIVITY THAN ANY FIRE-CLAY RETORT.**

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## ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON

COALEXLD SELLING AT 20/- A TON

**IN THE SAME TOWN.**

**X**

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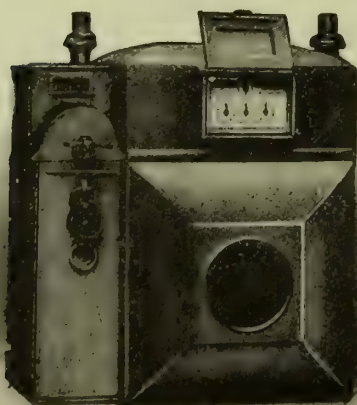
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LIMITED  
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Employed in the Manufacture of  
**WELDED STEEL MAINS**  
for WATERWORKS Etc.

# R. LAIDLAW & SON (EDINBURGH), LTD.

## GAS METER MAKERS.



**Prepayment  
Dry Meters in  
Tinplate Cases.**

Thousands of our  
Meters in use by the  
largest Gas Companies  
and Corporations and  
giving

**COMPLETE  
SATISFACTION.**

**Prepayment  
Wet Meters in  
Cast-Iron Cases.**



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# Welsbach

## LIGHT

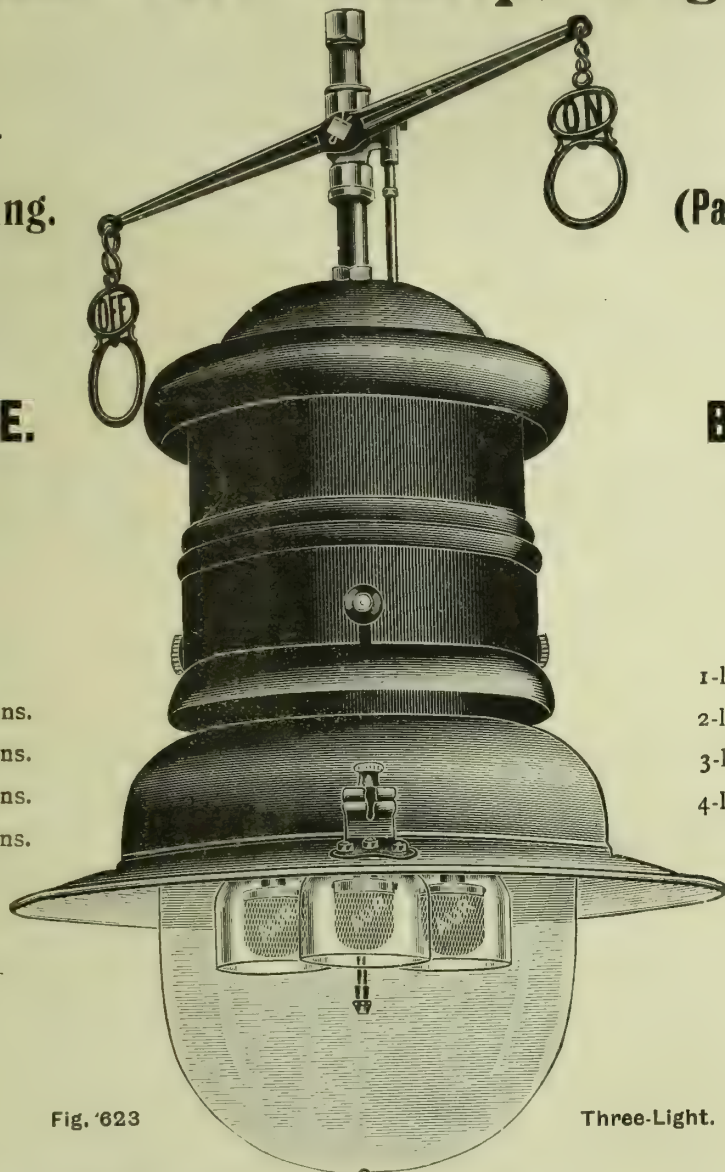
### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

#### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

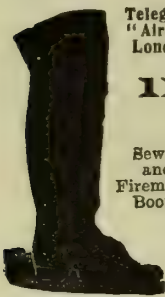
The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

**THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,**  
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.





Telegrams:  
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India-Rubber and Airproof Manufacturers and General Contractors,

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Gas Bags for repairing Mains.  
All Seams Stitched and Taped.

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Impervious to Main Liquor and  
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Oilskin Clothing, Diving and Wading Dresses,  
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Contractors' and Miners'  
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<p>LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.</p>	<p>CONDENSERS VARIOUS TYPES.</p>	<p>GAS AND WATER VALVES.</p>	<p>ROOFING STRUCTURAL WORK M.S. &amp; C.I. PURIFIERS.</p>	<p>GAS EXHAUSTER &amp; GAS ENGINE COMBINED.</p>	<p>ROTARY GAS EXHAUSTER.</p>
			<p>GASOMETER AND C.I. OR STEEL TANKS.</p>		

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Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

# ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

**VERY FREE FROM IMPURITIES.**

TELEGRAMS: "ATLAS SHEFFIELD."

**DRAKES**  
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# Our "HULO" INVERTED BURNER

Heavy  
Quality.

Brilliant  
Light.



FURTHER IMPROVEMENTS BUT  
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Gas Engineers,

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Established  
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— 2000 Workmen. —  
**CHAMBER-  
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In point of efficiency, cost of  
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**BEST FURNACES in the WORLD!**

# DELLWIK WATER GAS PLANT

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**TAR  
CARBURETTING**  
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AT  
**PRESCOT  
AND  
SNODLAND  
Gas-Works.**

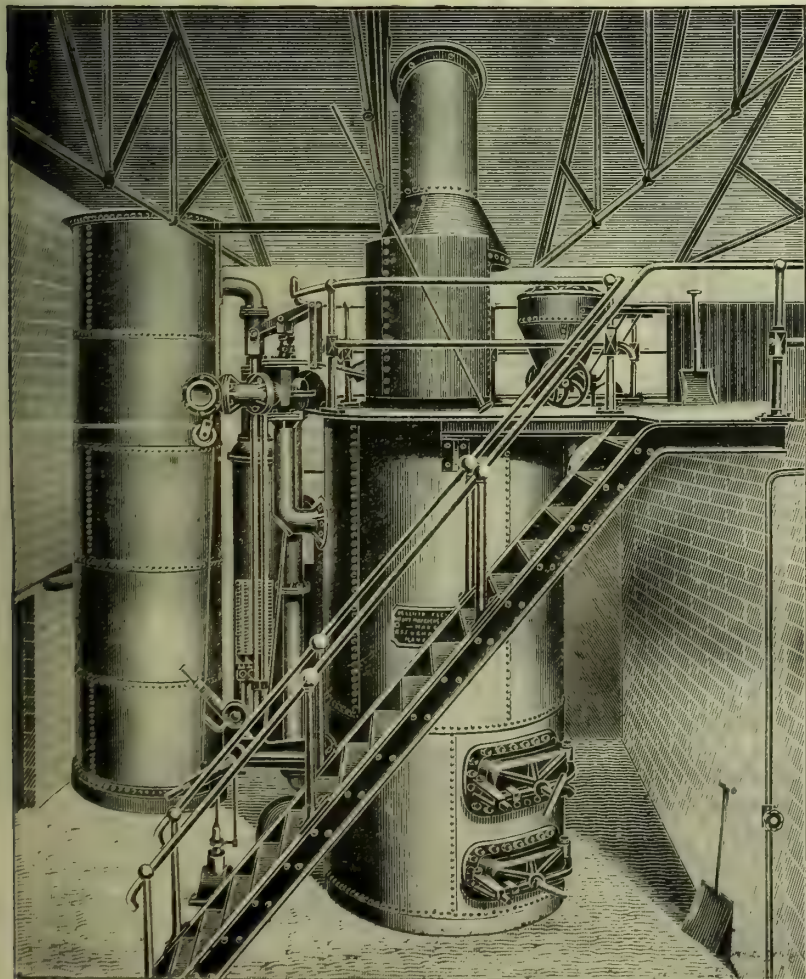
**Results Guaranteed.**

Full Particulars from

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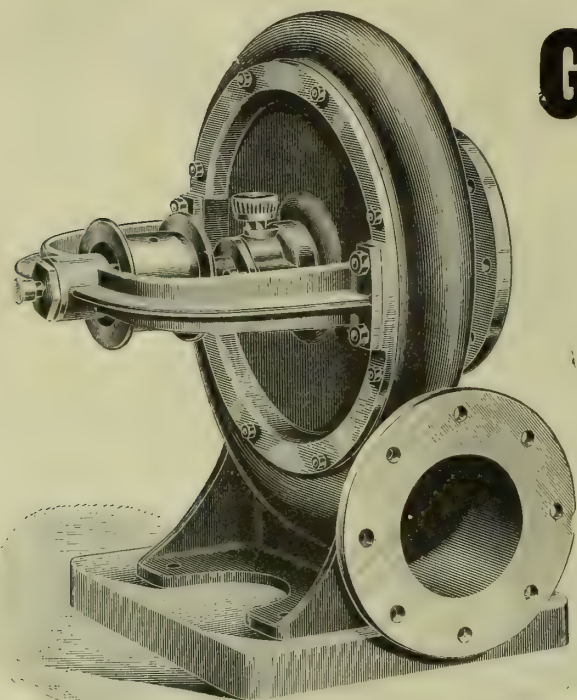
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Keith Blackman Gas Blower or Exhauster.

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**EXHAUSTERS**  
FOR BOOSTING GAS MAINS.

Made in various sizes, and  
also supplied fitted with direct  
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Steam Turbines.

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**BALL WASHER SCRUBBER** (Laycock and Clapham's Patent).

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**RAPID AUTOMATIC FASTENINGS**

15,000 Sold, and

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## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2441.]

LONDON, FEBRUARY 22, 1910.

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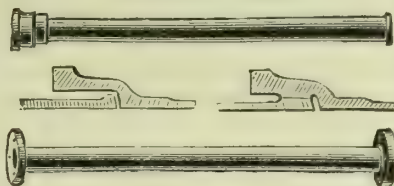
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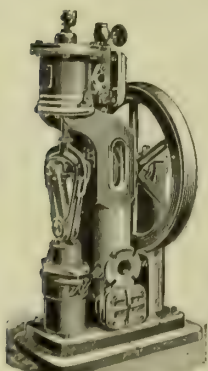


Fig. 705. "SINGLE RAM" STEAM-PUMP.

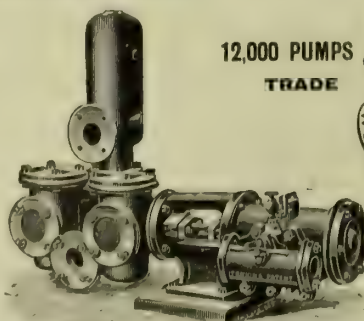


Fig. 696. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

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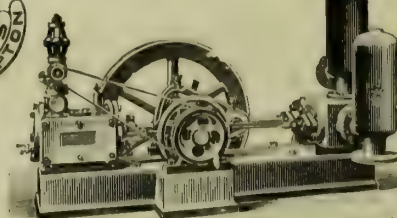


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

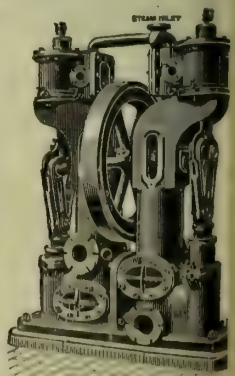


Fig. 712. "DOUELLE-RAM" STEAM-PUMP.



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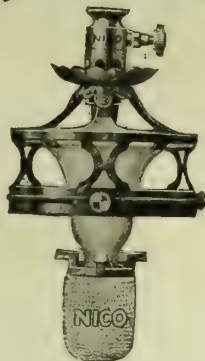
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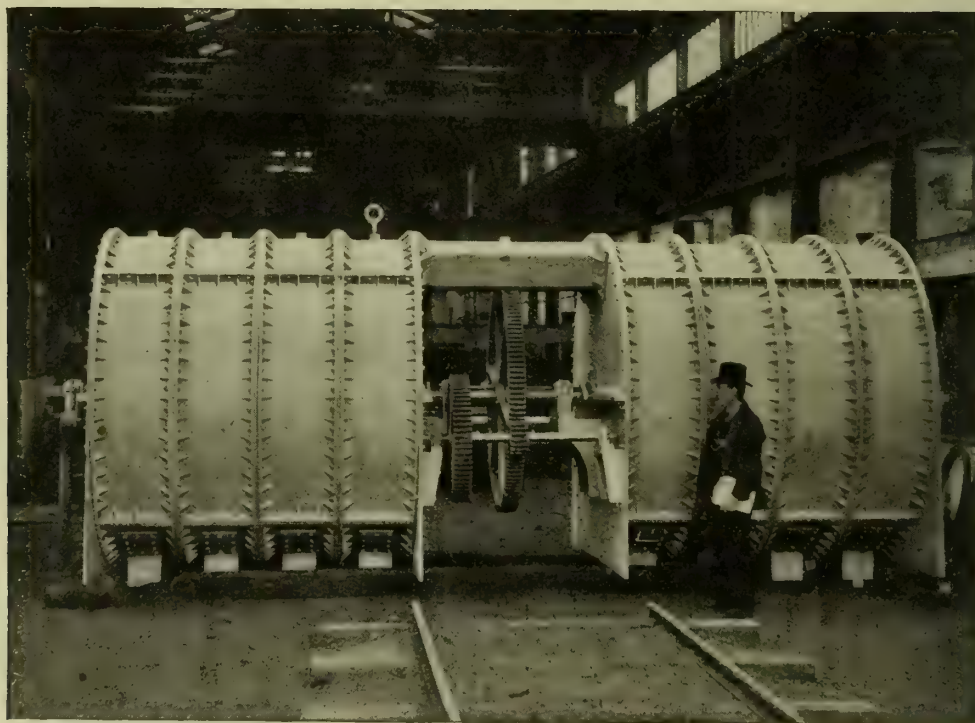
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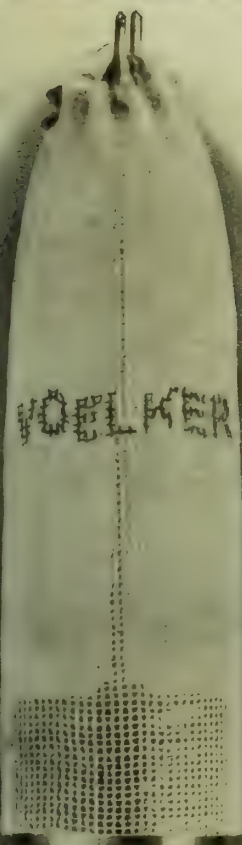
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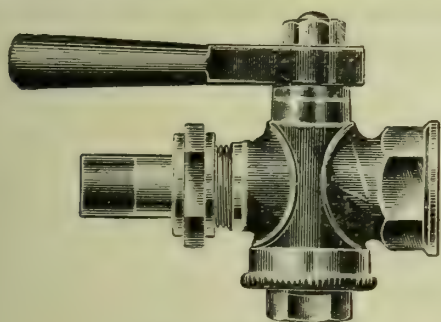
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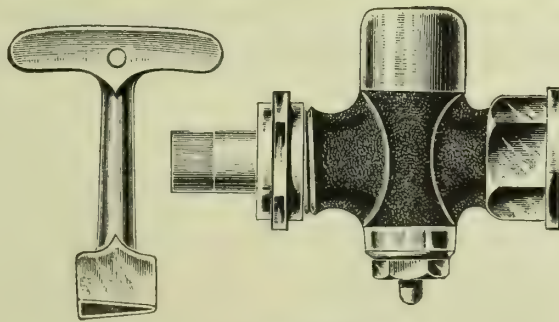
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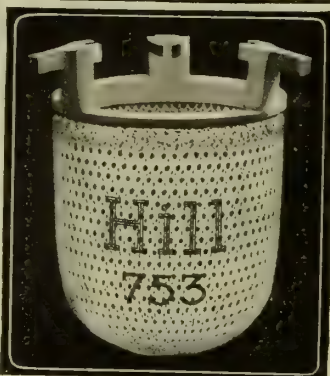
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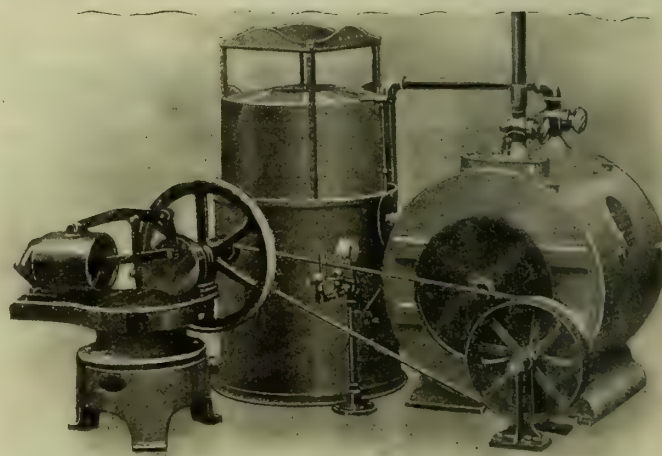
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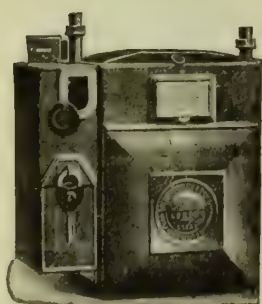
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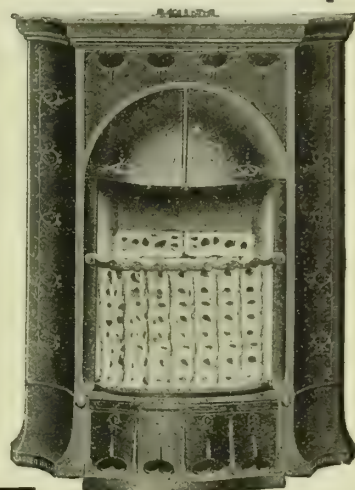
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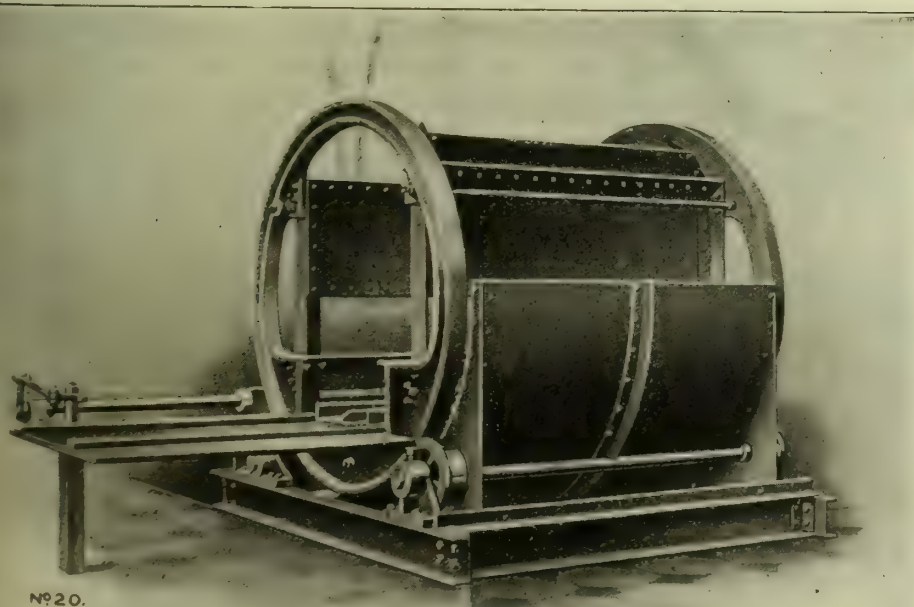
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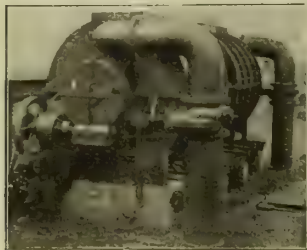
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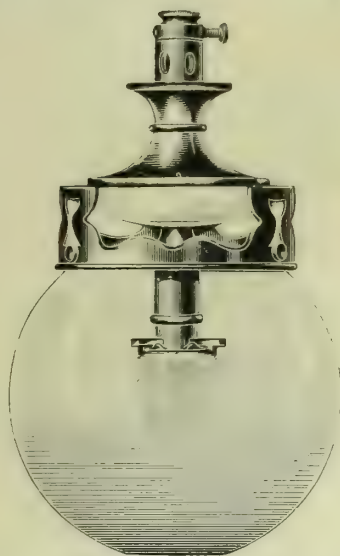
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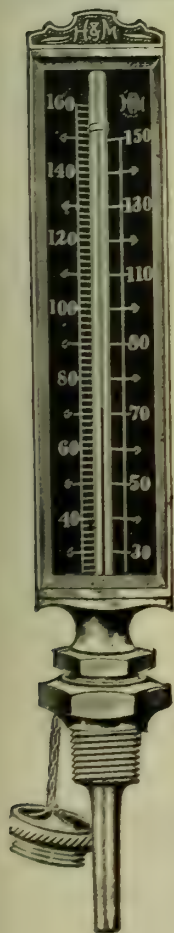
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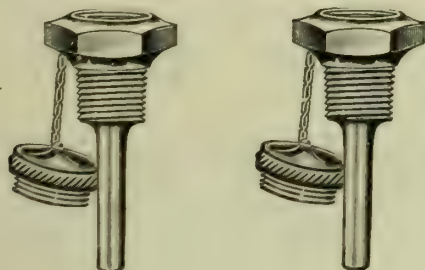
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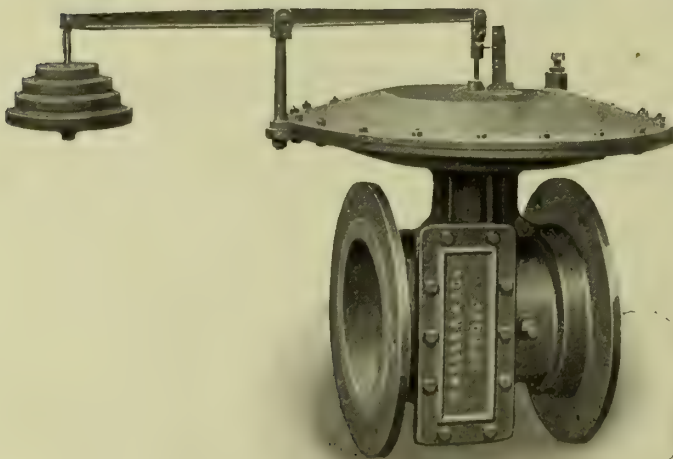
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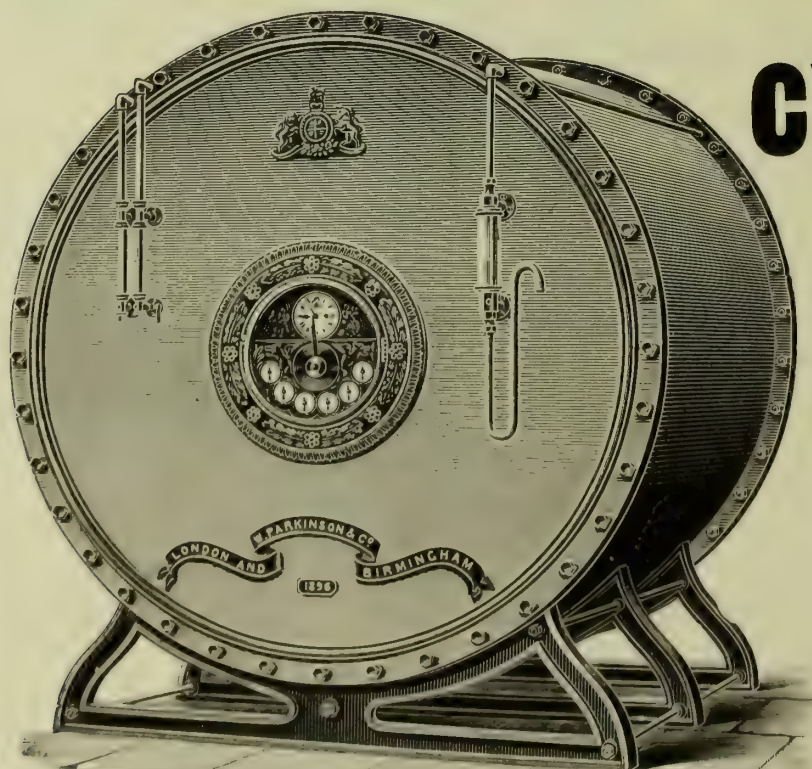
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2441.—TUESDAY, FEBRUARY 22, 1910.

## EDITORIAL NOTES—GAS, &c.

### A Gas Demonstration at Shepherd's Bush.

NOT being anticipated, all the more pleasure is there in giving hearty welcome to the enterprise of the London and Suburban Gas Companies in arranging for a demonstration of the applications of gas at the Japan-British Exhibition at Shepherd's Bush this year. The matter was arranged at a meeting of representatives of the Companies, held at the Horseferry Road offices of the Gaslight and Coke Company, early this month. It is proposed that the exhibit shall form part of the Decorative Arts Section, and shall be on much the same lines as the exhibit at the Franco-British Exhibition two years ago. A strong Committee has been formed to carry the scheme through. Of this Committee Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, is the Chairman; and Mr. F. W. Goodenough, the Chief Inspector of the Company, is the Hon. Secretary and Treasurer. The other members of the Committee, giving the names in alphabetical order, are: Mr. A. E. Broadberry, of the Tottenham and Edmonton Gas Company; Mr. James W. Helps (President of the Institution of Gas Engineers), Croydon Gas Company; Mr. Alex. A. Johnston, Brentford Gas Company; Mr. Stanley H. Jones, Commercial Gas Company; Mr. F. McLeod, South Metropolitan Gas Company; and Mr. S. Y. Shoubridge, South Suburban Gas Company. The constitution of the Committee is a strong one; and the members may be relied upon to arrange an exhibit that will effectually demonstrate the utility and economy of gas for many of the purposes to which it has application in the dwelling-house and elsewhere. With regard to the financing of the display, satisfactory guarantees have been received from the London and Suburban Companies; and though it is understood that no general appeal for funds will be made, we have no doubt the co-operation of any Gas Company who have sympathy with the project, and would care to assist the Committee in a more material way, would be heartily welcomed. The influence of such a demonstration at a place attracting the public from all quarters cannot be in any way circumscribed. From the above information, it will have been noted that Mr. F. W. Goodenough is the Hon. Secretary and Treasurer of the Committee; and any communications on the subject should be addressed to him at the Gaslight and Coke Company's Offices, Horseferry Road, S.W.

### Current Technical and Commercial

#### Topics Viewed from Australia.

THE universality of the gas industry, in its professional and administrative aspects, is brought home to one by such addresses as that with which Mr. P. C. Holmes Hunt, the Engineer of the Metropolitan Gas Company of Melbourne, inaugurated his year of office as President of the Victorian Gas Managers' Association, and which address was published in the "JOURNAL" last week. Of the character of the deliverance, we need say but few words. It carries through it the signs of an innate studiousness and mastery of contemporary technical and commercial knowledge such as, during the outstanding historical years in the development of the gas industry, have been traits associated with the honored patronymic that he bears. It breathes of the progressive instinct of the writer, and of a tight grip of the affairs of his profession. A man may profess and call himself what he will but the independent and irrefragable results of action and work are, and must be, taken as the testimony upon which he is judged. The occasion of the presidency of Mr. Hunt of the first, and at present only existing, gas organization in Australia permits congratulation upon the position he has attained in his profession both

in Melbourne and among his Australian *confrères*. The address indirectly tells of the industry by which the position has been won. But further as to the characteristics of the address. Throughout, there is just sufficient local colouring placed upon, and projection of local condition into, the consideration given to British and European gas practices generally to impart an added interest to the views and criticisms of a competent gas engineer so far removed from the homeland. It is seen that the same problems, the same practices, the same drawbacks (accentuated by geographical situation), the same successes (varied by local circumstance and business magnitude), occupy, vex, or cheer, as the case may be, the gas engineer and manager in Australia as here, and keep him ever active.

We find the correspondence in these regards limned from the beginning to the end of the address. Coal worries are ever with us at home. If some actual disturbance of the coal market does not prevail, it is an exceptional period nowadays when there are not rumours of some agitation brewing. Australia has had its measure of trouble in the coalfields full and overflowing of late; and gas-works have suffered in consequence, and their managers have had sleepless nights with stocks run down and deliveries erratic. Apart from the upheaval among the miners, the price of coal there, as here, continues to give anxiety. The price of coal here, there is little risk in saying, will never again reach the low level of prices which gas undertakings knew of old; the price in Australia, Mr. Hunt informs us, is at least 33 per cent. more than it was five or six years ago. Such a rise calls for no comment; its seriousness from the gas maker's standpoint is obvious. It is not, however, only through the acts of the Australian coal miners that prices have been put up to an undue level, but from combination of the coal owners. The Australian coalfields are in sufficiently few hands, and Australia sufficiently sequestered, for combination to be possible without much risk. More the pity for the country and its industries. Nationalization of coal supply is not a thing to be desired; but there ought to be some means of price regulation, so that a country's industry and trade are not brought to the verge of ruin, and people compelled to pay extraordinary rates for manufactured commodities, by the abnormal claims of a comparatively few conspiring owners. However, there are coal developments in Australia. New mines are being opened up; and the more of this sort of thing that goes on the better. The coal from one of the new fields is spoken of by the President as being of good gas-making quality. But there are Australian coals that require packing tight into the retorts for the making of decent coke; and there are other varieties which are of a contrary character, and will not submit to tight packing.

These facts show that the character of the most available coal for gas making must influence future policy in Australia in the matter of the adoption of the newest systems of carbonization and practices. This dominating influence of coal is present in the mind of Mr. Hunt when dealing with heavier and longer duration charges, and with the vertical retort system. His latest installation of carbonizing plant at Melbourne, with the De Brouwer projector, has enabled him to commence experimenting with heavier charges, and twelve-hour working. And the results are, with the class of coal used, nearly 450 cubic feet per ton increased gas production, with a slightly higher calorific power, and a negligible reduction of illuminating power. But the weight carbonizing capacity of the retorts is somewhat reduced. Against this, in addition to the higher make per ton, has to be set the improved coke, and the lessened cost of production. This is highly satisfactory; and it is believed there will be further increase in gas yield as the result of continued experience. Different considerations obtain in contemplating the vertical retort. There appears to be some doubt in the mind of Mr. Hunt as to whether vertical retorts will be capable of making gas of the illuminating quality required in Australia. The



more recent comparative tests at home with the same coal carbonized in vertical and horizontal retorts permit the deduction that what Australian coal will do in the matter of gas quality in a tightly packed horizontal retort will have some approximation with the result that is realizable from vertical retorts. Mr. Hunt recognizes that vertical retorts—whether continuous or intermittent—hold out the prospect of completely revolutionizing retort-house practice, and also, if not to solve, at any rate to lead the way to a solution of, the problem of cheap heating gas. But the doubt as to whether Australia is ripe for the vertical retort finds expression in the statement: "Either it must be demonstrated that the vertical retort is capable of making gas equal to our standard, or our standard must be reduced before we can adopt it, provided always that the coals at our command will not give better results than those at home."

Here, then, Australian gas administrators have set before them clearly the condition precedent—and this is said notwithstanding Mr. Hunt's proviso—to the full application of up-to-date carbonizing methods, and consequently to the benefit of the revenue account, and, through the revenue account, the consumers and shareholders. For the reduction of the illuminating power standard, or the supersession of that standard by a thermal value one, Mr. Hunt presents, so far as Melbourne is concerned, a very complete and unanswerable case. The day gas output of the works under his charge is, on the average, rather more than 45 per cent. of the total; and, during the summer months, the proportion is above 50 per cent. The part of the night output used for illumination is, he believes, consumed almost entirely in incandescent burners. In fact, he questions whether the latter are used more universally than in Melbourne by gas consumers anywhere in any other country. What longer need then is there for an illuminating power test for Melbourne? There is one thing that we hope Australia will not emulate this country in, and that is in making revision of the illuminating power standard and test a bridge to the inevitable calorific power standard and test. A direct supplanting of the one by the other will, with an appropriate standard and properly defined test conditions, comply exactly with the requirements and conditions of the times. Admitted, however, better the "bridge" than the continuance of the old-fashioned burner and candles—candles used sometimes with the temperature of the testing-room at above 90°—that have sway at present in measuring the illuminating power of gas in Australia. With some 62 companies and 16 local authorities already under the new illuminating power test in this country, and seventy gas undertakings (including those promoting the joint Bills) asking for similar prescription in the present session of Parliament, there is surely plenty of ground for Australia—if the jump to a calorific standard and test seems to be too precipitate—to place its gas undertakings under the modern testing conditions, and thus help to the economies that are pressingly necessary, in the interests of the consumers, in view of the high cost of coal. Fairness to the gas industry also claims a change, seeing that it has to fight a competitor absolutely free in its actions. In this relation, the section of the address treating of the organization of the distribution department of the Melbourne Gas Company is worth reading—one important piece of work to which special attention is being paid by it being the extermination of inefficient modes of gas utilization, the existence of which gives electricians the opportunity occasionally of being cock-a-hoop over savings that it would be impossible to show given modern means of consuming gas for illuminating purposes. This review touches on only a few of the topics excellently treated in the first presidential address of the son of a father who, during his long professional career in the gas industry, has established a record in the number of similar deliverances.

### The Message and the Effect.

In one's profession, the importance of being in earnest cannot be too constantly borne in mind; and if one be in earnest, one can hardly fail to be up-to-date. The importance of being up-to-date is no less important to the manager of the relatively insignificant works than to the manager of works of the largest magnitude. The only means that the manager of the works of moderate capacity has of keeping himself *au fait* with what is moving, both technically and commercially, are by diligent study of contemporary technical literature, and by membership of Associations devoted to the interests in which he is concerned. In

Australia there is not much scope for professional organization. The Victorian Gas Association has banded together a number of earnest workers, representing the two extremes of works' management in respect of magnitude of undertakings. But dissimilarity of position of the members does not matter. Interests are common, and conference is helpful and instructive to all, though the subjects be more of the detail order than those of higher import. But frequent conference is out of the question there on account of distances. Nevertheless, in the reported deliberations of the Victorian Association, there is found, even among the managers of the smallest undertakings, a knowledge of the most modern practices in British gas-works, and instances of application on experimental or working lines.

Mr. A. G. Ambrose, of Bathurst (N.S.W.), fully acknowledged in his paper his indebtedness to the gas journals for having been the channels by which information was conveyed to him as to how economy could be achieved, and the productiveness of the coal he carbonized be enhanced. The point invites one to pause, and remark upon the duty of engineers, if they have anything worth telling, and personal interest is not affected by the telling, to publish it for the common good. The message may be useful not only to immediate neighbours, but to some fellow-manager working in a place at the far ends of the earth, and isolated from personal contact with those of common interest, except at rare intervals. In the papers and the discussions at the Australian meeting, the benefit of the weekly technical messenger is seen. The information inspires and improves. Mr. Ambrose learns what is being done with governors and tar-towers in improving the conditions under which carbonization proceeds; and an expenditure of £27 enables him to increase his gas make per ton by 7136 cubic feet, to produce gas of more uniform quality, to greatly lower the deposit of carbon in his retorts, and, under the changed conditions, he finds an absence of naphthalene. Compensation for the expenditure was quickly realized. Again, Mr. J. W. Bean, of Wangaratta, shows how by the adoption of generator furnaces in small—"very small"—would be better—works, he has increased his make of gas. The information, too, as to the value of the heavier charge has reached these small works; and trials have shown the managers that, even in their restricted way and under their restricted needs, there is advantage in the same practice. Another economy to them from the heavier charge is that, in the summer months, when the demand for gas is low and the carbonizing capacity required is limited, the heavier charge when burnt off assists in maintaining the heats of the settings better than the lighter charges, and thus fuel is saved. In the discussions on these matters, the low quantities of coke produced and sold will strike readers; but the difference in the character of the coal used there and at home, and (in the small works) the comparatively heavy fuel accounts owing to limited operations, should be remembered.

### Modern Increased Strength.

THE great vitality and strength of the gas industry are in the main to be found in the comparatively modern diversity, on the large scale, of its business. The fact is borne upon one by the address of Mr. Charles Hunt to the proprietors of the South Suburban Gas Company last Friday. The Companies bordering the Metropolitan area all did well in the past half year in the matter of increased consumption, and among them the South Suburban Company added to their output 3.41 per cent. This is the largest expansion of business experienced by them in a similar period for some years past; but, in the relatively slow rate of progress, there is nothing over which to lament. There is probably no gas undertaking in the country that has not in recent years been, though additional consumption has not been up to the old normal level, supplementing, by more or less considerable numbers, consumers, stoves, heating appliances, and engines connected up to its mains. In face of this enlargement of custom, there have not been in all quarters the same percentage increases as formerly, though volume increases may have had closer relationship. The larger increased connection and the slower rate of consumption progress seem somewhat paradoxical. But there is explanation in the fact that these recent years, as Mr. Hunt puts it, have witnessed what has been practically a revolution in the economical methods of using gas—particularly for lighting; and there has, of course, been a certain loss through the competition from electricity suppliers, but not such a loss as has given



satisfaction to the latter. To them the pace is wearily slow; and every advance in economical application that the gas industry achieves makes it so much the worse for them. The abnormal years in the matter of a lower rate of increase have been those during which the more economical methods of gas utilization have been establishing themselves.

Again, the superior strength of the gas industry in comparison with its chief competitor is found in the fact that, in respect of cooking, heating, and so forth, the electrical industry is absolutely incapable of substantially establishing itself, with better value and efficiency offering by gas. The South Suburban Company's district is in major part one of the residential areas of London's workers of all classes; and therefore the daylight gas consumption must be largely due to cooking and heating. Mr. Hunt was able to inform the proprietors that the gas consumption during the daytime in the Company's area was now answerable for at least half of the annual output; and the disproportion which formerly existed between the summer and the winter consumption has been reduced by nearly one-half. Here, again, is seen the superior strength of the gas industry in relation to its principal competitor. Through the inefficiency of electricity appliances for heating and cooking, it is not infrequently found too that, in London mansions, where electricity is used for lighting, the gas-cooker and the gas-fire are largely employed; and the gas account for such places has often now a somewhat corresponding value to the days of lighting only. The gas industry has been strengthened immeasurably by the changed conditions that have brought the day and night draft upon the mains to almost equality. This enables plant to be worked more consistently and with greater efficiency, and this again produces economy. More gas, too, is now made per ton; and costs of manufacture—apart from the raw material—are lower to-day than ever they were. Economies of this kind represent much increased strength. These remarks merely emphasize the line of thought that ran through Mr. Hunt's address to the proprietors of the South Suburban Company, whose business served as the illustration.

### Glare Again—Electrical Criticism of Metallic Filament Lamps.

A FEW members of the Illuminating Engineering Society met at the Royal Society of Arts on Tuesday last to resume the debate on the subject of "Glare, its Causes and Effects," which had been opened at an earlier meeting of the Society by Dr. J. Herbert Parsons, F.R.C.S., and discussed from the physiological standpoint *ad nauseam*. Professor Silvanus Thompson, who presided, called on Mr. A. P. Trotter, the Electrical Adviser to the Board of Trade, to open the discussion, which was continued by some eight or nine other speakers. The general trend of the debate was in the direction of establishing the unsatisfactory character of metallic filament electric lamps for indoor illumination and of flame arc lamps for public lighting. Nearly all the speakers, the majority of whom were connected with the electrical industry, concerned themselves mainly with explaining by what means the effects of the glare due to metallic filament lamps could be avoided in interiors lighted by them. The intrinsic brilliancy of filaments was said by Mr. Trotter to be practically less than it really is, because the effect of irradiation makes the filaments appear greatly enlarged. This explanation (which is, of course, applicable to all sources of light of high intrinsic brilliancy) does not, however, lessen by one whit the objectionable effect of glare which metallic filament lamps produce. Mr. W. M. Mordey, a former President of the Institution of Electrical Engineers, declared that one could not rest one's eyes in a hall illuminated with metallic filament lamps such as that in which the meeting was held. He went on to say that the "whip-lash" of these bright lights irritated the nerves, and the Institution of Electrical Engineers had come to the conclusion that this "terrible whip-lash" on the eyes of exposed lights must be avoided at all costs in the new theatre of the Institution. This in itself is an authoritative yet, to the electrical industry, humiliating confession of the absolute failure of metallic filament lamps to satisfy the requirements not merely of the general public, but even of eminent electricians in regard to comfortable conditions of lighting.

Other members of the Society devoted their efforts to describing shades and screens by which the objectionable glare from metallic filament lamps could be curtailed or avoided. Others again referred to the glare from flame arc lamps

placed outside shop windows. Yet other speakers spoke of the indirect lighting of interiors as eminently desirable, but as too costly. Undoubtedly it is costly if electric lamps are used; for it is only by relying on direct illumination of the objects immediately required to be lighted, that electric lamps for indoor use become reasonably practicable on the score of expense. Anything like general illumination of a room to a sufficient extent to make nearness to the source of light unnecessary for reading or work in general, is an extremely costly matter when electricity is the illuminant employed. Hence the avoidance of glare is a matter that causes considerable worry at the present time to the electrical engineer. To some extent, his difficulty is to utilize to the full the illuminating power of the metallic filament lamp while preventing the clear glass bulbs, which are consequently essential, intensifying the effect of glare from the filament. A great deal may be done to avoid glare from metallic filament lamps if matt bulbs or prismatic shades are used, but these necessarily involve a sacrifice of a large proportion of the light emitted by the filament, and the same degree of illumination consequently becomes relatively and absolutely costly.

Gas lighting has great advantage over the higher-power electric lamps in that the intrinsic brilliancy of the source is less, while the cost of the light is so low that a large proportion may be sacrificed, in order to secure diffuse or indirect illumination without the expense of the lighting becoming prohibitive. Mr. Trotter's contention, that the filament of an electric lamp must not be taken at its actual dimensions for computing the intrinsic brilliancy of the light, may be equally applied to incandescent gas mantles, because the effect of irradiation likewise renders the latter (when incandescent) apparently much larger than they are. The apparent surface area of an incandescent bijou inverted mantle is many times greater than the real surface area of the mantle itself. No one, however, for ordinary uses, thinks of viewing an incandescent mantle through clear glass, except in quite exceptional circumstances. Some form of frosted, opal, prismatic, coloured, or matt-surfaced globe or screen is almost invariably used; and the effects of diffused or indirect lighting are thus obtained at the sacrifice of a small proportion of the illuminating power of the light. Owing to the cheapness of lighting by means of gas, this is a sacrifice which even the poorest can well afford to make in order to avoid the effects of glare. Even a naked gas mantle does not, however, produce the "terrible whip-lash" glare of the exposed metallic filament electric lamp to which Mr. Mordey so frankly referred.

### The Largest Gas-Supply Districts.

Speaking in reply to a vote of thanks at the meeting of the Croydon Gas Company on Friday last, Mr. James W. Helps, the Engineer and General Manager, claimed that, with the Company's area of 78 square miles, they had the largest gas-supply district of any Company in the country, excepting perhaps the Gaslight and Coke Company since the annexation of the West Ham Company's territory. Prior to this event on Jan. 1 last, the Gaslight Company's area of supply covered 62 square miles. Such immense areas represent a great deal of work; and there is little time to which the descriptive term "leisure" can be applied for the distribution staffs of the Companies. The members of such staffs have to be constantly on the alert, and here, there, and everywhere.

### Practice and Principle.

The difficulty of compiling figures regarding the success, or otherwise, of municipal trading, in such a manner that they may be strictly comparable one with another under the various circumstances that attach to different cases and places, has long been recognized as an obstacle to the satisfactory treatment of the question from a statistical standpoint; and, speaking for ourselves, recognition of the existence of this drawback is not by any means weakened by a dip into the bulky series of Blue-Books on Municipal Trading which have for some months past been making their appearance in solemn procession. One more of these volumes (which it will be remembered were called for by the House of Commons at the instance of Mr. Chiozza Money, who has now, we are glad to say, ceased to be a member of that assembly) was published last week; and its real usefulness, and that of its predecessors, towards solving the vexed problems that surround present-day local government finance, is not strikingly apparent. At any rate,



it seems impossible that it can be proportionate to the outlay that must have been incurred in the preparation of the statistics. On the general subject of the comparison of results of municipal and private trading, Mr. Douglas Knoop, who lately read a paper before the Manchester Economic Society, expresses the opinion that the statistical arguments commonly advanced to show the advantage of the one form of management over the other, are without value; so that he also has evidently felt the difficulty just referred to. In his paper, he discussed four methods of comparison: (1) Taking a particular plant and comparing the charges made before and after municipalization and the benefits otherwise afforded, such as contributions to the relief of the rates and conditions of employment; (2) comparing different plants under municipal and private management; (3) comparing the average results of all municipal and all private undertakings of particular kinds in the country; and (4) making international comparisons between countries where there is much and where there is little municipal trading. He clearly showed how many factors might be present to render valueless any calculations based on the first three methods of procedure; while as to the fourth, he remarked that international comparisons—which in practice become comparisons between the United Kingdom and the United States—are even less trustworthy. Under these circumstances, Mr. Knoop's conclusion is that there seems to be nothing for it but to abandon these statistical arguments, and to determine municipal or private ownership as a question of principle. But who shall decide the question of principle—on which differences of opinion arise, as they do on other matters? Mr. Knoop would not appear to have made any effort to do so. Possibly, however, he is reserving this aspect of municipal trading for consideration on some future occasion.

#### Local Government Finance.

There has now appeared the last of the eight Blue-Books into which the Local Taxation statistics for the year 1906-7 are divided; and, as is customary, it consists of a summary and an index. Incidentally, opportunity is taken to draw attention to the vast amount of labour that is required in the systematic arrangement and tabulation of the financial transactions of the 25,502 local authorities whose accounts are dealt with. Very few of the returns from which the particulars are compiled can be obtained from the authorities immediately after the conclusion of the financial year to which they relate, as they have to be audited, which takes time. Most of the authorities have their accounts audited by the District Auditors; but where this is not the case, the labour involved in the preparation of the statistics for the Blue-Books is increased, in consequence of the different methods of account-keeping adopted by various authorities. In order that accuracy may be ensured in regard to the figures, all the returns are carefully examined in the office of the Local Government Board; and considerable correspondence takes place with reference to apparent errors, or points on which further information is required. Some notice of the figures relating to the year 1906-7 will be taken in an early issue of the "JOURNAL;" but meanwhile it may be remarked that, in addition to particulars relating to that year, the Blue-Book contains the usual comparative statistics which furnish an interesting indication of what has been the financial tendency during recent years.

#### Some Comparisons.

In the period which has elapsed between 1899-1900 and 1906-7, the outstanding loans have gone up from £293,864,224 to £494,487,512—the latter figure, however, including no less a sum than £47,407,029 on account of the Metropolitan Water Board. The amount provided during 1906-7 (otherwise than out of borrowed moneys) for the repayment of loans was about £12,500,000, or equivalent to something like a one-thirty-ninth part of the total amount of loans outstanding at the commencement of the year. During the twelve months, the loans outstanding increased by £11,500,000, which is smaller than any annual increase that took place between 1897-8 and 1906-7. In fact, the £20,393,901 raised in that year was some £4,000,000 less than the figure for 1905-6; and the decrease affected most of the more important classes of work for which local authorities borrow. A falling-off of £1,168,184 is shown under the head of highways and street improvements, and £1,027,196 for electric light undertakings. Of the total outstanding, over 50 per cent,

is on account of revenue earning departments. Including the Metropolitan Water Board, the average sum per pound of rateable value of loans outstanding has increased from £1 13s. 6d. in 1899-1900 to £2 7s. 9d. in 1906-7; and per head of the population, from £9 4s. 4d. to £14 16s. 3d. The average amount per pound of valuation of public rates raised has gone up from 4s. 11½d. to 6s. 1½d.; and per head of the population, from £1 5s. 7d. to £1 14s. 6d. In the same period, the total amount received from rates has risen from £40,734,219 to £59,557,199. While in the same seven years the amount of the outstanding loans on gas-works has gone up from £19,819,301 to £23,550,765, that for electric light undertakings has grown from £7,853,061 to £28,218,444. The receipts from gas-works have in the same period increased from £6,035,526 to £7,150,028; those from electric light undertakings, from £910,329 to £3,094,989; and those from water-works, from £3,730,219 to £4,615,664. The total receipts have gone up from £77,202,175 to £117,898,553. In 1899, the rateable value of property assessed to local rates was £175,622,758; and in 1906 this figure had increased to £207,067,675. The growth of the last two groups of figures, it will be noticed, is not in the same proportion as the increase in the outstanding loans.

#### PERSONAL.

This year's President of the Dutch Gas Association is Heer J. VAN ROSSUM DU CHATTELL, of the Haarlemmerweg Gas-Works, Amsterdam; and the Secretary, Heer N. W. VAN DOESBURGH, of Leyden.

At the recent half-yearly meeting of the Aldershot Gas, Water, and District Lighting Company (noticed elsewhere), Mr. A. F. WILSON, the Chairman, announced his intention of relinquishing this position, after occupying it for twenty-eight years. He will, however, remain a member of the Board. He gave as a reason for his resignation his age and the affairs with which he is connected elsewhere. He thanked the shareholders for the uniform courtesy they had shown him, and for the support they had always given him. He said that during the whole of the time he had been Chairman he did not recollect any acrimonious speech at their meetings.

At a meeting of the Becoles Gaslight and Coke Company last Tuesday, to consider the filling up of the vacancy caused by the resignation of the Engineer and Manager, Mr. CLAUDE CLARENCE CARPENTER was appointed to the position, from among 97 applicants. Mr. Carpenter is a son of Mr. W. J. Carpenter, Assoc. M.Inst.C.E., Engineer and Manager of the Great Yarmouth Gas Company, whose works he entered, on leaving school, as a pupil under his father. He has for some time past been engaged as Assistant-Engineer there. Mr. Carpenter was educated at Yarmouth, and followed up his scholastic studies with a course of instruction at the Corporation Technical Schools.

The last issue of our contemporary, "Il Gaz," reports that Sig. Comm. Ing. POUCHAIN is retiring from the Anglo-Romano Gas Company after the long period of over forty years spent in their service. At first he held some subordinate positions in gas-works at Paris and Lyons, but afterwards went to Naples, where his father was then the Manager of the gas-works. Leaving there, he was appointed Engineer at Rome, and has raised himself to the high position he has so long honourably occupied at the head of the gas undertaking there. We understand his experience will still be at the disposal of the Anglo-Romano Company; for Sig. Pouchain will remain as consulting technical adviser. His place as Managing-Director will be taken by Sig. Ing. MARCELLO DE JONG, a native of Holland, who has proved himself an able Assistant-Manager of the Rome Gas-Works since July, 1908.

#### OBITUARY.

We regret to learn that Mr. SAMUEL J. ACLAND, the eldest son of Mr. Thomas Acland, died at Newport last Saturday. The deceased gentleman was 34 years of age.

We are sorry to announce the death of Mr. EDMUND LORD, Manager to the Whitworth Vale Gas Company, which took place on the 16th inst. Mr. Lord, who was in his 64th year, had a serious illness two years ago, from which he never thoroughly recovered. It was in 1864 that he entered the service of the Whitworth Vale Gas Company; and after a period of six years spent in the office, he was appointed to the position of Manager, in succession to Mr. Charles Lord. He was the oldest member, as well as Hon. Treasurer, of the Keystone Lodge of Freemasons, Whitworth; and his quiet and unassuming disposition made him many friends in the craft, and in the gas profession. To the widow and two sons have come numerous letters expressing sympathy with them in their bereavement. The interment took place on Saturday, at the Whitworth Parish Churchyard.



## THE CASE FOR THE STANDARD BURNER BILL.

[COMMUNICATED—CONTINUED FROM PAGE 416.]

ALL the grounds of objection which, so far as is known publicly at present, have been raised to the provisions of this Bill, have been discussed in the earlier instalments of this article; and it has been shown that none of them is capable of being maintained in the face of the evidence the promoting Companies should be in a position to call. Whether, in the event of the opposition to the Bill being pursued as far as the Parliamentary Committee Rooms, the evidence given for the Gas Companies will in fact be covered by the arguments adduced in this article in favour of the Bill is, of course, improbable, as the author has presented merely his own opinions. He has not had the advantage of conferring with the promoters of the Bill, or otherwise gaining any direct information as to their case. Granting that there is wisdom in a multitude of counsellors, it is certain that the promoters will be able to present a much stronger case for the Bill than that which an unaided individual has outlined in this communication. Yet, even without the additional arguments and evidence in favour of the Bill which the many highly experienced and trained engineers and experts connected with the promoting Gas Companies will undoubtedly adduce, it must be evident that the case for the Bill, as here presented, is extremely strong. This will be perhaps more readily apparent from the following summary of the conclusions drawn in the previous instalments of this article.

The Bill provides that the standard burner for use in the statutory testings of the illuminating power of the gas supplied by the promoting Companies shall be the "Metropolitan" argand burner No. 2. The author has learnt, from information supplied to the Editor of the "JOURNAL," that the standard burners prescribed at present are: For 43 of the undertakings represented by the promoting Companies, Sugg's "London" argand No. 1; for four of the undertakings, an argand with 15 holes and a 7-inch chimney; for one undertaking, the "Wandsworth" argand; and for another undertaking, a batwing or fishtail burner consuming 5 cubic feet of gas per hour. Excluding the last-named case (Liverpool), where, owing to the richness of the gas supplied, the early argands were impracticable for use, no justification can be found for the want of uniformity here displayed in the type of burner prescribed. It cannot be confidently alleged that Parliament prescribed one burner for (e.g.) Brentford and another for (e.g.) Croydon, in order that the definition of gas of a stated illuminating power might be different in the two places. The particular burner prescribed in each case was a mere accident of the date of the Act or Order when the prescription was made. The intention of Parliament throughout has clearly been to confer on all companies the right to have the illuminating power of their gas tested through the burner which is most suitable for obtaining from the gas the greatest amount of light. This intention has been explicitly stated in the Acts of 1868, 1869, and 1905 relating to the Metropolitan Gas Companies, and it was undoubtedly believed at the time of its prescription that the prescribed burner for each of the 49 undertakings of the promoting Companies fulfilled this intention in regard to them also. Now that it is known that the prescribed burner no longer fulfils this intention, the Companies are appealing to Parliament to revise the prescription, and so bring it in line with the principle established in the Acts named above, and adopted directly or indirectly in other Acts and Orders—viz., that the burner used in testings of the illuminating power shall be that most suitable for obtaining from the gas the greatest amount of light. According to present knowledge, that burner is the "Metropolitan" argand burner No. 2.

The use of the burner which is most suitable for obtaining from the gas the greatest amount of light has hitherto been granted by Parliament as a right of the gas undertakings concerned; and no reduction of the standard price chargeable for gas has been imposed on the companies, which from time to time have been granted the use of such a burner, by way of compensation for any benefit that might accrue to them therefrom. The London Gas Act, 1905, which explicitly restored to the Metropolitan Gas Companies the right (which had stood in abeyance for a number of years owing to the misconception that finality in the construction of argand burners had been reached with the "London" argand No. 1) to the testing of illuminating power with the burner most suitable for obtaining from the gas the greatest amount of light, made no alteration in either the standard price or the prescribed illuminating power of the gas of these Companies. Parliament cannot reasonably be asked, in granting the same right to a number of relatively small Provincial Gas Companies, to exact from them compensation in any form, when it exacted none at all from the large Metropolitan Companies.

The whole of the grounds of opposition to the Bill are really disposed of by this one consideration. The promoting Companies are asking for no more than Parliament has already granted unconditionally to the Metropolitan and a number of other gas undertakings; and gas legislation for the Metropolis has hitherto always been much more stringent in regard to conditions of testing than gas legislation for provincial centres. If, however, other justification is asked for the prescription of the "Metropolitan" argand burner No. 2 as the standard burner for testing the illuminating power of the gas supplied by the promoting Companies, it may be found in the fact that the illuminating power thereby ascertained varies, as the quality of the gas rises and falls, strictly

in correspondence with the light obtainable from the gas in flat flame burners. The testing burners now prescribed for the promoting Companies do not give results which similarly rise and fall in correspondence with the light afforded by flat-flame burners. Since the object of maintaining testings of illuminating power must be mainly, if not wholly, the protection of consumers who continue to use flat-flame burners, the adoption of the "Metropolitan" argand burner No. 2 is justified on its merits from the standpoint of the consumer.

There is no justification for the suggested imposition of a standard of calorific power at the present juncture. A standard of calorific power has so far been applied to only one Gas Company—viz., the Gaslight and Coke Company. This Company agreed to the prescription of a standard of calorific power in consideration of the obtaining of certain concessions. It had secured the prescription of the "Metropolitan" argand burner No. 2 for the testing of the illuminating power of its gas four years prior to the prescription of the standard of calorific power. The two prescriptions were therefore absolutely independent; and the promoting Companies have a right to expect that, in their case also, the prescription of the "Metropolitan" argand burner shall be considered quite apart from any proposal for the imposition of a standard of calorific power. Such a proposal, if raised at all, should be embodied in another Bill or other Bills. If and when it is raised, the promoting Companies will reasonably ask for a probationary period of at least four years duration, during which testings of calorific power may be made "for information only." After the lapse of this period, they and the local authorities will be in a position to judge what is a reasonable standard of calorific power for the particular case. It would be monstrously unfair to expect any of the promoting Companies to work to a standard of calorific power without having had the advantage of a preliminary course of "information" testings extending over at least as long a period as the four years which was allowed therefore to the Gaslight and Coke Company, with its unique facilities and organization.

It has further been shown that the imposition of a standard of calorific power is unnecessary for the protection of the consumer at the present time, since no appreciable reduction in the calorific power of the gas supplied can occur until there is a considerable reduction in the prescribed illuminating power. The promoting Companies are not in this Bill providing for any reduction in the prescribed illuminating power. Thus, both on precedent and on merits, there is no case on the present Bill for the prescription of a standard of calorific power for any of the Companies.

The other grounds of objection to the Bill are not of sufficient importance to call for further notice. Broadly, the provisions of the Bill are such as Parliament has already embodied in many Gas Acts merely as a measure of justice to the gas undertakings concerned. The promoting Companies expect to receive similar meed of justice from Parliament. The local authorities which are arranging to oppose the Bill should bear in mind that in doing so they will be attempting to perpetuate an inadvertent act of injustice to the Companies, whose interests are closely identified with those of a very large number of the citizens and ratepayers represented by the various local authorities. If it could be demonstrated that the provisions of the Bill will afford any gain to the Companies, it would have to be remembered at the same time that all, or nearly all, the gain would be passed on to the consumers of gas. The provisions of existing Acts and Orders which are untouched by the present Bill establish and ensure this community of interests as between gas companies and gas consumers.

## Vertical Gas-Retort Proposals for Rochdale.

The Sub-Committee of the Rochdale Corporation Gas Committee who, along with Mr. T. B. Ball, the Gas Manager, have visited recently several places where vertical retorts are in use, presented their report to the General Committee last Wednesday. The Sub-Committee have seen the Glover-West vertical retorts operating at the St. Helens Gas-Works, the Vertical Gas-Retort Syndicate's installation at Sunderland, and Messrs. Woodall and Duckham's retorts in London. They now recommended that Messrs. Glover and West, Messrs. Woodall and Duckham, and the Vertical Gas-Retort Syndicate be invited to send in tenders for an installation capable of carbonizing 100 tons of coal per 24 hours. This recommendation was agreed to by the General Committee; the Sub-Committee being authorized to receive and examine such tenders when sent in. It will be remembered that the Rochdale Gas Committee in December last approved of plans for extensions at the works prepared by Mr. Ball; the proposals including one for the rebuilding of the old retort-house, and the introduction of vertical retorts. The extensions are estimated to cost about £25,500.

The third monthly meeting of the Commercial Section of the Southern District Association was held last Thursday at No. 39, Victoria Street, S.W.—Mr. W. E. Price, of Hampton Wick, in the chair. A discussion on hiring and hire-purchase occupied the greater part of the proceedings.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 524.)

BUSINESS last week in the more speculative quarters of the Stock Exchange—Rubbers, for instance—was most brisk; the public being in a very catchable humour. But taking departments all round (both lively and sedate), the volume of activity was not great, and at times things fell quite quiet. Towards the close, owing to the extreme difficulty in making any forecast of the political cat's jump, the tendency was rather to lie low and do nothing. However, the opening day was pretty bright. The chief markets were firm; and Rails advanced on more peaceful coal prospects. Tuesday was a quieter day; but the favourable tendency was maintained. Wednesday was more active, and the tone was distinctly good. Consols met with support; and several Railway issues were higher. The Foreign Market was generally strong. Business fell back quieter on Thursday; but the firm attitude was maintained. The gilt-edged division profited by cheap money; the other leading lines were firm. On Friday, there was a change; the obscurity of the political horizon was oppressing, and there was reluctance to launch out in the dark. Dullness and some flattening of prices was the mark pretty well all round. Saturday was much the same. Caution was the order of the day; and business was restricted and dull. The Money Market was very easy throughout; and the week closed without any sign of a change. Business in the Gas Market was unusually brisk and active, and quotations were full of strength. More conspicuous even than usual was Gaslight and Coke ordinary, which had quite a busy week. On Monday, it changed hands at 103 $\frac{3}{4}$ , from which point it rose steadily to 105 $\frac{1}{4}$ —the quotation being 1 up. In the secured issues, the maximum marked 88 to 88 $\frac{1}{2}$ , the preference from 103 special to 104 $\frac{3}{4}$  (a rise of 1), and the debenture 82 $\frac{1}{2}$ . South Metropolitan was quiet and unchanged. Transactions ranged from 119 $\frac{3}{4}$  to 121; and the debenture marked 82 $\frac{1}{2}$ . Little was done in Commercials—one deal in the 3 $\frac{1}{2}$  per cent. at 105, and one in the debenture at 81. Among the Suburban and Provincial group, Brentford old changed hands at 258; but nothing else in the London list was touched—a record of inactivity. In the Provincial Exchanges, Chester fetched 110, Liverpool "B" 167 and 168, and the three Sheffield 234 apiece. In the Continental companies, Imperial was only moderately dealt in at from 175 to 176 $\frac{1}{2}$ , ditto debenture marked 91 $\frac{1}{4}$  and 93, Union 97, ditto preference 138 $\frac{1}{4}$  and 138 $\frac{3}{4}$ , and European part-paid 18 $\frac{1}{2}$  and 18 $\frac{3}{4}$ . Among undertakings of the remoter world, the most noteworthy feature was the further advance in the quotations of the three amalgamating Companies in Buenos Ayres, coupled with considerable activity in the shares of one of them. The result is that they now figure at prices rather dearer than those of several choice home companies. Buenos Ayres was done at 14 $\frac{1}{2}$  (a rise of  $\frac{1}{2}$ ), Primitiva at from 7 $\frac{3}{4}$  to 7 $\frac{3}{4}$  (a rise of  $\frac{3}{4}$ ), ditto preference at from 5 $\frac{3}{4}$  to 5 $\frac{9}{16}$  (a rise of  $\frac{1}{16}$ ), ditto debenture at 99, and River Plate at 17 $\frac{1}{2}$  (a rise of  $\frac{1}{4}$ ). Other dealings were in Monte Video at 12 $\frac{3}{4}$ , and in South African at 12 $\frac{3}{4}$ .

## ELECTRICITY SUPPLY MEMORANDA.

**The Imperfections of Cooking and Heating Appliances—An Unattractive Cooking Outfit—Lighting Consumers and the Power Load—Metallic Filament Prices—The Odd-Job Man—Defective Installations Passed by Supply Authorities.**

IN the past, there have been many unfounded claims as to electrical appliances for cooking and heating having reached a practical and efficient stage. It happens that experience has not been altogether consistent with statement; and those who have been honest enough to say so, if ranked among the competitors, have had hard things said about them for their trouble. Memories crowd upon us. But we are pleased to know that the unreliability of electrical appliances has become so notorious that the electrical papers now appear to be agreed that there is nothing to be gained by pretending that the position is otherwise. It is openly confessed that, both in respect of durability and perfection, electrical cooking and heating appliances leave much to be desired. The writer of "Installation Topics" in the "Electrical Times" upbraids manufacturers for their slowness in producing really practical apparatus. This is what is said: "Though electrical cooking and other heating apparatus has been on the market for a number of years, manufacturers in some cases do not seem yet to have designed these articles with a view to their use under everyday domestic conditions. Perhaps these makers never use their own goods, or surely they would find out, and eliminate, their weak points." The last remark has a particularly nasty smack about it. The "Electrician" is not so severe upon the manufacturers. It was, according to our contemporary, "in the early days, in spite of statements to the contrary, that much of the electric heating and cooking apparatus was unsuited for serious work." From which, it may be taken that we are expected to infer that the "unsuitable-for-serious-work" condition is now completely overcome—in fact, it is said later, "the unfortunate state of things has now been changed." But still any confidence these brave words may have stimulated is dissipated the succeeding week in our contemporary's "Industrial Supplement," in which it is read that "among the firms who have contributed their

quota to the advance of electric heating and cooking apparatus towards a state of perfection—a state, however, which still seems some way off—." We may stop there without attempting to consider the virtues of the goods of the firm who have contributed their quota to advance. But when statements such as those quoted here are made in the technical electrical press, we wonder of what use was that great torrent of words recently advocating greater activity in the matter of domestic electrification. If the cooking and heating appliances still contain so many defects, and are so far off perfection, then to palm them off on the unsuspecting householder as something worthy of his highest regard is to obtain business under false pretences. In the "Installation Notes" already referred to, a column of criticism is written, most of it calling attention to defects in the apparatus. Even so, the indictment is incomplete, inasmuch as "much more might be written on the question of weak points in the design of cooking and heating apparatus. But enough has been said to indicate that makers might do worse than overhaul their existing patterns, and carry out such improvements as are needful to make them thoroughly sound commercial articles."

Some time ago we noticed the "Tricity" cooking outfit, which, on being introduced to notice, was, in the customary manner, promptly placed by our contemporaries among the goods that promised to work marvels. Then the price of the output was so reasonable that nobody would be without one. But alas! the inflated hopes of the time were, like bubbles from a clay pipe, destined to speedy collapse. It is acknowledged now that hitherto the price of the apparatus has placed it beyond the reach of the majority of users [*sic*]. They are not "users" if they have not got the apparatus. But the term was, of course, a *lapsus calami* on the part of the contemporary whose reference to the subject is now before us. The point of this reference is that the makers have decided to offer the complete "Tricity" outfit, comprising the cooker itself, and some eighteen utensils—including ovens (plural), grill, saucepans, and kettles—for £7 15s. This is a long price; but still it is less than half the former price. And at £7 15s. it is "probably the cheapest electric cooking outfit on the market." Besides the old price which prevented the adoption of the "Tricity" outfit by the million, there was it seems, another objection. It had grave limitations. It could do almost anything except roast meat or bake pastry. It could boil, stew, fry and grill, heat flat irons, and air clothes, but it was unequal to those two great essentials—the roasting of meat and the baking of pastry. This shortcoming has now been met by the introduction of an oven, which fits over the hot-plate, and which has a capacity of about a cubic foot, which is large enough to take a 6-lb. joint, puddings (plural), or pastry. Provided the hot-plate is already warm when the oven is placed on top, a temperature of 300° to 400° Fahr., it is stated, can be obtained in about six minutes—the rate of consumption of electricity being less than a unit. Those are the statements. This necessary adjunct to the "Tricity" outfit is listed at £1. When it is found that householders still look askance at the price of £7 15s., and continue to pass by to the side of the gas competitors, we take it it will then become a question as to whether it will be worth while making the outfit, as we read that the price now named can "only prove remunerative if the cooker is supplied in large numbers."

The "Electrician" has been writing in justification of a lower price per unit for power than for lighting business. Justification is not required for a reasonable difference; but electrical undertakings have dug such an absurdly big gulf between the prices for lighting and power, that justification is completely lost in it. All, or the greater part of, the economies produced in connection with an electricity undertaking have been swallowed up in trying to develop the power consumption; and it is not denied that the lighting consumer, generally speaking, in respect of price, has received little consideration. But lighting consumers are asked to believe that they ought to find their reward in the greater efficiency of the lamps they use, and to feel benevolently inclined towards the power consumer who more than absorbs all the economies effected—very largely through the patronage of lighting consumers as a whole. And why? Because cheap current is said to attract business to towns. This is all very well; but it is not such a tangible reward to the individual consumer as a reduced price for the commodity he purchases. It must be remembered that there are many undertakings that could not exist without the lighting consumers, but which could exist without the power consumers. The whole argument is surrounded by limitations. There is a limit to business and industrial occupation requiring power; the law of demand attends to that. This being so, cheap current cannot be expected to be magnetic in all towns; and, as a matter of fact, there are few that are favoured according to their deserts as measured by the fine fractional prices charged for current. "Ultimately, the undertaking, when it has obtained a very large power load, is able to supply other consumers at a much lower price." For many towns, the "ultimately" and the "very large" may refer to ages to come, and so therefore may the "much lower price." Apart from the considerations mentioned, however, proceeds our contemporary, "there is no doubt that lighting consumers are, as a rule, not penalized by this policy; and, in fact, they may obtain considerable benefit from the improved load-factor, and reduced cost of generation resulting from the additional load." The use of the word "may" indicates that the "considerable benefit" is extremely problematical. And, indeed, it is difficult to trace in the majority



of towns—and the majority are those with a restricted power demand—that the lighting consumer derives any benefit whatever from the power “load;” steadfast prices indicating rather the reverse. To cite the industrial district of West Ham in support of our contemporary’s argument, is about on a par with quoting Newmarket as an instance giving support to the adoption by other towns of a racecourse. One case is insufficient to constitute a commercial principle; it may merely be the exception to a salutary rule.

According to the “Electrical Review,” a break-up of the prices of metallic filament lamps has just commenced in Germany. There must be a limit to the breaking-up of prices in view of the expense of constructing the lamps, as, if the process is carried too far, there will not be (as has been found in other branches of electrical enterprise) much profit left for the makers. The present downward move of prices, it appears, was started, through the action of the Deutsche Gasglühlicht (Auer) Gesellschaft, in putting forward a scheme to increase the share capital of the undertaking from £650,000 to £1,300,000 for the purpose of developing the incandescent gas mantle departments, in consequence of the prevalence of stronger competition in this particular line of production. Although there was hostility to this scheme of capital duplication powerful enough to cause the Directors to withdraw it, the proposition shows that they, at all events, see a good prospect for the further development of the incandescent mantle business—the opulent success of which has drawn into it many substantial manufacturers. Simultaneously, the Company announced that the growing rivalry in the metallic-filament lamp trade (in which they claim to be the oldest makers) rendered it necessary for them to promote the bulk manufacture of Osram lamps, in view of the prospective reductions in prices. This they can do without raising further capital. However, war in the matter of prices has now seriously commenced in Germany, as it did in this country some months since.

The “Electrical Review” has solemnly averred that “the wire lamp has changed the whole illuminating practice very much in favour of the electric light instead of gas.” This is a categorical assertion on the part of our contemporary that has about as much justification behind it as the “long shots” that were witnessed in the general press recently respecting the probable reconstitution of the Cabinet. If the statement were true, why is it the Directors of the Deutsche Gasglühlicht Gesellschaft were so foolish as to propose such a large capital expenditure for the development of the incandescent mantle business? If true, whence comes the large increase of gas consumption that has been witnessed in Germany during recent years? If true, why the large capital expenditure that has been, and is being, witnessed in Germany on new gas-works plant? These are pertinent questions that require an answer from the daring writer. He further goes on to assert that in Germany the demand for metallic filament lamps is at present so large that all the factories are sufficiently provided with orders to find full employment. This, too, is rather a loose statement. “The demand” is not confined to Germany, but includes all those metallic filament lamps that are made in Germany, and are dumped into this and other countries. Still, as we read on, we see that the supply is likely to overtake the demand, inasmuch as “the probability of over-production will have to be reckoned with in the future.”

Recrimination has been running high of late between some of the electricity supply authorities and the contractors for wiring and fitting. The latter naturally want to keep the wiring and fittings business in their own hands; the former say that the latter are stumbling-blocks to the electricity supply business, partly through the antagonism of interests, and partly because the contractors have not the means or the power to develop the electricity business. Now the contractor blames the odd-job man and the supply authorities for much of the odium that has fallen upon the electricity industry; but we do not think the palatial establishments that have suffered from fire lately were wired by the odd-job man. The class of men who come under the reproachful designation are the plumber and the bell-hanger, who will take on any electrical installation work that people will entrust to him. Where the supply authorities come in in connection with this class of contractor—pardon! we should have written jobber—is in passing, in a most perfunctory manner, the installation work that they do. If all that Mr. E. H. Freeman says on this point in the “Electrical Review” is correct—and we have no reason to doubt him, in view of the illustration he furnishes—the supply authorities are guilty of gross negligence in their business. Mr. Freeman’s indictment is one that is not to be readily dismissed. He says that it is the casual and useless insulation test, and the entire absence of proper inspection of the installation on the part of the supply authorities, that makes it possible for these small odd-job men to go from job to job. “A regular refusal to connect up a defective installation would put an end to this class of contractor; and his continued existence is largely due to the deplorable laxity of the supply authorities.” As this matter is being considered, a vision of that mass of wiring rules and regulations bearing the imprimatur of the Institution of Electrical Engineers rises before our eyes; and the recently revised version of the rules and regulations of the Phoenix Fire Office also comes within view.

There is no gainsaying that Mr. Freeman proves his case when he can quote, as he does, ghastly examples of installation work that have been passed as satisfactory by some supply authorities, who, by their reprehensible carelessness, impose upon the public,

and give assurance of safety where the greatest danger actually exists. We ask pardon for quoting the examples without permission. They are most instructive. “(1) A 7/22 wire carrying 68 carbon lamps on one circuit without any fuses, and with eight or nine joints in less than 12 feet. (2) Unprotected wires run between floors without casing or tubing. (3) A pair of live wires cut off with pliers, and left unsealed and alive, with the copper quite exposed, and the two conductors not  $\frac{1}{2}$  inch apart. More than a dozen such ends were found in one house, and had been there for months at least. (4) Flexible cord run unprotected between floors; many points being thus wired. (5) Flexible cord run in casing and tubing, again to many points in one house. (6) A main switch, fuses, and meter fixed immediately over a large hot-water boiler, and within 3 feet of the top of it. (7) Sub-mains and other cables insulated with rubber tape only (exactly like bell wire), and then laid up with cotton yarn to look like ordinary cables—these on 240 volts connected to the mains of a supply authority with some of the most stringent rules existing—on paper. (8) Flexible cord buried in plaster without any protection whatever. (9) A combined gas and electric light fitting wired with flexible cord threaded in and out of unbushed holes in the brass tube of the fitting—this in a large City office rewired within the last three months.” On the very day on which Mr. Freeman was writing, he saw a 1-horse power motor on 400 volts with absolutely unprotected terminals; with the wiring run in unearthed tubing; and with the motor itself not earthed, and wiring to another 400-volt motor run in wooden casing almost entirely devoid of capping—all within 100 yards of Holborn Circus, and in a building which an insurance company’s inspector had visited within a few weeks. This kind of thing, he declares, is by no means uncommon. The indictment cannot be regarded as other than a serious one; and it may well be asked, In whom is the electricity consumer to place his trust in regard to the safety of his installation?

## AN AMERICAN TREATISE ON THE GAS-ENGINE.

THERE has lately reached us from the other side of the Atlantic a work dealing with the various types of internal combustion engines which may be recommended both from the practical and theoretical standpoint.\* The contents are of an extensive nature; the pages numbering no less than 447. So much of the information included in the volume is obviously inspired by personal observation that the value to the reader is thereby considerably enhanced. The author explains that while the illustrations are, with one or two exceptions, representative of American practice, the text is based on operating experience in Germany, Belgium, France, and England, in addition to his native country America.

It should be explained that the volume deals with both gas and oil engines, and from the student’s point of view it may be suggested that the descriptions of the two types of engines might have been more clearly separated. In some parts it is rather difficult to grasp to which type of motor the author is referring; and it is conceivable that this would appear confusing to the novice, especially as a certain amount of elementary knowledge is assumed.

Insufficient attention is given to the use of coal gas as a gas-engine fuel. This may possibly be accounted for by the fact that in America the manufacture of coal gas has not, with a few notable exceptions, been developed to the same extent as in this country. The price of coal gas is high, and, besides, the gas coals are not, generally speaking, so numerous nor so good as in England. It is a noteworthy fact that in towns—and a good many in England are included in this category—where gas for power purposes is sold at 1s. 6d. per 1000 cubic feet, or thereabouts, producer plants have made little or no progress.

The volume, which is composed of 21 chapters, is well indexed. The chapters are conveniently divided into sub-headings, all of which are descriptive of the contents, and are separately numbered. By this means, reference may be readily made to any particular subject.

Several of the chapters do not call for special comments beyond the statement that the subject-matter is throughout discussed in a decidedly practical manner. Chapter III., on “Ignition,” is complete and most instructive. The amount of information contained in this and the following chapter, on “Control of Power and Speed,” is a notable feature of the whole work, and will amply repay close study. The same remarks apply to two later chapters on “Starting and Adjusting the Motor” and “Theoretical Heat Cycles.” A great deal of useful information of a sort particularly suitable to the user is contained in the three chapters on “Troubles, Remedies, and Repairs,” “Lubrication of Motor,” and “Cleaning and Miscellaneous.” Several of the concluding chapters deal from the theoretical aspects with the gas-engine and the various fuels used therein.

The work under notice will well repay perusal, especially by those in charge of gas and oil engines. It is full of that practical information which is so necessary to proper and economical running, and which is so often unfortunately lacking in users of the gas-engine.

\* “The Gas-Engine.” By Professor Forrest R. Jones. New York: John Wiley and Sons. London: Chapman and Hall, Limited.



## WATER LEGISLATION FOR 1910.

IN preceding issues of the "JOURNAL" the principal features of the Gas Bills and Provisional Orders for the session just opened have been noticed. We to-day deal with the Bills relating to water supply; taking first the measures brought forward by Companies.

The Cambridge Water Company are applying for authority to construct new works in the rural district of Chesterton, in the county of Cambridge. They will consist of a reservoir on land in the vicinity of the existing reservoir at Cherryhinton, a pumping-station adjoining the present one there, two others, two adits, and two pipe-lines in connection therewith. Ten years are asked for the completion of these works. The Company wish for power to construct the necessary works for the purpose of sterilizing or otherwise treating the water taken by them, and supplying it to the owner or occupier of any house, or to any local authority or other consumer taking or requiring a supply from the Company. Additional capital to the amount of £180,000, including premiums, is applied for; but the Company will not raise by the issue of preference shares or stock a greater amount than £90,000. The new capital is to be sold by auction or tender, and the dividends are limited to 7 and 6 per cent. per annum on the two classes. Borrowing powers to the extent of one-third of the additional capital are required. It is proposed to alter, as from June 24, 1911, the rates for a supply of water for domestic purposes. Where the annual value of the premises supplied does not amount to £6, the rate is to be 8s. 8d. a year; above this the charges range from 7½ down to 6 per cent. per annum, according to the annual value. Authority will be sought to purchase or take on lease houses, cottages, and other buildings for persons in the Company's employ, as well as offices and other buildings for the purposes of the undertaking; and also to erect, maintain, and let any such building upon any lands for the time being belonging or leased to the Company. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Bill promoted by the East Grinstead Gas and Water Company is to obtain confirmation of the construction of their works at Hackenden, and authority to extend and improve them. These works consist of wells, an adit, and a pumping-station, situated partly in East Grinstead and partly in Lingfield, and two aqueducts or pipe-lines in connection therewith. The Company also require power to make new works, comprising a well and pumping-station in the parish of Forest Row, a service reservoir and a water-tower in the parish of East Grinstead, and three aqueducts or pipe-lines in connection therewith, to be completed in five years; also to acquire by agreement, from Mr. H. Hepburn Hastie, the well and water-works now in course of construction on the estate known as Place Land, and complete them for the purposes of the undertaking. The Company ask to be allowed to raise additional capital to the amount, including premiums, of £40,000, not more than £20,000 (nominal) of which is to be issued as preference capital; and the two stocks are to be entitled respectively to 7 and 6 per cent. per annum dividend. Power to borrow to the extent of one-fourth of the additional capital, as well as to create debenture stock, is required. The Bill contains provisions in regard to the protection of the Company's works and supply, and to the sale of water to or by outside parties. [*Parliamentary Agents: Messrs. Rees and Freres.*]

Authority is sought for the incorporation of a Company with power to acquire the undertaking of the Kingswood Water Company, Limited, which was established on July 9, 1908, for the purpose of supplying water within the parish of Kingswood, in the county of Surrey. The original capital was £15,000, in £10 shares; and 440 shares have been issued and are fully paid up. There is a debenture debt of £2000. The promoters of the Bill ask for authority to raise, in addition to the original capital, £5000 in ordinary or preference shares or stock, and to borrow to the extent of one-third. The new Company will acquire the existing works, comprising a well and pumping-station in the parish of Reigate and a pumping-station in the parish of Kingswood; and they ask for power to construct another station and reservoir, a water-tower, two rising mains, and two lines of pipes. These works are to be completed within two years from the passing of the Act. The rates for the supply of water for domestic purposes, including one closet, range from 11s. up to 5 per cent. per annum, according to the annual value of the premises; the minimum being 10s. The Company wish for authority to supply water in bulk and by measure; and the price in the latter case will not exceed 2s. 3d. per 1000 gallons. For every closet beyond the first the charge is to be a sum not exceeding 11s. 3d. per annum; and for every fixed bath, filled to the extent of not more than 50 gallons, 22s. 6d. per annum. The Bill contains a number of regulations for preventing the waste of water; and also a clause to enable the Company to sell their undertaking to any local authority whose district may be within their limits of supply. [*Parliamentary Agent: Mr. Herbert Deane.*]

The object of the Maltby and Tickhill Water Bill is to incorporate a Company for the supply of water in the parish of Maltby, the urban district of Tickhill, and certain adjacent parishes in the West Riding of York. The proposed capital is £25,000, in £5 shares; and authority is sought to borrow to the extent of one-third of the amount of capital raised at the time of borrowing, and also to create debenture stock. The limits of supply are, in addition to the above-named parish and urban district, the parishes

of Braithwell, Hooton, Levitt, and Stainton. It is proposed to construct a well and pumping-station in the parish of Maltby, a line of pipes connecting them with a water-tower, and another conveying the water to its destination. A period of five years is asked for the completion of these works. The rates proposed to be charged range from 8s. 8d. up to 5 per cent. per annum, according to the rateable value of the premises supplied, with an addition of a sum not exceeding 5s. for every closet beyond the first, and 7s. 6d. for every fixed bath holding not more than 50 gallons. The charge for water if supplied by measure is not to exceed 1s. 6d. per 1000 gallons, with a minimum payment not exceeding 10s. per quarter. Authority is sought to make bye-laws for the prevention of waste. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Pontypridd Water Company have promoted a Bill to obtain an extension by two years of the period limited by the Pontypridd Water-Works and Tramroad Act, 1908, for making a substantial commencement with the works connected with the construction of the Llia reservoir, and the purchase of lands for the purposes of the reservoir and other works authorized by the Act, except the tramroad and works authorized to be abandoned by the Act of last session. An extension for a period of seven years is, however, required for the completion of the reservoir and ancillary works. Parliament will also be asked to extend for two years, from Aug. 16, 1912, the powers granted to the Company by the Act just named for the compulsory acquisition of lands for the railway and other works thereby authorized, and for their completion. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Slough Water Company are applying for an extension of their limits of supply so as to include a portion of the parish of Fulmer, in the county of Buckingham. They wish to have the construction of their existing works confirmed, and require authority to lay pipes along any roads or streets adjoining or contiguous to the limits of supply, for the purpose of conveying water from one portion of the limits to another, and of supplying water within the limits. The Bill contains provisions in regard to the acquisition of lands, springs, and waters, the supply of fittings, the sale of water in bulk, and the application of the Company's capital for the purposes of the intended Act. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Southend Water Company are desirous of obtaining authority to extend their limits of supply so as to include the parish of Buttsbury, in the rural district of Chelmsford; but the provision in the Company's Act of 1879 as to the supply of part of premises is not to extend to that parish. Confirmation is sought for the construction of the existing works, and power to make others, consisting of fourteen pumping-stations, to be completed in fifteen years, is applied for. In addition to the lands which are now in the possession of the Company, or which they have the right to purchase, authority is required for the acquisition of others in the parishes of Downham and Wickford. Further capital not exceeding £200,000 is applied for, the dividend on which—whether issued as ordinary or preference—is limited to 5 per cent. The new capital is, of course, to be sold by auction or tender. Power to borrow to the extent of one-third of the additional capital is required, as well as to create debenture stock, also to be sold by auction. Other provisions in the Bill relate to the supply of water in bulk, the making of agreements with adjacent authorities, the sale or letting on hire of meters, &c. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Bill of the South Hants Water Company is to obtain confirmation of the construction of the existing works, and authority to make others and extend the limits of supply. The new works consist of two covered service reservoirs, one in the parish of West End, and the other in the parish of Hedge End, both in the rural district of South Stoneham, and five aqueducts or pipe-lines in connection therewith; and a period of seven years is required for their completion. The proposed extension of limits will, if sanctioned, bring portions of the parishes of Owslebury, Upham, and Minstead, in the rural districts of Winchester, Droxford, and New Forest respectively, within the Company's area. Permission is asked to raise additional capital not exceeding in the whole £120,000, in £10 shares, to be sold by auction or tender, and to be limited to a dividend of 5 per cent. per annum if issued as ordinary capital. Power is required to borrow to the extent of a fourth and to create debenture stock. [*Parliamentary Agents: Messrs. Bircham and Co.*]

The South Lincolnshire Water Bill is to authorize the extension of the limits of supply of the South Lincolnshire Water Company so as to include the parish of Holbeach, in the county of Lincoln. An agreement, dated June 19, 1906, and made between the Bourne Company and Alfred Robert Blanchett, on behalf of the South Lincolnshire Company, is to be annulled; and certain sections of the Company's Act of 1906, giving protection to the Bourne Council and the Bourne Water Company, are to be repealed. Authority is asked to increase the capital to £42,000, in £5 shares; and to have the borrowing powers granted by the Act of 1906 altered in proportion. The additional capital may be raised by ordinary or preference shares or stock; but it is not to bear more than a 6 per cent. preferred interest. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Staffordshire Potteries Water Company's Bill is to enable them to construct additional works, comprising a pumping-station in the parish of Eccleshall and another in the parish of Draycott-in-the-Moors, both in the county of Stafford, a service reservoir in the parish of Swynnerton, in the same county, and six aqueducts



or pipe-lines. Periods of seven and fifteen years are specified for the completion of these works. For those which have already been constructed, confirmation is sought. Additional capital to an amount not exceeding £180,000, to be issued as ordinary or as preference in £10 shares, is applied for. If the former, it is to be entitled to a dividend of 7 per cent. per annum; if the latter, to 6 per cent. Power to borrow to the extent of one-third is required; also to create debenture stock. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

Application is being made for the incorporation of the Thorne and District Water Company, with power to supply water in the parishes of Thorne, Hatfield, Stainforth, and Fishlake, in the West Riding of York, and in the parish of Crowle, in Lincolnshire. The capital is to be £25,000, in £5 shares; and authority is sought to borrow to the extent of one-third, as well as to issue debenture stock. It is proposed to construct a pumping-station and a water-tower, with a conduit connecting them, in the parish of Thorne; also a line of pipes commencing at the water-tower, and ending at a point in the Thorne-Marshland Road. Similar works are to be carried out in the parishes of Hatfield and Crowle; but in these cases the pipe-lines from the water-towers will end at places named in the Bill. Five years are required for the completion of the works. The rates to be charged for water range from a minimum of 8s. 8d. up to 5 per cent. per annum on the rateable value of the premises supplied, with an additional 5s. for each closet beyond the first, and 7s. 6d. for a 50-gallon fixed bath. The charge for water supplied by meter is not to exceed 1s. 6d. per 1000 gallons, with a minimum charge of 10s. per quarter. Other provisions in the Bill are of the usual character. [*Parliamentary Agents: Messrs. Baker and Co.*]

Another Company for which incorporation is sought is the Wells and Fakenham Water Company, who are applying for power to supply water in the urban district of Wells-next-the-Sea, and a number of parishes in the rural district of Walsingham, in the county of Norfolk. The capital is to be £18,000, in £5 shares; and borrowing powers to the amount of one-third are required, as well as authority to issue debenture stock. It is proposed to construct a well, pumping-station, and water-tower, with a line of pipes to connect them, in the parish of Sculthorpe, and also a conduit or pipe-line commencing at the tower and passing through Sculthorpe into the parish of Fakenham, terminating in the road leading from this place to Little Walsingham. These works are to be completed within three years from the passing of the Bill. The rates chargeable for water are to be the same as those in the Thorne Water Bill, with the usual extras for an additional closet and a fixed bath. The charge by meter is not to exceed 2s. per 1000 gallons, with a minimum of 10s. per quarter. The Bill contains the usual provisions in regard to the supply of water in bulk, the framing of bye-laws for the prevention of waste, &c. [*Parliamentary Agents: Messrs. Baker and Co.*]

The gas portion of the Whitland Water and Gas Bill has already been noticed in connection with the other Gas Bills of the session [*ante*, p. 88]. The limits of water supply are specified parishes in the counties of Carmarthen and Pembroke; and the works consist of two wells and intakes, a service-tank, and three conduits or pipe-lines, which are to be completed within five years. The rates are to be the same as those specified in the two Bills last noticed; the charge for water supplied by meter not to exceed 1s. 6d. per 1000 gallons, with a minimum of 10s. per quarter. The other provisions are much as usual. [*Parliamentary Agents: Messrs. Baker and Co.*]

### Experimental Lighting in the City of London.

At the meeting of the Court of Common Council last Thursday, Mr. Gunton, the Chairman of the Streets Committee, brought up a report on the reference to the Committee of the 21st of October last, to arrange for further experimental lighting in the City thoroughfares on the lines set out in the report on the recent inspection of various systems of public lighting on the Continent. They submitted an offer from the City of London Electric Lighting Company to make further experiments at a cost of about £525 per annum, and an offer from the Gaslight and Coke Company to carry out similar experiments at a cost of about £360 per annum; and they recommended that the Committee be authorized to arrange for such experiments in suitable thoroughfares. The report was adopted without discussion, and referred to the Committee to arrange accordingly.

**Manchester District Institution of Gas Engineers.**—The fortieth annual meeting of the Institution will be held in the Grand Hotel, Manchester, next Saturday. We learn from the programme issued by the Hon. Secretary (Mr. W. Whatmough, of Heywood) that the opening proceedings, comprising the passing of the annual report and accounts, the reception of the reports of the Commercial Sections, and the consideration of a proposed alteration of the rules, will be disposed of under the presidency of Mr. J. W. Morrison. At the conclusion of this business, he will induct his successor, Mr. H. Kendrick, of Stretford, who will deliver his Inaugural Address. There will subsequently be a discussion on Mr. Glover's paper in "Vertical Retorts at St. Helens," read at the autumn meeting last year, and given in the "JOURNAL" for Nov. 2 (p. 316), and in the brochure issued by Messrs. Glover and West, on "Continuous Carbonization," in connection therewith. At the close of the business "high tea" will be served; and afterwards the President will hold the usual reception.

## THE FLOW OF GAS THROUGH PIPES.

By F. S. CRIPPS, Assoc.M.Inst.C.E.

THE contribution by Mr. Chandler to the stock of information on the flow of gas in pipes, is singularly interesting and instructive. It draws attention to a fact of which many engineers have been long cognizant—viz., that Dr. Pole's formula is scarcely applicable to the flow of gas through very small pipes.

In the preface to the explanation of my four diagrams for determining the flow of gas through pipes (published in 1892), the following words occur:—

Barlow's tables—which are simply tabulated results derived from the application of Dr. Pole's well-known formula to several examples—are very limited in range, and are scarcely reliable for pipes of small diameter. With a view, therefore, to correcting inaccuracies, and displaying on a much more comprehensive scale the several problems relating to the passage of gas through pipes, I have prepared the present work and the accompanying diagrams.

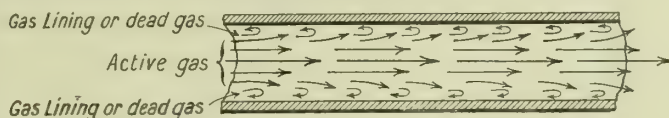
The results given by Diagram 1 accord with actual experiments, made expressly for this purpose; and it will be found the results differ greatly from those given by Barlow's tables. The Diagrams Nos. 2, 3, and 4 give results which exactly accord with Dr. Pole's formula.

Unfortunately, I cannot put my hands on the tabulated records of my experiments; but my impression is that the experiments were made with somewhat larger pipes than those given by Mr. Chandler—probably with  $\frac{3}{4}$ -inch or 1-inch pipes. For this reason, no doubt, the discharges given for small pipes in my diagrams are greater than Mr. Chandler's experiments seem to justify, although less than would be obtained from Dr. Pole's formula or Barlow's tables.

Again, I may say that my diagrams were more particularly applicable for proportioning mains than services; so that small-diameter pipes occupy but a small space on the diagrams.

It would be a great advantage if Mr. Chandler would extend his experiments to pipes of larger diameter. The skin resistance in small pipes has so much more influence over the passage of gas through them than in the case of large pipes, that it is almost impossible to reason from the one to the other. I do not propose to enter fully into the question; but the following—unscientifically expressed—observations may serve to emphasize this important factor in connection with the problem of flow of gas.

Gas, in passing through a pipe, rubs against the sides or circumference of the pipe, and, as it were, leaves a film of gas behind it—hugging the sides of a pipe, just as we may conceive water wets the inside of a pipe and paints it, as it were, with a film of water. The rougher the interior of a pipe, the thicker is this coat of paint, whether it be water paint or gas paint. The gas passing through the middle part of a pipe slips over this gas lining, somewhat after the manner of the waves on the seashore rolling over the lower strata of water, thus—



In other words, the velocity of the gas at the centre of a pipe is considerably greater than at the circumference of a pipe, as represented by the length of the arrows, due to the friction against the sides of a pipe.

Now it is obvious that in very small pipes the thickness of this coat of dead gas is relatively much greater than in large pipes; and therefore it leaves but the smallest space possible in the centre of the pipe for the active gas to pass through. Hence, after the rate, the quantity of gas which can be passed through a small pipe as compared with a large one, is very much less than might be anticipated.

As to the thickness of the coat of dead gas, there is no doubt it may vary slightly with the size of the pipe; and therefore it is most essential that experiments should be made with larger pipes than those adopted by Mr. Chandler, before basing any empirical formula upon his experiments as applicable to large pipes, and before throwing aside Dr. Pole's formula altogether.

I suggest that in compiling another formula, the diameter of the pipe should first be reduced by what may be termed the thickness of the coat of dead-gas lining in the pipe. The actual thickness to be allowed for this coat of dead gas to be determined by experiment, as it would vary for different sizes of pipes.

I need scarcely say that when I speak of a coat of "dead gas," I do not mean that it is actually dead and without any movement whatever, but that it moves with so much less velocity that it may, for all practicable purposes, be considered as dead, and in this way allow for the retarding effect on the passage of the main body of gas through the pipe.

It would be a convenience, when experiments are made, if the lengths were given in yards instead of feet, so as to correspond with tables hitherto published.

With respect to the discharge of gas through orifices, the tables I published in January, 1905, give lower discharges than Mr. Chandler's experiments; but it must be noted that my tables apply in that instance to the passage of gas through valves and similar gas apparatus—not simply to thin diaphragms, as in Mr. Chandler's experiments.



## DIRECT SULPHATE OF AMMONIA MANUFACTURE.

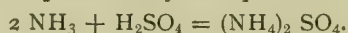
### NOTES OF SOME EXPERIMENTS AND THEORIES.

By G. STANLEY COOPER, B.Sc.

THE direct manufacture of sulphate of ammonia from ammoniacal or crude coal gas has been the subject of much experimental work and theorizing. Two principal methods are proposed for achieving this end—viz., (1) by simply leading the ammoniacal coal gas into strong sulphuric acid; and (2) by converting the ammonia first into ammonium sulphite and then oxidizing this to ammonium sulphate. It is with the first of these suggested processes that the present paper deals.

Many practical difficulties have been met with in devising processes for this direct manufacture; and the surest evidence that the difficulties have not been yet satisfactorily overcome lies in the fact that the process is at present confined to the experimental stage. Several patents have been taken out claiming to have achieved the direct manufacture of sulphate; but much more improvement will have to be effected before this method can be placed on a satisfactory commercial footing. Many problems have to be faced, and numerous complications arise during the operations.

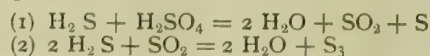
In the ordinary production of sulphate of ammonia, the reaction is one of simple neutralization of sulphuric acid by ammonia. This reaction is represented by the equation—



If the ammonia in crude coal gas was present merely as a constituent of a mixture of gases, it would render the process a straightforward one. Unfortunately, this is not the case; and many subsidiary points thereby arise, which are of especial importance in so much as they make or mar the success of the working.

The chief difficulty met with is the prevention of the deposition of tar in the mixing chamber, and so interfering with the purity of the sulphate. It is desirable, if possible, so to arrange the strength of the acid that the solid sulphate is formed; and hence no evaporation is necessary. This, of course, makes a considerable reduction in the working expenses of a plant. It is found that by simply passing the ammonia mixed with crude gas into concentrated sulphuric acid, more tar is deposited. But strong acid is necessary to bring about the deposition of solid sulphate. If the sulphate was contaminated with tar, recrystallization would be necessary, and no advantage be gained. With weak acid, the deposition of tar is very small; but at the same time no solid sulphate of ammonia is formed, and hence evaporation is necessary. Some process is required to prevent the deposition of the tar; and this can be attacked from two different points of view. In the first case, the tar might be removed before the gas is used for the manufacture; or, as an alternative, conditions might be so attained that the tar is carried on with the remaining gas. Superheating has been suggested to bring about the latter; and one of the patent processes referred to above claims to bring about the former.

There remains, however, another reaction which will have to be taken into consideration in any direct manufacturing process. It is commonly supposed that sulphuretted hydrogen gas has no action on sulphuric acid; but this is not the case. Sulphuretted hydrogen has a distinct action on the acid, with the ultimate production of free sulphur, which is deposited in the containing vessel. Sulphuretted hydrogen is a reducing gas; and as such it acts on the strong acid and forms sulphur dioxide and free sulphur. Then there is a further interaction between the sulphuretted hydrogen and the sulphur dioxide, with production of more sulphur. The reactions which take place are represented by the following equations:—



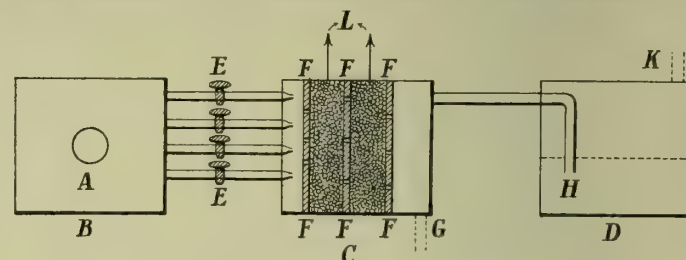
Hence if sulphuretted hydrogen be present in any quantity in the gas which is led into the acid, some sulphur will be deposited and the sulphate contaminated. Sulphuretted hydrogen is, to some extent, soluble in water or dilute acid; but it cannot be removed in this way owing to the solubility of the ammonia in water. It would seem desirable, therefore, in any direct process to remove the sulphuretted hydrogen as well as the tar.

The latter substance can be entirely removed from the coal gas by a thorough condensation; but the necessity of having no water present makes this method difficult. What is wanted then is a reliable dry condensation process, without unreasonable enlargement of the apparatus. A method which might eventually meet with some commercial application was suggested to the writer by the following observation. It was necessary on one occasion to test for ammonia the gas near the condenser inlet; and a tube with a fine bore was connected to the tap. The gas, which issued in a fine stream, was directed against a filter-paper; and it was noticed that there was a distinct deposition of tar on the paper—much more so, indeed, than was ordinarily observed. It was decided to attempt to apply this principle of condensation for the removal of tar in connection with experiments already in hand, dealing with the direct manufacture of sulphate of ammonia.

It is a well-known fact that all gases are capable of undergoing great compression. It is also a fact (but one which is far less

widely known) that if a highly compressed gas be allowed to expand suddenly, a considerable cooling effect is produced. This, of course, is because the compressed gas, on expanding, performs a large amount of work; and the energy necessary for this work is supplied by the abstraction of heat from the gas itself. By a proper regulation of pressures, it is possible to bring about great cooling of a gas. This cooling would help considerably in the condensation of the surplus tar. The tar is supposed to exist in the gas as minute bubbles; and these must be burst before the tar can be completely condensed and separated from the enclosed gas. By causing the gas at a high pressure to impinge on some sort of screen, the tar bubbles are burst; and the gas passes on while the tar is deposited. At the same time, the sudden decrease in pressure brings about some lowering in the temperature of the gas; and this in itself aids the process of condensation. If the tar is removed in this way, the remaining gas can be led into the acid chamber or saturator, and strong acid can be used without fear of contamination of the resulting solid sulphate.

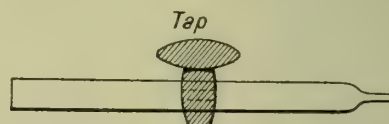
In the writer's experiments, the form of apparatus used is shown in the accompanying sketch. The essential parts are: A fan or exhauster to attain a fairly high pressure; a pressure chamber; a filter chamber for the separation of the tar; and a saturator.



A. Section of Inlet Pipe connected with Rotary Fan. B. Pressure Chamber. C. Tar Extractor. D. Saturator. E. Taps for Regulating Pressure. F. Perforated Screens for Breaking-up and Arresting Tar. G. Tar Outlet. H. Gas Inlet to Acid. K. Gas Outlet to Purifier. L. Packing of Coke, Breeze, and Sand.

[The gas chamber referred to in the article is not shown in the sketch, but would be inserted between the filter chamber and the saturator.]

Sufficient pressure was obtained in this case by the use of a rotary fan; and the gas used was taken before it had passed through the condenser. It was forced into the pressure chamber, which had four outlets that could be regulated at will; and so the changes in pressure were under complete control. A sketch of one of the outlets is shown. It consisted of a glass tube drawn



Section of Pressure Tube.

out at one end to a very fine point, so that the issuing gas passed through an exceptionally small hole. These outlet tubes led into separate long glass tubes of wide bore, which were to act as filter chambers.

The question now arose as to the most suitable packing to use for these chambers. Sand was found to be a good absorbent for the tar; but the possibility of its becoming clogged and so preventing the passage of the gas through it, decided against its use. For a similar reason, coke or coal dust could not be used. It was found, however, that the following arrangement of materials inside the chambers was quite efficacious, and removed all the tar. Immediately opposite the fine opening of the inlet tube, a small screen was erected consisting of lumps of coke packed closely together inside a narrow bag made of sacking, and completely filling the interior of the tube. Two of these screens were placed at each end of the filter tubes; and the intermediate space was packed with pieces of coke, sacking, wood, and waste. The outlet tubes from the filter chambers led into one gas chamber, and from this into the acid chamber; the pipe conveying the gas dipping just below the surface of the acid. The tubes comprising the filter chamber were slightly inclined, and the lower end of each was fitted with a small tube through which the tar deposited could be removed if necessary. The sulphuric acid used in the saturator was of specific gravity 1.82, corresponding to about 90 per cent. by weight of acid.

A quantity of crude coal gas was passed through an apparatus of the form described. The gas was tested for ammonia before entering the pressure chamber and after leaving the saturator. The test was carried out by passing a small quantity of the gas into ammonia-free water, and testing by means of Nessler's solution (an alkaline solution of mercuric iodide). Much ammonia was present in the gas leaving the condenser; but none was found in the gas issuing from the saturator. The gas passed into the pressure chamber was dark in colour, and contained much tar; but the gas which passed into the gas-chamber referred to above was absolutely clear, and no trace of tar was noticed in the sulphuric acid after the gas had been passing through it for two hours. As an extra precaution—to prove the absence of tar—the gas issuing from the saturator was passed through a washer containing water, but no deposition of tar was noticed.

A small quantity of solid sulphate of ammonia was produced,



but not as much as had been expected. This may have been due to the fact that the sulphuric acid was present in too great an excess, and so prevented the deposition of the solid sulphate. The acid became very dark brown, and a quantity of sulphur was deposited. This no doubt was owing to the reduction of the acid by the sulphuretted hydrogen, as indicated above.

It was found that, by using a rather weaker acid, the action of the sulphuretted hydrogen on the acid was considerably lessened; and experiments were carried out with a view to finding the least concentration of acid which could be used to secure the deposition of solid sulphate of ammonia. Very inconsistent results were obtained, and no reliable conclusions were arrived at.

The experiments seem to show, however, that there is some degree of possibility in the direct process, and certainly give an indication as to where the difficulties of the process lie. The incorporation of a workable plant constructed on lines somewhat similar to the apparatus described above would not be a difficult matter on any works. The saturators would, of course, be worked in series, just as the oxide purifiers are worked at present, and would have to be made of lead or some other material unaffected by the acid.

COST OF GAS AND ELECTRIC LIGHTING.

A Practical Demonstration at Chichester.

THE energetic Engineer and Manager of the Chichester Gas Company, Mr. T. Ebenezer Pye, is affording the residents an excellent opportunity of comparing the relative costs of gas and electric lighting, without putting them to the trouble of studying a number of figures bearing upon the subject. He has had fitted

in the window of the Company's show-rooms two lights—gas on the left and electric on the right—so that they may be easily compared. A comparison is also provided in a darkened room within, to which visitors are invited. The whole of the electric lighting was fitted up by a firm in the city, who were instructed to so arrange as to give their light the most favourable opportunities in the demonstration. The two lights are assumed to be of about the same illuminating power, and are of the most efficient types yet introduced. They are so controlled that both must be turned on and off together; and therefore each is in operation exactly the same number of hours. They are connected to special meters, which register the quantity of gas and electricity consumed. It was the intention of the Gas Company to have both meters in the window, under the observation of the public; and the gas-meter has been so fixed. The Electricity Company, however, refused to fix theirs in the window, but put it in the cellar of the premises, where it may be seen, and its records ascertained, by all those desiring to do so.

The date of commencing the test was Dec. 14, 1909; the gas-meter being then at zero and the index of the electricity meter standing at 39'32. Up to the 7th of January the records were as follows:—

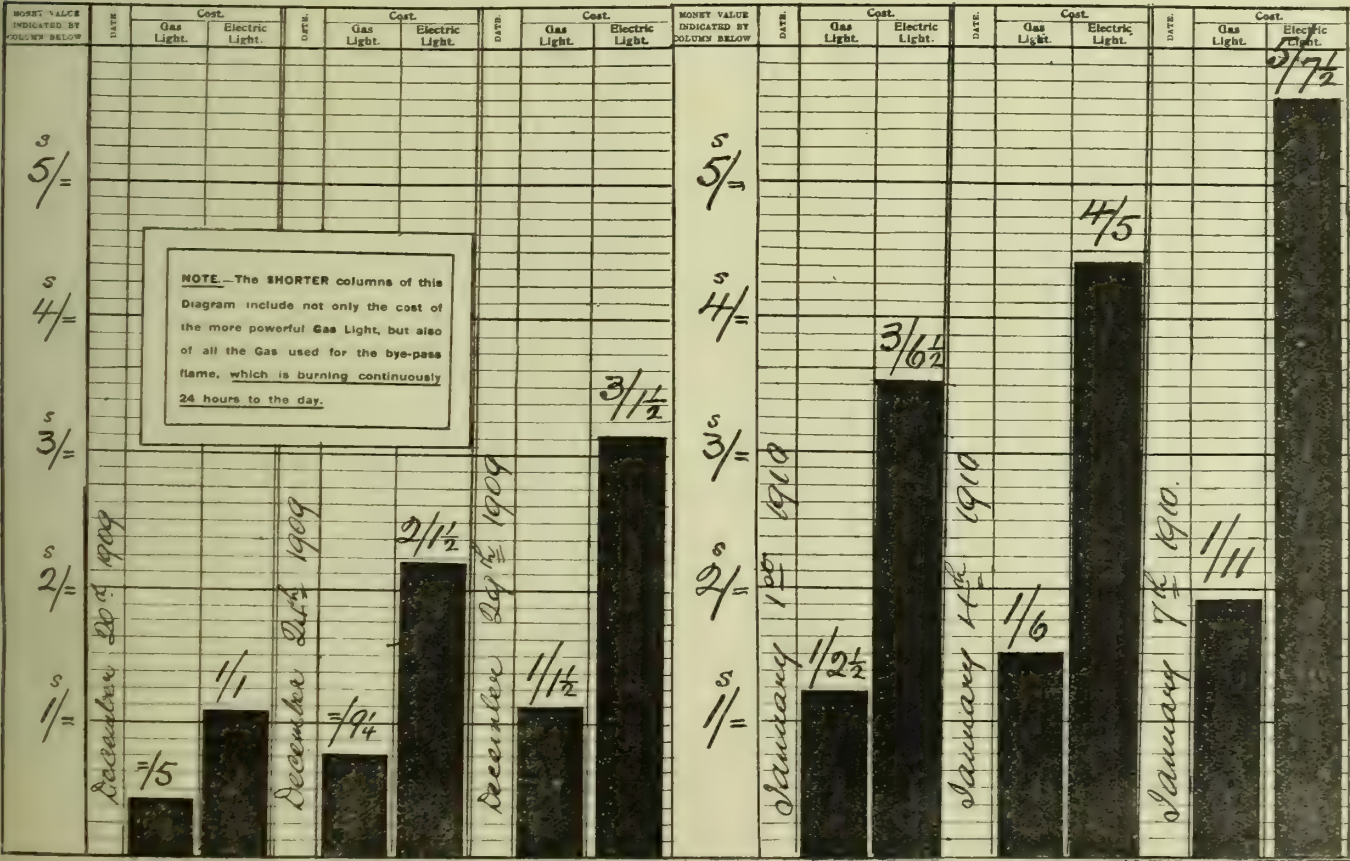
Gas used (including bye-pass flame), 545 cubic feet, costing 1s. 11d.  
Electricity used, 11'27 units, costing . . . . . 5s. 7½d.

Difference in favour of gas . . . . . 3s. 8½d.

The foregoing particulars are printed in bold type on a large sheet hanging in the window; and accompanying it is a diagram, of which we give a reproduction, showing at a glance the great difference in the cost of the two lights. The demonstration has not only proved attractive, but has had beneficial results in several ways. Mr. Pye is to be congratulated on the happy thought which led him to give his fellow-citizens this effective object-lesson in economic *versus* extravagant lighting.

HOW TO ADD TO THE COST OF ARTIFICIAL LIGHTING.

The Diagram below shows the actual progressive costs of the Gas and Electrical Lights exhibited in comparison in this Window and inside the Show Room. The actual cost of each light is ascertained by reading the Index of the Gas Meter, and that of the Electricity Meter, respectively, on the dates stated.



Wholesale Fittings Company's Anti-Vibration Light.

Attention is drawn by the Wholesale Fittings Company, of No. 30, Commercial Street, E., to an inverted anti-vibration gas-fitting for use in factories, workshops, warehouses, printers' machine shops, weaving sheds, and other places where such appliances are required. In this arrangement, everything tending to complexity is avoided; simplicity and cheapness being the

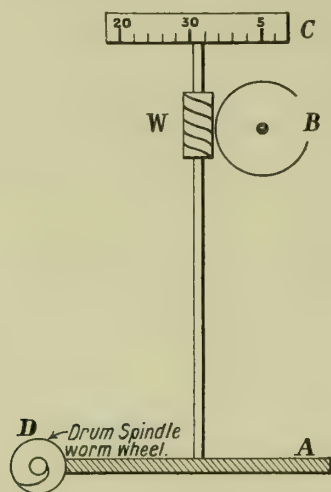
points aimed at in its design. The fitting complete (which is claimed to furnish, with a minimum gas consumption, about 120-candle power downward light) consists of a brass rod, with stopcock and chains, and a spring and flexible tube anti-vibrator so fitted that all shock or jar is absorbed before it can possibly reach the mantle. There is also provided a highly-enamelled protector; and a best hard-glass bulb attached to an "Ezol" reflector burner.



## THE TESTING OF METER-GEARING.

By R. G. MARSH, of Birmingham.

I AM enclosing a formula that I have worked out for application to the gear-mechanism of wet meters; its use being to enable one to quickly and easily work out what should be the proper number of teeth on each of the various gear-wheels in the train of the gear-mechanism, so that the meter shall register accurately with a given drum-capacity. It is applicable to any wet meter with a vertical spindle; and it is easily adaptable for dry meters. In the case of cylinder wet meters, the gear is so simple that a formula is hardly necessary.



Let  $a$  = number of teeth on A  
 $b$  = " " B  
 $c$  = " cubic feet round C  
 $d$  = capacity of drum D.

In the case of a single worm on the drum-spindle  
 $d a = c$ ; because D has to revolve " $a$ " times for one revolution of C.

In the case of a double worm on the drum-spindle  
 $d \frac{a}{2} = c$ ; because D has to revolve half " $a$ " times for one revolution of C.

1 revolution of C =  $\frac{1}{b}$  revs. of B (single worm at W)

1 " " C =  $\frac{2}{b}$  " " (double " " )

But 1 rev. of B = 1000 c. ft. (in all sizes above five-light)

Therefore, 1 rev. of C =  $\frac{(1 \text{ or } 2) \times 1000}{b}$  c. ft.

RULES FROM THE ABOVE.

I. Single worms top and bottom  $d a = \frac{1000}{b} = c$

II. Double worms top and bottom  $d \frac{a}{2} = \frac{2000}{b} = c$

III. Single worm top, double bottom  $d \frac{a}{2} = \frac{1000}{b} = c$

IV. Double worm top, single bottom  $d a = \frac{2000}{b} = c$

EXAMPLE 1.—What should be the number of teeth on A when  $d = \frac{1}{3} b = 50$ ? Single worms top and bottom.

$$\begin{aligned} \text{From formula I. } d a b &= 1000 \\ a &= \frac{1000}{d b} \\ &= \frac{1000}{\frac{1}{3} \times 50} \\ &= 60 \text{ teeth.} \end{aligned}$$

Further, what should  $c$  be?

$$\begin{aligned} \text{From formula I. } b c &= 1000 \\ c &= \frac{1000}{b} \\ &= \frac{1000}{50} \\ &= 20 \text{ teeth.} \end{aligned}$$

EXAMPLE 2.—In a 100-light meter with a single worm at the bottom and a double worm at the top, and a drum capacity of 5 cubic feet per revolution, what should be the number of teeth on B when there are 20 teeth on A?

$$\begin{aligned} \text{From formula IV. } d a b &= 2000 \\ b &= \frac{2000}{d a} \\ &= \frac{2000}{20 \times 5} \\ &= 20 \text{ teeth.} \end{aligned}$$

Further, is C correct at 100 when there are 20 teeth on A?

$$\begin{aligned} \text{From formula IV. } d a &= c \\ 5 \times 20 &= 100 \\ \text{C is therefore correct.} \end{aligned}$$

In 3-light and 5-light meters, instead of the cog-wheel B being on the same spindle as the first index-finger, there is generally an intermediate spindle. There is a small gear-wheel on the spindle of B, which engages with a larger gear-wheel on the spindle which carries the first index-finger. In this case, it is only necessary to alter the formula by multiplying the factor 1000 by the ratio of these two gear-wheels to each other.

To give an example: In a 5-light meter with a drum capacity of 0.25 cubic foot with single worms top and bottom, what should be the number of teeth on A when B has 30 teeth engaging in the worm W with a wheel of 6 teeth on the spindle of B engaging with a wheel of 20 teeth on the first index-finger spindle?

$$\text{From formula I. } d a b = \frac{1000 \times 6}{20}$$

$$a = \frac{6000}{20 \times 0.25 \times 30} = 40 \text{ teeth.}$$

It is interesting to note that in 30-light and 60-light meters with a single worm and 33 tooth wheels at A, the drum capacity is not exactly 1.5 and 3.0 cubic feet respectively, as is printed on the index; but 1.51 and 3.03. Since a whole number is a necessity, 33 is the most convenient to use. For the meters to be accurate with drum capacities of exactly 1.5 and 3 cubic feet respectively, there would have to be 100 teeth on the wheel A and a triple worm on the drum-spindle.

## THE EXPLOSION AT COATBRIDGE GAS-WORKS.

### The Wrecked Purifier-Shed.

IN the last number of the "JOURNAL" (p. 451), we reported the occurrence of a serious explosion in the purifier-shed at the Coatbridge Gas-Works on the evening of the 10th inst. We are now in a position to give some additional particulars in regard to the disaster, the effects of which will be apparent from the accompanying reproduction of a photograph taken by Mr. Thomas Wilson, the Engineer and Manager of the Gas Company.



The purifiers, four in number, were set on six walls, 2 ft. 6 in. high. Gas had doubtless accumulated under the floor of the purifier-shed, and had ignited at some light near, with the result that the four boxes, being raised in a body and falling back on the walls, were so smashed that not a whole plate remained. The floor, which was made of 3-inch pitch pine, was shattered into



atoms; and the shed, which was 130 feet long, 20 feet high, and 30 feet broad, was entirely wrecked—the woodwork being thrown to considerable distances. The roof of the shed was composed of T-rafters and angle purlins, supported by ten strong cast-iron pillars and beams; and the whole was twisted into a complete mesh and became a total wreck. Some large pieces of iron were projected to a great height, and falling on the crown of two of the gasholders caused large perforations.

A large amount of damage has been done to adjoining buildings, both inside the gas-works and for some distance outside; the windows in the neighbourhood being shattered. The North British Railway Company's workshops, which adjoin the gas-works, suffered considerable damage to the roofs and the telegraph system. The report of the explosion was heard for a distance of six miles. The local Fire Brigade turned out, but it was of little avail, as it was only the gas burning from the inlet and outlet connections that caused the fire; and when the valves were closed this was extinguished. The night foreman had occasion to be in the neighbourhood of the shed at the time of the accident, and he was found 20 minutes later among the *débris*, severely injured. His life was at first despaired of, and he was removed to the hospital; but we learn that he is making progress towards recovery.

Mr. Wilson is of opinion that the cause of the explosion was a sudden outburst of gas due to a plate or some of the connections giving way through a subsidence of the ground; the minerals in the whole of the district having been worked out. Seeing that the purifiers were a total wreck, Mr. Wilson was for a time at a loss as to what to do to keep the supply of gas going; but he resolved to utilize two old tower scrubbers, and for the time being clean the gas with milk of lime. It was further arranged to erect two temporary wooden boxes, 20 feet square, for the purpose of purifying the gas until permanent purifier boxes could be provided. Mr. Alex. Wilson, the Chief Engineer of the Glasgow Corporation Gas Department, on learning of the catastrophe, notored out in the early hours of the morning for the purpose of rendering assistance.

ILLUMINATION.

A course of lectures is being delivered by Professor Silvanus P. Thompson, D.Sc., F.R.S., at the Royal Institution, on the subject of "Illumination, Natural and Artificial." The first of the series was delivered on Thursday last. The prefatory remarks conveyed to the audience the largeness of the subject, seeing that it referred to the lighting of private residences, streets, shops, schools, churches, theatres, and numerous other places, all of which required different forms of treatment in regard to illumination. The subject had occupied a great deal of attention of recent years. Gas engineers, electric engineers, people who dealt in acetylene, oil, and miscellaneous forms of lighting, had been much exercised over the question, because they realized how extremely imperfect were the methods of utilizing the sources of light evolved by the progress of science. So much was this the case, that special societies had been formed in the United States and in this country in which the rival interests of gas, electricity, and acetylene were for the moment happily merged, and the rivalry laid aside in the combined study of problems of illumination, with the object of bringing to practical issue questions agitating those concerned. In this first lecture, he had to deal with preliminaries which would necessarily come into consideration in more detail in the next two lectures. First of all, they had to consider that which was the source of illumination—viz., light. It was necessary to distinguish between the two things—light as the cause, illumination as the effect. The sources of light would be of no use to us unless they produced illumination. The study of light and light sources was a very old one. Optics went back many centuries; but in only comparatively recent times had there been any precise or quantitative study of the amounts and values of different sources of light.

They had to think of the quantities of light produced by illuminants, and also of the quality of those lights. Quantity could not be dealt with accurately without deciding the terms. Therefore it was necessary to speak of the quantity of light in terms of some definite unit, and then say how many times the subject under consideration was worth in terms of that unit of quantity. They wanted to be able to say in the first instance how much light was being given by different sources, how bright they were, and what was their actual quantity in luminosity. The unit in which the brightness of light was described was the candle. The term candle was dealt with; and then it was explained that the difficulties of producing an absolute standard were so great that the standard candle had been abandoned. They had now another unit which was described in terms of the candle—that was, the arcourt 10-candle pentane lamp; and it was much more satisfactory than the standard candle. With it, as with the candle, they had to be taken in reference to the moisture, &c., of the air. The units of Germany and France were explained; and then it was mentioned that we had practically arrived at an international agreement regarding the definition of 1 candle. But the unit of light was not a physical quantity in the same sense as other physical units with which physicists work. It was a physiological standard. Candle power could not be defined in terms of a watt, or any other physical unit. The eye was the

ultimate judge; but the eye is an imperfect instrument. It could not form an absolute judgment about a light. Entering a lighted room, no photometrist could tell with any degree of accuracy the candle power within 20 per cent. of the truth. The eye made its judgments biased by all immediate impressions. The eye could not draw quantitative judgments itself under standard conditions. What it could do under given conditions was to estimate equality. If there were two lights under equal conditions where they could be compared, the eye could pronounce upon equality, but could not give quantitative judgment. The eye could not draw quantitative judgment of 2 to 1 or 3 to 1; but it could judge the equality of 1 to 1, 2 to 2, or 10 to 10. The eye was therefore that which came in to judge of these matters. The lecturer then traced the development of photometers in which the eye was brought in as the judge of equality; and incidentally in this connection he stated, when speaking of the grease-spot disc, that personally he preferred the paraffin wax block. Passing on, illumination photometers for measuring the light falling on surfaces were described.

Coming to the question of the quality of light, he said this was a matter to be seriously considered. They were told that white light consisted of a large number of coloured lights combined together. This was learnt from the text-books. They had to some extent to unlearn this. White light was not strictly speaking a combination of several colours; it was a complex unity. And its sorting out had been undertaken by Abney. When white light was seen through a prism, a spectrum was obtained; and the white light could be analyzed into its various constituents, which were different one from another. Some figures of Abney's were given by the lecturer to impart an idea as to the qualities of light:—

	Red.	Green.	Blue	Violet.
Sun light . . . . .	19	37	44	68
Sky light . . . . .	9	23	42	12
Arc light . . . . .	22	36	42	12
Gas flame (batswing) . .	45	43	42	12

GLARE: ITS CAUSES AND EFFECTS.

Illumination a Matter of Individual Requirement—The Necessity for Screening Metallic Filament Lamps.

Discussion of this subject was continued at the Meeting of the Illuminating Engineering Society, at the Royal Society of Arts, last Tuesday—the PRESIDENT (Professor Silvanus Thompson) in the chair. It will be remembered that the debate was opened by a paper by Dr. J. Herbert Parsons, F.R.C.S., at a meeting held on Jan. 11 (*ante*, pp. 147, 167, 344). On this occasion, there were only, at the outside, three dozen members present.

The PRESIDENT remarked that, at the January meeting, the subject was mainly considered from the physiological side, but on this occasion they were dealing with the more practical application of these matters. Mr. Trotter would open the discussion.

Mr. A. P. TROTTER, Electrical Adviser to the Board of Trade, said he understood the discussion was to be mainly practical; but, with the permission of the President, he would like for a moment to be, he would not say theoretical, but physiological, since at the last meeting a problem was set for their consideration. It was whether the contraction of the iris which causes a reduction of the area of the pupil was due to the light entering the pupil, or whether it was due to light falling upon the cornea or, also, upon the iris. He was interested in the question of the contraction of the iris some 30 or 40 years ago; and he then used a very simple instrument for at all events forming a good idea of the contraction of the iris. He found that, with a 16-candle lamp, at about  $\frac{3}{4}$  metre away, causing a contraction of the pupil of more than 25 per cent. in diameter, when the pupil alone was isolated from the light, and when the light fell upon the cornea and more or less on the iris, there was no perceptible relaxation of the pupil, when the pupil was screened. It appeared to him that the contraction was always due to the light falling on the cornea and the iris; and it might be 5 per cent., but he did not think it was 10 per cent. Screening the lamp and unscreening the lamp, he saw no difference in the size of the retina. They had had a good many questions put before them for consideration in connection with this subject. The first was: "What exactly constitutes a 'glaring' system of illumination?" The word "exactly" was a very troublesome one indeed. Dr. Hyde had given one of the best answers. It was illumination that was painful or uncomfortable; but so many different people had different ideas as to what was discomfort. Another question was: "Is it desirable to recommend that sources of a brilliancy higher than a certain limiting value should never be used unscreened in interiors? Or that such sources should be placed a certain minimum distance from the ground?" This brought them to the question of intrinsic brilliancy, which came in with other of the questions. For instance, "What instruments are available for measuring in a simple manner the intrinsic brilliancy of any luminous object? And what accuracy may be expected in such measurements?" As he understood intrinsic brilliancy, it was simply the relation of the candle power of the source of light to the area—the effective area—of that source of light. The ordinary candle flame measured about 2 inches high, and about 0.4 inch at the base. The candle power was (say) 2.5 per square inch. Some years ago in a paper, he put it down at 2-candles per square inch;



but he had that evening measured it up again with an old parliamentary standard candle giving rather a smaller flame, and he found it came to the candle power per square inch that he had mentioned. It seemed to him that the candle was a very good standard for ordinary interior work for the maximum and minimum intrinsic brilliance which should be ordinarily permitted. When they came to more than that for lights that were close by, the intrinsic brilliance began to get rather painful. On the other hand, the question of distance somewhat complicated matters. Where they had powerful lights at a considerable distance, subtending at small angles, then other considerations came in. In regard to this question of intrinsic brilliance, he thought it was a serious mistake to calculate the intrinsic brilliance of a filament lamp by taking the length of the filament, and its diameter, and, multiplying the length by the diameter, say that was the number of square inches of the filament; and then to take the candle power per square inch, and say that was the intrinsic brilliance. That was altogether wrong, for the question of irradiation came in very largely. It was all very well to measure the filament of a glow lamp, and say it was 0.2 mm. Nobody ever saw a glowing glow lamp with a filament of that width; it appeared to be fully ten times that width. If it appeared to be so, then, for ordinary practical purposes in considering this matter, it was so. One could not go into the question of irradiation here; it might be merely an optical phenomenon. Very largely it was a functional matter that physiologists might explain. Whether it was partly subjective, he did not know. For all practical purposes, a bright filament looked at pretty closely was 4 or 5 inches in diameter. Therefore the intrinsic brilliance would be about one-tenth of what it would be if they took the diameter of the filament as usually measured. Looking at an open lamp, one could not see the filament, but one mass; and in his opinion, they should take the number of square inches over the whole, and not merely of the filament itself. Turning to still more practical questions. There were two broad methods of lighting—one in which the source of light was within the range of vision, and the other in which it was practically outside it. For domestic lighting, the lamps had to be, for the most part, within the range of vision. There was, however, a charming but expensive way of lighting a room by cornice and ceiling lights, and for all practical purposes the lamps were not in the range of vision. Under these circumstances, it was convenient and desirable that the intrinsic brilliance should not exceed about 1 candle per square inch or thereabouts. In 1880, electric lighting was beginning; and they had Swan lamps and Edison lamps. And it seemed to him then that they would soon get lamps so brilliant that they would be unbearable to look at. It had taken thirty years, and they were still about the same brilliance as they were. They had now, however, metallic filament lamps; and he thought something would have to be done to reduce the brilliance. Thirty years ago he designed a globe with a prismatic surface for shading the lights. [One was exhibited.] It was at least fifteen years too soon; and it had been re-invented by others, and improved by the Holophane Company. It was intended to spread the light; and putting one over a 16-candle power lamp gave about  $7\frac{1}{2}$  square inches, and this gave about  $4\frac{1}{2}$  candle power per square inch, which was rather too bright; and he must confess he did not use it in his own house. When the light was within the range of vision, it was either desirable to reduce the intrinsic brilliance or to get rid of it altogether. For some years past he had had a holophane lamp over the desk in his office at about 4 feet from the table, and it gave a very nice light concentrated upon the book or papers or whatever work he was engaged upon. But he found his sight was beginning to fail a little; and he wanted more light. It was an easy thing to pull a lamp down, but then one got the light in front of one's eyes. He had therefore come back to a dark green, deep shade, hanging just below the level of his eyes; and he enjoyed this lighting very much. The reflected light was quite enough for the rest of the room for ordinary purposes. He personally found this was an extremely agreeable kind of light; but Dr. Louis Bell, who was an acknowledged authority on the subject, said it was most objectionable. It was such a large subject that it was extremely difficult for anyone to lay down rules; and it seemed to him that each person must look after himself. Well now, as he had said, there were two sources of light—one within the range of vision, and one outside. Where the light was within the range of vision, as in ordinary domestic lighting, he used a shade made of the paper such as jam-pots were covered with. Lights, when so placed and screened, up against a whitewashed wall gave a tremendous amount of illumination.

Mr. H. AGAR BAUGH (London) remarked that reflection from the ceiling gave ideal illumination; but it was expensive for ordinary rooms. It was, in fact, very expensive. He had therefore made some experiments with obscured glass covers for incandescent gas lighting and metallic filament lamps, and found the light much better than without them. Pointing to a rough surfaced frosted globe, he described it as being much better than an opal one. In his case metallic filaments were positively painful. If he looked at one he had, on turning away, the image of the filament in his eyes. Some people, of course, could look at an arc lamp and not feel any inconvenience; but that was not so in his own case. After making experiments in diffusing light, he used a shade well covering the lamp—a perfectly opaque shade being better than any kind of opal or transparent shade. It was very restful to the eye, and very economical in use. With such a shade, a bijou inverted incandescent gas-lamp, using only 1 cubic foot

of gas an hour, gave a good light, as did also a 16-candle metallic filament lamp. With either, one got an ideal light on the table; and he did not think it possible at any price to get a better light on a table, even by reflection from a ceiling. Gas had one advantage over the electric light. It could be turned up or down, and so could be adjusted at will. If he was in good health, he could do with 1 cubic foot of gas; if he was tired, he wanted a little more. In private houses the problem was very different. Then for decorative effect, there was nothing to touch imitation candles, with shades such as Mr. Trotter described.

Mr. J. S. DOW summarized some communications received from foreign members. One was from M. Blondel, of Paris, in which he stated that he became interested in the subject of glare many years ago, and had engaged in developing shades and the holophane type of glassware, to reduce it. Professor A. Grau, of Vienna, took up the question as to how far it was possible to do what theoretically ought to be done—to specify a limit for the intrinsic brilliancy used in an interior. He thought it impossible to lay down any rigid specification; all one could do was to try to keep naked lights high up, or, if very powerful illumination was required, it should be rather by a large number of small units, than by only a few powerful ones. Then the Engineer of Messrs. Körting and Mathieson, of Berlin, laid stress on the desirability of reproducing in artificial illumination the best daylight conditions. Yet they must not always try to imitate daylight, because, when weather conditions were bad, daylight could be injurious. One object of artificial illumination should be to keep it out of the range of sight wherever they could manage to do so. Then it was also thought that we ought to try to get the light from an illuminated surface, instead of from the source itself, especially if it were an intense one. There was agreement that it was impossible to give any answer to the question as to the maximum and minimum intrinsic brilliancy, though one could come near to it in small interiors. Dr. K. Stockhausen advised the collection of evidence as to the effect of different illuminants on the eyesight. By circularizing them, data might be collected from the Ophthalmic hospitals, schools, and foreign countries. He thought that in an interior one ought to try, if possible, to see that no source of illumination was used that had an intrinsic brilliancy of more than 0.5 Hefner unit per square centimetre. The Doctor also seemed inclined to suggest that the present system of lighting streets was wrong in principle, and that sacrifices ought to be made even to get down the intrinsic brilliance—that it might be better to lose light in order to get a glow round the source; so that as one went by a light one did not get the dazzling effect which one was bound to find in the streets of London. Finally, he laid stress on the need of some sort of Committee to secure definite information.

Mr. COOPER disagreed with most of the definitions of glare that had been given. Generally speaking, he did not think that glare depended upon brilliancy. Taking the metallic filament lamp, at night one found it a distinctly unpleasant thing to look at; but in daylight it was not at all unpleasant. If a lamp was placed against a black wall, there would be the sensation of glare; if placed against a whitewashed wall, glare would not be found so much. With a whitewashed wall, there was greater intensity of illumination; but with a black wall there was greater contrast and glare. When one was reading by daylight, and one switched on a light to one side, then one ceased to go on reading with any comfort. Consequently, he thought that glare must be defined as a contrast, which was due to the eye trying to adapt itself to a high illumination on the one hand and to a low illumination on the other. He thought that possibly the contraction of the pupil in passing from the lower to the higher illumination might be used as a measure of glare. There seemed a great tendency at the present time to use metallic filament lamps unshaded, which was a great mistake. The intrinsic brilliancy of these lamps was certainly much higher than that of carbon filament lamps; and their use, without being properly shaded, was extremely bad. One constantly saw cases of this kind. In the Reading-room of the Patent Office, lamps were fixed on the tables by which to read, but the lamps were put in so that they were below the edge of the shades. If one sat down to read, one had a bright field of brilliancy within view. That had since been remedied. He also quoted a recent example of bad shop window lighting, and concluded by saying that he thought the Society would do good work if, in respect of the lighting of public buildings, they brought pressure to bear upon the authorities concerned.

Mr. W. M. MORDEY (London) asked whether the Society had considered the question of the relative ability to see, as distinct from relative illumination. The question should be taken up as to how well one could see in rooms differently lighted. Take a room that struck one as being dark—a room lighted by reflected and uniform illumination. A room such as this, which struck one as being dark on going into it, when one sat down in it, gave one a feeling of restfulness, and enabled one to work in comfort. Then going into a room brilliantly lighted, one soon, if working, had a feeling of restlessness. What one wanted to arrive at was comfortable seeing rather than the amount of light. Mr. Trotter said that, for all practical purposes, exposed lamps were necessary for domestic lighting. He (Mr. Mordey) would like to question this. He could not help thinking they were going rapidly in the direction of abandoning exposed lights altogether. If one could have a room lighted without glare, with a sort of luminous paint laid evenly on the walls, that would be an ideal sort of lighting. With bright lights, such as those illuminating the hall in which they were assembled [metallic filaments], one could not rest one's



eyes. The whip-lash of these bright lights irritated one's nerves. Reflected light would give them a better result; and they would see equally well with much less light. In the new theatre of the Institution of Electrical Engineers, they had come to the conclusion that they must, at all costs, avoid this terrible whip-lash of exposed lights such as they had before them at the Society of Arts rooms, at the Institution of Civil Engineers, and in nearly every other place of meeting in London. He did not suppose the makers of lighting fittings would welcome the change; but he thought there would be a field for them in developing the lighting of buildings, by putting to better use the brilliant lights that now existed, in the sense of having comfortable seeing rather than brilliant illumination.

Mr. HAYDN T. HARRISON (London) said, after all they had heard and read, he did not think anybody had quite defined what glare was. If they added up the various definitions, they would, in his opinion, find the true definition. First of all intrinsic brilliancy did enter into the question; and intrinsic brilliancy would always be found by the area of the source of illumination. Then the contrast question came in, which they should also be able to put into an equation. If the adjacent surroundings of a source of light were illuminated up to the same degree as the source of light itself, the contrast would be unity, and there would be no glare. Therefore it was a question of intrinsic brilliancy and contrast. If the factor of candle power were divided by the degree of the illumination of the surrounding objects, he thought that would give them some useful information. The definition of glare was, of course, difficult to get at; but he thought it could be put into a formula which would be very useful. If they took a white screen and a black screen, the effect of glare in front of the former was practically negligible, but in front of the black screen it was very great. The reason the metallic filament lights in the meeting hall gave them the effect of glare was because there was a dark surface above; if there were a white surface above, there would not be the effect of glare. There was another point that came up in connection with this question of glare. Everybody seemed to think if he could eliminate the source of light altogether, and get indirect illumination, he would arrive at a sort of millennium of lighting. Personally he did not like a shadowless room; nothing was more pleasant to sit in than a shadowed room. He did not say the source of light should be definite or visible; but it ought to throw some shadows. Without, a room would be rather depressing.

Mr. LEON GASTER remarked that intrinsic brilliancy of lamps had very much to do with the whole question of glare; and from offices, banks, and so on, they had plenty of complaints of this. But by putting the lamps at a proper angle and in proper position, the complaints could be remedied. They wished to impress upon the users of lamps that they should keep the light away from the angle of vision, and that there should be care that the intrinsic brilliancy was not beyond a certain minimum. This, of course, led up to the question of who should decide the minimum. With regard to Dr. Stockhausen's proposal, Mr. Gaster put before the members a resolution by the Council to the effect that an International Committee be appointed by the Illuminating Engineering Society to consider the question of glare from modern illuminants, and to collect evidence as to its causes and effects. In the course of further remarks, he said he thought the question of glare ought to be carefully considered. In the City, the police authorities had recommended that high-power lamps suspended in front of shops should be screened on the side of the traffic. This was right.

There were two or three other speakers, and then the PRESIDENT ran lightly over points raised in the discussion; among them being that Mr. Trotter, Mr. Cooper, and Mr. Haydn Harrison had emphasized the necessity in considering the question of glare of not only taking into account intrinsic brilliancy but contrast as well. Concerning Dr. Stockhausen's proposal, it ought to bear fruit. As to the Council's resolution, he hoped they would be encouraged to take action in this matter, because no doubt a great deal of useful information could be arrived at by collecting data.

**Sexton on Fuel and Refractory Materials.**—We have received from Messrs. Blackie and Son, Limited, of Old Bailey, E.C., the second edition of "Fuel and Refractory Materials," by A. Humboldt Sexton, F.I.C., F.C.S., Emeritus Professor of Metallurgy in the Glasgow and West of Scotland Technical College. The author has not found it necessary to make any alteration in the scope or general arrangement of his book; but since the first edition was published, changes and developments have occurred in connection with coke-ovens, gas-producers, and pyrometry. Considerable additions have therefore been made in the chapters dealing with these subjects. The book will be more fully noticed in a later issue.

**Visit of Mr. P. C. Holmes Hunt to England.**—It will be seen, from the report of the concluding proceedings at the fourth annual meeting of the Victorian Gas Managers' Association, noticed elsewhere, that Mr. P. C. Holmes Hunt, the Engineer of the Melbourne Metropolitan Gas Company, who has been re-elected President for the current year, will pay a professional visit to England in the course of the summer, and will probably cross the Channel to see what is being done in Berlin and elsewhere in connection with vertical retorts. Though, on his return to Melbourne, he will necessarily be busy preparing reports for his Directors, his next Presidential Address may nevertheless be expected to contain matter of special interest to members of the Association.

## VICTORIAN GAS MANAGERS' ASSOCIATION.

### Fourth Annual Meeting.

In the last number of the "JOURNAL," we gave a report of the opening proceedings at the fourth annual meeting of the above-named Association, held in Melbourne on Nov. 3 and 4, 1909, together with the address of the President—Mr. P. C. Holmes Hunt, the Engineer of the Melbourne Metropolitan Gas Company. Elsewhere in the present issue (see pp. 508-13) will be found the papers read, with some notes of the remarks made thereon; and below we give the questions discussed by the members, and a report of the concluding proceedings at the meeting.

### THE "QUESTION BOX."

#### I.

*"Is there any benefit to be derived from the use of Maitland coal as compared with Newcastle coal?"*

Mr. S. E. FIGGIS (Ballarat) said he supposed there was nothing connected with the gas industry that was of so much interest to those engaged in it as the coals they had to use. For the past forty years they had in Ballarat obtained their supplies from Newcastle; and excellently well they had been served. It was unfortunate, however, that many of the best pits were almost worked out. But, Providence had been good enough to permit man to open up a fresh coal district at Maitland; and Pelaw Main, Abermain, Stanford Merthyr, Aberdare, and Hebburn were all very good mines. He had had the pleasure of using, though not on a very large scale, some of these coals. The first he received was Stanford Merthyr; and he did not think he had ever handled a better gas coal. Certainly the coke from it, as indeed from all Maitland coals, was in some respects not so good as from the Newcastle; but they made a good gas coke, and one could get as great a yield of tar as from Newcastle coals. He had also tried Aberdare, Hebburn, and Pelaw Main coals; and they were all good for gas-making purposes. He would ask members to give their opinions as to these coals, and also as to the future of the coal supply. On the question of yield, he was in an excellent position to test it. He recently received a cargo of one of the Maitland coals, and kept it by itself. He took the meter at a certain hour in the day, and they ran the coal (some hundreds of tons) to within half-a-ton of the cargo, and the result was a make per ton of 12,500 cubic feet of 16 to 17 candle gas. So far as the coke was concerned, his experience was that it was excellent; and in the fires it was immeasurably superior to the Newcastle coke, though it was true they would not get the same quantity per ton.

Mr. T. LORD (Geelong) said about three months previously he made an effort to give Maitland coal a thorough practical test; and he came to the conclusion that if this coal would not yield what he termed a proper coke for supplying their best customers, though it might be well to use it for gas, it would be better to mix it with another kind for the production of residuals.

Mr. W. PAIN (Bendigo) said they had been in the habit of using Maitland coal since 1904, and he must acknowledge that, providing he got a good sample of Abermain coal, he would not ask for anything better. It was a first-class coal for burning off, free from naphthalene, and good for the production of tar. Originally, when he used Newcastle coals, he found that under the intense heat there were chokes; but since using the Abermain coal there had been no stoppage of this kind. The yield of gas was 11,300 cubic feet per ton.

The PRESIDENT (Mr. P. C. Holmes Hunt) asked Mr. Pain if he thought the Maitland coal was all round decidedly better than that from Newcastle.

Mr. PAIN said he did, for general work; but it did not yield a household coke.

Mr. S. MARSH (Mentone) said that up to eight months previously he had been using nothing but small Newcastle coal. Then their coal contractor refused to supply them with this coal any longer, but said he would send Maitland instead. They were quite agreeable; and after using it, their customers asked them where they got such good coke from. The yield of gas per ton was 12,700 cubic feet from the Maitland, as compared with 11,500 cubic feet from the Newcastle coal. He had no trouble with the clinking.

Mr. T. GALE (Footscray) said they had used a lot of Abermain coal—in fact, nothing else for the last four or five years. The coke produced was very good, and they got about 11,000 cubic feet of gas per ton. The tar also was really good.

Mr. KEMPSTER (Waratah, N.S.W.) gave the members some information about the Maitland coals, as his works were situated near the mines, and he had been using the coals for some time. For about fourteen years, when the Hetton coal was really at its best, he was getting from it an average of 9000 cubic feet of 16-candle gas to the ton. All at once, however, this coal fell off; and he had to go to Maitland. With Abermain unscreened coal, he obtained a return of a little more than 10,000 cubic feet—sometimes it averaged 10,200 cubic feet—of gas to the ton, while the illuminating power was very good. The coke had a good sale; and the people were very pleased with the tar, though the yield of this residual was not quite so large as from the Hetton coal. Unless he could get a coal something like the Hetton was a few



years ago, he would not care to give up the Maitland and go back to Newcastle.

Mr. J. THOMPSON (West Melbourne) said that they had several trial shipments of Maitland coal, and from a Superintendent's point of view, he would not like to use any other. There was no difficulty in keeping up the illuminating power of the gas, and no trouble with clinker. The coke averaged  $9\frac{1}{2}$  cwt. for sale per ton of coal carbonized. With heavy charges the result was a good, hard coke which the maltsters all liked, and it was also a good suction plant coke. He preferred Maitland coal to Newcastle.

Other members having offered remarks,

The PRESIDENT said they were indebted to Mr. Figgis for introducing the subject. He (the President) had dealt rather fully in his address [see *ante*, p. 423] with the question of Maitland coals, and therefore he did not propose to say much on the topic. There was no doubt that Maitland coal was one of the best gas coals in the world. It was a coal of which he considered they did not yet know the potentialities. He hoped that before long, owing to a better knowledge as to the way to carbonize it, they would be talking of makes nearer 13,000 than 12,000 cubic feet in steady working. Whether or not this was going to be done in horizontal retorts he was not quite sure; but he certainly thought they would be able to do it when the retorts were turned on end. The question of whether or not they used Maitland or Newcastle coals must be decided very much by local conditions, having regard to the sales of residuals; but the day was undoubtedly near when the Newcastle coal would not be obtainable at all. The Maitland coal certainly had advantages, and one was that the coke was a very much kinder coke in the furnace. Producers would run for at least 48 hours without clinkering; while the amount of ash was small in quantity, and did not contain those fluxes which brought about the consolidation of clinker. He would just mention this point—that Maitland coal, on account of its large gas-yielding properties, would have the effect of reducing the amount of gas-producing plant required on gas-works, large or small. Therefore it would have a tendency to decrease capital outlay on carbonizing equipment.

## II.

*"How will the Daylight Saving Bill affect the gas industry?"*

Mr. R. BEARUP (Stawell) considered that the Bill would, if carried, have a most disastrous effect on all lighting concerns—whether electric, gas, or candle works—that were in a small way of business. The State was supposed to protect and foster industries; and surely the lighting industry was deserving of some consideration, as there was a large amount of capital invested in works. If the Bill contained any clause to compensate those whose businesses were injured, one could not cavil. The putting forward and backward of the clock seemed to him to savour somewhat of faddism.

Mr. W. SWINBURNE (Melbourne) thought there could only be one reply to the question as to how the Daylight Saving Bill would affect the gas industry—namely, that it would affect it unfavourably. If an hour was added to the daylight, an hour would be taken from the period of lighting. Therefore the receipts from gas, electric, or any other forms of lighting must suffer. The day consumption would no doubt be increased somewhat; but whether it would compensate to the full extent for the loss of an hour after dark, he could not say. Therefore he thought that the question before them could only be answered by the statement that the passing of the Bill would be detrimental to all lighting companies. If, however, there was to be a demand for the change, and it was declared to be of benefit to the community, he did not think they should oppose it. The chief evidence in favour of the Bill was that, if it were passed, more time would be available for amusement and sport; and he thought enough time was already devoted to this.

## III.

*"I have trouble with ascension-pipes becoming blocked. What is the cause? And how can I prevent it?"*

Mr. T. GALE (Footscray) said that ascension-pipes in the best regulated retort-houses occasionally became choked with carbonaceous matter. One of the principal causes of this was back-pressure from too deep a seal in the dip-pipe, which was often immersed in thick tar. To run the tar off the hydraulic main often considerably lessened the evil, as the thick tar offered so much resistance to the gas getting away from the ascension-pipe. He always insisted on an augur being used every time the retorts were charged. He noticed there was a lot of difference in coal having more or less tendency to choke the pipes. When a pipe became choked, he found it the simplest plan to remove the cap off the bridge-pipe, and make a way through with the augur, or failing that a red-hot pipe; and, if the retort would stand it, to take the back out, and let the heated air make its way through the aperture. This would serve to clear the retort of carbon as well as clear the ascension-pipe.

Mr. J. BOWMAN (Sale) had had a fair amount of trouble with stopped ascension-pipes. One of the principal reasons was that a certain class of coal—the Wickham—which was not obtainable now, used to conduce to it. Of course, there were various methods of burning out and cleaning out; but the best plan he had found had been to put a little water-drip in the bridge-pipe, letting the water drop in steadily. The water got out through the mouthpiece on to the floor; and it was easy to gauge whether there was too much. They used very little water for the purpose.

It was brought from an overhead tank; and the plan worked admirably. The ascension-pipes, in consequence, were always clean. He certainly would not do without the water-drip under any consideration.

Mr. J. W. BEAN (Wangaratta) said that occasionally he had a little trouble with blocked ascension-pipes. He found the best preventative was to keep as much heat going through the pipes as possible. If a stoppage took place near the mouthpiece, he took a 3-inch augur and cleared it thoroughly. If this was not done properly, the pipe would be stopped as badly as ever an hour after the charge was put in. His experience was that a screen placed between the ascension-pipe and the retort-bench, so as to allow an air space between the bench and the screen and between the screen and the pipe, proved very effective. After adopting this method at Wangaratta, he had had no trouble with choked ascensions.

Mr. C. W. HOWLETT (South Melbourne) said that, without going deeply into the cause of the trouble, there was a minor point the mention of which might be useful. Mr. Bean spoke about auguring his pipes. During the last fifteen months at South Melbourne, they had had three stopped pipes in their new installation; and now they were altogether a thing of the past. There was a good wrinkle in keeping them clear. Their Engineer (Mr. Hunt) had always insisted on having a good, large augur to try the pipes; and he had been very particular to see that the augurs were always the same size. Immediately they showed signs of wear, they were renewed; and, of course, augurs wore down from 6 inches to  $3\frac{1}{2}$  inches. If auguring were neglected, the carbon would form on the sides of the bends and give a great deal of trouble. He thought there was a great secret in seeing that the augurs used were kept at a proper size.

## IV.

*"Does a gas cooking-stove fitted with a special browning burner give better satisfaction generally than the stove without one?"*

Mr. J. LORD (Williamstown) could not discover that there was any favour shown for stoves with browning burners. He did not think that, if a stove was used in a proper way, a browning burner was necessary.

Mr. E. TIPPER (Box Hill) found that among his consumers there was a distinct preference for a stove with a browning burner—provided, of course, that the person knew how to use it. It was also used as a large-sized grilling burner.

Mr. W. PAIN (Bendigo) thought the browning burner was only asked for through want of education in the use of gas-stoves. Pastry, scones, &c., could be easily browned with a stove not specially fitted with a browning burner.

Mr. A. CUSA (Shepparton) said that the few consumers who used stoves in his district called his attention to the smallest thing that went wrong with the browning burner. They preferred it.

Mr. J. W. BEAN (Wangaratta) remarked that the browning burner could be done without by making the cooker do the browning without having an extra frame on the oven.

The PRESIDENT (Mr. P. C. Holmes Hunt) said that, as the hour was getting late, they would postpone the discussion of the remaining questions until the next meeting.

## CONCLUDING PROCEEDINGS.

### ELECTION OF OFFICERS.

Mr. T. LORD (Geelong) said the pleasing duty devolved on him of proposing that Mr. Holmes Hunt be re-elected President for the ensuing year. The reason he had again been nominated was chiefly that it was his intention to visit Great Britain during 1910, leaving Melbourne during February\*; and the Council thought it would be very fitting if he could be in England as President of the Victorian Gas Managers' Association.

Mr. S. E. FIGGIS (Ballarat) seconded the motion. He said that there was one little matter which Mr. Lord had forgotten to mention, and that was that, in the natural order of things, the President this year should have been Mr. Lord himself; but he had most magnanimously stood aside. Mr. Hunt was not only going to visit the Old Country, but would also, he understood, cross the Channel and see what was going on in Berlin and other places, in order to ascertain what he could about the use of vertical retorts. As the members knew, the Germans were in the forefront in invention, not only in regard to gas, but to lighting generally. Consequently, he felt sure Mr. Hunt would be able, as the result of his travels, to interest them when the Association met again.

The motion was put and carried unanimously.

Mr. HUNT, in returning thanks for his re-election, said he appreciated very much indeed the honour the members had done in re-electing him as President for another year. It was with great diffidence that he consented to accede to the wishes of the Council in the matter, as he did not like the idea of postponing the promotion of the Vice-President (Mr. Lord), who had already stood aside the previous year on the plea that it would be well to have alternate meetings of the Association in Melbourne and the country. Mr. Lord, however, had assured him that he was quite willing to stand aside again. He (Mr. Hunt) would do his best to represent the Association in Great Britain or elsewhere, if and when occasion offered.

\* We have since learned that Mr. Hunt's departure for England has been deferred till April.—ED. J. G. L.



The other officers appointed for the year 1909-10 were as follows:—

*Vice-President.*—Mr. T. Lord (Geelong).

*Member of Council.*—Hon. George Swinburne (Melbourne).

*Auditors.*—Messrs. J. Bowman (Sale) and J. Lord (Williamstown).

*Hon. Sec. and Treasurer.*—Mr. C. W. Howlett (South Melbourne).

#### PLACE OF NEXT MEETING.

The PRESIDENT said the next business was to decide the place for the next annual meeting; and he begged to move that it be held in Melbourne. He wished to express the hope that every member would endeavour to help to make the annual meeting a success. They were stretching and enlarging their boundaries, as it were, and so extending the scope of the Association. Only the previous day they had approved of the election of a member from New South Wales. This suggested that they were likely to have requests for membership from other parts of Australia; and he hoped they would ultimately become a large organization, having members in all parts of the Commonwealth. Therefore it behoved members to provide the highest technical fare for their debates.

Mr. R. O. THOMPSON (Melbourne) said the intention was to have the meeting in the country in alternate years; but, under the presidency of Mr. Hunt, and considering how well they were entertained, they might hold it in Melbourne again. It was a central place for people from all parts of the Commonwealth, and for visitors from over the sea. He therefore had much pleasure in seconding the motion.

The motion was put and carried unanimously, and the meeting then closed.

#### VISIT TO THE SOUTH MELBOURNE GAS-WORKS.

As briefly mentioned last week (p. 430), on the afternoon of the first day of the meeting the members visited the South Melbourne works of the Metropolitan Gas Company, where they had an opportunity of inspecting the new carbonizing plant which has already been described and illustrated in the "JOURNAL" [see Vol. CVIII., p. 307]. The members were much interested in inspecting the operations; twelve-hour charges being worked. A feature of considerable attraction was the travelling platform and coke-shoot illustrated on p. 310 of the above-mentioned issue, which appeared to find favour on all sides. In another part of the works the new sulphate-house was inspected, and also a large water-tank in course of erection, together with filter-beds, for storing all surplus water from condensers, coke conveyors, &c., for use again in the retort-house. Finally, the special water-cooling plant, comprising a Linde machine of a refrigerating capacity of 12 tons per day, installed for cooling the water supplied to the condensers and washers, was seen in operation; and the system of condensation proposed to be carried out at these works, as outlined by the President in his address [*ante*, p. 429], was explained to the visitors.

#### THE PRESIDENTIAL DINNER.

In the evening, the members and visitors were entertained at dinner by the President at the Hotel Victoria, South Melbourne.

After the toast of "The King" had been honoured,

The PRESIDENT proposed the health of the visitors. He said that the members of the Association had been honoured and delighted to see at the meeting so many friends in the profession from elsewhere. On the two previous occasions, they had visitors from adjoining States. This year they had representatives from all the States (with the exception of West and South Australia), and also from the Dominion of New Zealand; and he hoped that the presence of these gentlemen was an indication that, as time went on, an increasing number of visitors would honour them by their presence, and help them to discuss and thrash out the many debatable points connected with their business. The Association was now getting firmly established, and it must consequently become of more use and of greater power in the gas industry in their part of the world; and he ventured to express the opinion that it would draw to it members of the profession in all parts of the Commonwealth and the Dominion. On the present occasion, he felt that they had all benefited by the presence of their visitors. It was not a case of unity being strength so much as of unity being an education, for all must assuredly learn something at the meetings, and thus become of more use to the Boards of Directors whom they served. On this occasion, it was gratifying to know that the various Companies were helping them, and encouraging them to hold their meetings; and he would take the opportunity of saying how much he felt indebted to his Board for the help given to him in connection with the Association.

Mr. S. E. FIGGIS (Ballarat) supported the toast, and remarked how gratified they were to see so many representatives from other States, and how pleased they were to extend the right hand of fellowship to their friends from New Zealand, Queensland, New South Wales, and Tasmania. To him their presence indicated that the fame of the Association was extending; and he hoped that in time to come they would have representatives present from as distant a State as Western Australia.

The toast was enthusiastically honoured.

Mr. HUNGERFORD (Dunedin, N.Z.), while thanking the members

for his reception, said he greatly appreciated the kindly action of all who, at no little inconvenience to themselves, had made such successful efforts to render their stay in Melbourne a pleasant one. Melbourne had to him been a city of surprises; and among them the progress of the Victorian Gas Managers' Association had not been the least. He hoped Associations would be formed in other States and also in New Zealand; but he should like to see one large society established, which might have branches in the various States, and so arrange matters that there could be a big meeting in one or other of the various capitals from time to time.

Mr. KEMPSTER (Waratah, N.S.W.) said that, though he had made a long journey to get to Melbourne, what he had heard and seen during his stay had well repaid him for the trouble.

Mr. RABBIDGE (Invercargill, N.Z.) expressed his appreciation of the kind remarks made by the President, and of the hearty manner in which the toast had been received. In accepting the invitation to be present at the meeting, he felt that he was sure of a cordial welcome. The hospitable way in which he had been received surpassed his expectations. He would thank the Secretary (Mr. Howlett) for his constant endeavours to show the visitors as much as possible, and make them comfortable. As for the business part of the meeting, he had learned very much from the discussions; and to him the visit to the South Melbourne Gas-Works was a revelation. It showed him something of what could be done in the gas industry. Of course, they worked on similar lines in New Zealand, but in a much smaller way; and it was astonishing to him to see the orderly manner in which such large works were carried on. It was evident that at South Melbourne a big scheme had been laid out, and would some day be brought to completion; and he thought that a day spent there by any gas man was something of an education. When he returned to New Zealand, and saw any of his brother gas managers, he would certainly tell them they had missed the chance of a lifetime not attending the Victorian Gas Managers' Association meeting.

Mr. BARSON (Broken Hill, N.S.W.), Mr. SCOLES (Ipswich, Queensland), and Mr. ALLAN (Hobart, Tasmania) also briefly responded.

Mr. BARSON proposed the health of the President, and wished him an enjoyable and useful time during his contemplated visit to Europe.

Mr. KEMPSTER supported the toast, which was drunk with musical honours.

The PRESIDENT, in acknowledgment, remarked that he had been very pleased to be of some little assistance in making the meeting a success. He was pleased to say there existed a free-masonry among the gas men in Victoria equal to anything of the kind in any other part of the world; and he hoped that when their visitors went back to the various States and to New Zealand, and came in contact with their fellow-managers, they would tell them that they had only to send the Secretary of the Victorian Gas Managers' Association an intimation that they were going to Melbourne about the first week in November, and they might rely on a hearty welcome at their meetings.

#### INSPECTION OF NEW LIGHTING INSTALLATIONS.

The company then dispersed, and proceeded to the Beaconsfield Parade, on the sea-front, in order to inspect the new installation of lighting recently put up by the Metropolitan Gas Company in conjunction with the South Melbourne City Surveyor (Mr. A. E. Aughtie). In this scheme, Kern burners are used throughout. The lamp-columns are placed at short intervals in the reserves along the foreshore; the columns being of the well-known Paris pattern, erected on special bases, and fitted with two brackets from which are suspended globe lamps, each containing three Kern burners. The details of the installation were explained to the members and visitors by Mr. G. F. Harper, the Chief Lighting Inspector of the Gas Company; and the excellent lighting was much admired by all. Later in the evening, the company walked to the St. Kilda Esplanade, and inspected the special lighting there. In this Paris columns (first introduced to Melbourne by Mr. Hunt for this installation) are also used, and are placed about 40 yards apart. The lanterns—made in the Company's own workshops—are of the shadowless type, and each contains three No. 4 Kern burners.

The Midland Association of Gas Managers will hold their annual general meeting in Birmingham on Thursday week (the 3rd prox.), when the new President, Mr. Vincent Hughes, of Smethwick, will deliver his Inaugural Address.

**Leeds and Butterfield on Acetylene.**—We have received from Messrs. Charles Griffin and Co., Limited, of Exeter Street, Strand, the second edition, enlarged and revised, of "Acetylene: The Principles of its Generation and Use," by the late Mr. F. H. Leeds, F.I.C., and Mr. W. J. Atkinson Butterfield, M.A. The book was originally brought out in the summer of 1903; and its revision for a new edition was already far advanced when it was interrupted by the sudden death of Mr. Leeds about two years ago. The revision was, however, continued by Mr. Butterfield, with the help of the very full notes which his collaborator had left. The result of his labours, as presented in the volume just published, will be more fully noticed in a subsequent issue. Meanwhile, we may mention that the price of the book is 8s. 6d. net.



## GAS v. ELECTRICITY FOR HEATING AND POWER.

### Debate between the Manchester Junior Gas Association and the Electrical Engineers.

The debate between members of the Manchester and District Junior Gas Association and the Manchester Students' Section of Electrical Engineers, on "Gas v. Electricity for Heating and Power," took place last Tuesday in the Manchester School of Technology. There was an attendance of about 150. Mr. V. NELSON DODGE, the Engineer to the Bradford Dyers' Association, was voted to the chair, on the motion of Mr. James Taylor, of Mossley, President of the Junior Gas Association, seconded by Mr. L. J. Jepson, of the Electrical Engineers. It was explained that, for the purposes of the evening's discussion, the price of gas would be taken as 1s. per 1000 cubic feet, and of electricity at 1d. per unit.

Mr. C. WOODHEAD opened for the gas engineers. He said that, though in no way belittling the great potentialities of electricity, he would endeavour to convince his hearers that for heating purposes it was an absolute failure at the present time on economic grounds. The amount of work performed in this sphere of labour being entirely dependent upon the number of British thermal units evolved from a unit of the fluid employed, and the efficient application of the same, it was necessary to acquaint themselves with the relative monetary value of an equivalent of each. Calculating from the prices agreed upon, they got the following preponderance in favour of gas.

	Amount of Fluid.	British Thermal Units.	Cost.
Electricity . . . . .	1000 watts	3425	1'0
Gas . . . . .	5'71 cubic feet	3425	0'0685

Or a penny would give 3425 units from electricity, but 50,000 from gas—an advantage of 15 to 1 in favour of gas. Having this great disadvantage to begin with, it was no wonder that electricity was at a standstill, and only adopted where novelty was the ruling passion, and expense a matter of entire indifference. Coming to a practical application of the respective fluids, he would place before his hearers a true bill of cost for heating two rooms for one year; the area being taken to meet the capabilities of the best electric heaters on the market and gas-fires chosen to suit. In the first case—that of a room with an area of 1600 cubic feet, with an average daily use of five hours—they got the following results: Gas-fire—ornamental stove, £1 12s. 6d.; gas consumed, 15 cubic feet per hour, £1 7s. 4½d.; and renewals, 6d.; making a total of £3 0s. 4½d. Electric radiator—radiator, £4; current, 1000 watts per hour, £7 12s. 1d.; and renewals, 4 els. at 4s. 6d., 18s.; or a total of £12 10s. 1d. This test gave them four times the cost by electric heating for the first year, six times for running expenses, and a saving of £7 per annum if gas were used. In the second case, the area of the room was 4000 cubic feet, and the average daily use the same (namely, five hours); the details being: Electric bronzed gas-fire, £4 18s. 6d.; gas consumed, 30 cubic feet per hour, £2 14s. 9d.; a total of £7 13s. 3d. Elerector, £12; current, 3000 watts per hour, £22 16s. 3d.; a total of £34 16s. 3d. The advantage for gas here on the first year was nearly 5 to 1, and running expenses 9 to 1, or a saving of £20 per annum. His experience of a gas-fire regularly in use for three years was that the renewals were *nil*; but with the electric radiator he was informed that it was generally found necessary to replace each element at least once a year. Turning to the cost of heating workshops, factories, churches, public halls, &c., he submitted the following economic statement relative to the three forms generally used for this purpose:—

	Electric Radiator.	Gas Steam Radiator.	Gas-Fire.
Consumption per hour . . . . .	1 B.T.U.	12'0 cub. ft.	25'0 cub. ft.
Total heat produced B.Th.U. . . . .	3425	7200	15,000
Available heat B.Th.U. . . . .	3425	7200	10,500
Cost per hour . . . . .	1d.	0'144d.	0'3d.
„ of equivalent heating value. . . . .	3'1d.	0'210d.	0'3d.

In this calculation, he had only allowed an 80 per cent. efficiency for the gas-fire, but clearly showed the enormous advantage, on equivalent values, of 15 to 1 in favour of the gas steam radiator, and 10 to 1 in favour of the gas-fire. He asked them to compare a well-known and tested gas steam radiator, suitable for heating 10,640 cubic feet in factories and workshops, against the electrical appliances on the market for doing the same work. The tested consumption of gas in this appliance was 23 cubic feet per hour, giving them 13,800 B.Th.U. per hour, all of which was available for use. They would require at least four five-element radiators or two elerectors. How did they compare here for cost at the end of twelve months, the average daily use being taken as eight hours? In order to illustrate his point, he submitted the following figures:—

GAS.	
One gas radiator . . . . .	£11 0 0
Gas consumption . . . . .	3 7 2½
Renewals . . . . .	—
	£14 7 2½

### ELECTRICITY.

Four radiators—					
Five Els. . . . .	£25	4	0	Two Els. . . . .	£24 0 0
Current . . . . .	60	16	6	Current . . . . .	73 0 0
Renewals . . . . .	4	10	0	Renewals . . . . .	—
	£90	10	6		£97 0 0

Here, again, they had an advantage for gas of 7 to 1 on the first year's cost, but over 20 to 1 for current consumption. As these elerectors were only advertised for 4100 cubic feet capacity, it would be necessary to put three of them in instead of the two he had taken for comparison. These examples could be multiplied times without number—all indisputably proving the vast superiority of gas from a thermo-dynamical standpoint, as well as on economic grounds. Another sphere of usefulness where gas was largely adopted, and was rapidly extending, was for the heating of water for domestic and other purposes. He would demonstrate by statistics that the efficiency of gas over electricity was 12 to 1 on the heating of 120 gallons of water from 60° to 120° Fabr. He mentioned that at a well-known business establishment in London 200 gallons of water were boiled daily for teas, at a cost of 10d. Calculating this on the prices they were debating upon, they got a cost of 5½d. for gas. If electricity were used, the price for current would be 7s. 4d.—another 16 to 1 advantage for gas heating. A seven-course luncheon was recently cooked by electricity for 65 persons at a cost of 4s. 8d. Against this, an eight-course dinner for the same number of people was cooked by gas for 9d. A comparative statement relating to the cost of an electric cooker and appliances compared with a gas-cooker showed £19 0s. 6d. for the former, and £7 13s. 2d. for the latter. To this had to be added the exceedingly high cost for renewals with the electric method, whereas they as a rule obtained a gas-cooker for nothing, or at most for a nominal yearly rent, with no expense whatever for renewals or repairs.

Mr. L. J. JEPSON followed as leader for the advocates of electricity. At the outset, he complained about the prices arranged; saying they made his task almost hopeless. Still, there were, he submitted, other factors to be considered besides that of price. The vital point at issue was whether electricity could, or did, compete favourably with gas for domestic and industrial purposes. If so, under what circumstances. With the price of 1d. per unit for electricity, and 1s. per 1000 cubic feet for gas, electricity had in some cases absolutely no chance, and in most of the other cases very little chance, on the question of price. Out of curiosity, he obtained from the returns the average price paid for a unit of electricity for heating purposes in England; and it came out at 1'7d. This included both small and large stations; the price varying from ½d. to 3d. Then he obtained the average price of gas of the first 75 places on the list of towns where a special price was quoted for heating; and this came out at 3s. 9½d. per 1000 feet. Then he took the average price quoted by the first 50 places having an output of at least 100,000,000 cubic feet; and it came out at 2s. 5d. per 1000 cubic feet. This included the price for gas-engine supply, where heating was not specially quoted. These figures allowed of a reasonable comparison to be made for many operations with various classes of apparatus. Where electricity could compete with gas, however, was in its utility, cleanliness, and healthiness. Ignoring for the moment the question of price, he asserted with confidence that there was no operation beyond that of poisoning which could not be as successfully performed by electricity as by gas. Gas engineers should remember that the real electrical industry was only 25 years old, and the heating section only about ten; further, that the price of current had only recently become sufficiently low to allow the consumer an opportunity to make a trial at a reasonable cost. Personally, he was of the opinion that the successful advent of electric heating was only made with the birth of the luminous radiator. Had the gas-heating engineer started with the same competition as the electric heating engineer, he would probably have had less successful results, not because of his lack of ability, but because of the natural disadvantages of his commodity. Gas heating was dearer than coal; and its present popularity was only due to its usefulness—especially in summer, and at odd times. Because of its greater usefulness, cleanliness, and healthiness, therefore, it was natural to expect that electricity would eventually oust gas from its present position. One of the most telling things he knew of in the history of the fight for supremacy in favour of electricity was the enormous increases in the number of articles now sold compared with the last five or six years. Up to 1904, the output of one of the largest, if not the largest, manufacturers in the country had only been between 4000 and 5000 articles; whereas for 1909 no less than 26,000 were sent out. These thousands were only missionaries of the millions which would follow as sure as day followed night. He defied any gentleman present to prove to them that any cooking operation could be done by gas which could not be done equally well by electricity, providing, of course, that each selected his own apparatus. He would go further, and say that any ordinary gas-stove which cooked directly by gas-flame tainted the food, unless special precautions were taken. Deny it as they might, the gas-cooker in the hands of the ordinary servant or person was a dirty article after some use, and consequently smells were emitted when heated. If they doubted this, let them study the gas trade papers for the week ending Jan. 29 last. The disadvantages he had spoken of were not to be found with the electric grill. Where the shoe pinched was that the electrical engineers had nothing much to lose and all to gain; whereas just



the opposite was the case with their gas friends, for they had the monopoly at present.

Mr. D. V. HOLLINGWORTH followed next on behalf of gas. Dealing first with the charge that gas-fires emitted fumes and products dangerous to health, he said it had been repeatedly proved that a normally burning gas-fire did not evolve into a living room smoke, carbonic acid, carbon monoxide, sulphur, or, indeed, any deleterious products whatever. It had sometimes been urged, to the disadvantage of gas, that viands cooked in a gas-oven smelt of gas. What nonsense this was! For culinary purposes, the heat from a gas-flame was well-nigh perfect; being far superior to the old-fashioned grill. Dealing with the chief ways in which heat was given off from its source, he would endeavour to show that the electrician's fondness for convection heating was not so much because he considered it the best way of doing the work, but because it was the only system that he could adopt which had a ghost of a chance of being economically successful. Convector heat could be easily obtained from an electrical radiator working at a temperature of about 200° or 300° Fahr.; but a respectable percentage of radiant heat could only be obtained when the electric elements reached a temperature above 1000° Fahr. It was well known what an extremely destructive effect such a high temperature would have upon the tubes and terminals foils and filaments, which went to make up the complicated electric radiator. In one of the most famous electric radiators on the market, there were fixed six glowers containing iron spirals. For each of these wires, the makers claimed an average life of 500 hours. So that in one year each spiral, working nine hours a day, would have to be renewed six times. Six times for each spiral and six spirals, made 36 spirals altogether, which, at 6d. each, meant 18s. a year for spirals alone, not to mention the trouble of pulling the stove to pieces once every ten days. Here was laid bare the mind of the electrician when he preferred convector to radiant heat for warming. A temperature sufficient to give radiant heat would mean oxidation of the wires, breaking of the glowers, melting of the enamel in which the elements were embedded, and, in short, it would, and did, mean the renewal of the entire heating elements every day or two, at a cost, in most cases, of 4s. 6d. a time. Let them contrast this with the utility and the stability of a modern gas-fire with its radiant heat. In the "business part" of the gas-fire there was attained a temperature of over 2000° Fahr.; and this could be kept up for years without a vestige of injury, on the outlay of 2d. on renewals. On the question of gas heating of rooms and ventilation, he said that, where a gas-fire was used, the products of human exhalation had no time to become deposited on the walls and ceilings, as in a room electrically heated. Where a gas-fire was used, the impurities actually passed through the fire, whereas by the use of a low temperature convector or elelector, there was no intense heat to destroy the impurities; and even where an electric radiator was employed, the heating elements were so enclosed by globes and glowers, shields and screens, that for the purposes of bacterial destruction they were absolutely useless. In the light of these facts, the modern gas-fire, constituting as it did such a perfect warming, ventilating, and sterilizing instrument, had been well-named the "refiner's fire." While not denying to electricity a certain sphere of usefulness in other directions, yet in the enormous field of domestic and industrial heating he most emphatically denied that electricity could attain a position of any importance. The day when Bunsen designed his burner, electricity was hopelessly beaten. To-day, in comparison with the gas-fire, electricity was thrice beaten; and in the days ahead, when the final conflict came, he did not hesitate to affirm his sincere conviction that electricity would still be beaten.

Mr. L. J. LEFINE then took up the case for electricity against gas in connection with power. It seemed to him, he said, that the electrical representatives agreed to the low price of 1s. per 1000 cubic feet of gas for the evening's debate because otherwise there could have been no cause for discussion. Gas was not really a competitor of electricity for industrial power purposes; and the only reason why gas-engines were sold was that there happened to be places at the present time where electricity was not procurable. No doubt they would have figures produced that evening showing that gas power was cheaper; but in order to do this, their gas friends would have to take the worst electric drive possible—that was to say, they would drive by electricity the same way as they would drive by a gas-engine. Anybody who adopted a gas-engine, always without exception would have a group drive. The remainder employing an electric drive would take advantage of the enormous benefits derived from what was called the individual drive. This was a most important feature, and was largely responsible for the scrapping of large gas-engines everywhere. In big works, it was absolutely essential, so as to obtain economy and also high efficiency, that all machine tools and industrial machines should be, as far as possible, individually driven, so that there would be no unprofitable shafting employed. That was to say, a machine would only be running when it was actually wanted. Arguing that even with gas at 1s. per 1000 feet electricity was cheaper, he submitted figures as to the cost for a 30 H.P. installation. In this he allowed for one gas-engine driving the whole shop for the gas installation of 30 H.P. output, and allowed for three 7½ B.H.P. motors for the electric equipment, driving separate machines, or else separate groups. The figures for an electric installation came out about half that of the gas installation; and a great deal of unnecessary shafting was eliminated, together with the various losses incurred for the same. With regard to the running costs, there

was an apparent saving with the gas-engine of £6 per annum. But this was completely wiped out in almost every case by reduced output, and therefore reduced profits, caused by breakdowns, starting difficulties, and prosecutions for nuisances; also rent of space required by the gas-engine, and loss of work from machinery which could have occupied the space. This he put down at anything from £10 to £100 per annum. Then if gas had been charged at 2s. instead of 1s. per 1000 feet, the £6 saving would have been more than absorbed. One never found a modern works of large or medium size driven by anything but electric motors—it would not really pay to use gas-engines. A gas-engine, he maintained, was no use where a variable speed drive was required, or where a constant speed was needed. Where it was possible to discard a gas-engine and put in an electric motor, one was amply repaid by the less attention necessary. In order to make apparent the vast differences between the gas-engine and electric motor, it was only necessary to specify the various moving and wearing parts of a gas-engine. Further, the disadvantages of the gas-engine were made more apparent when they considered the amount of space necessary as compared with the electric motor. Almost as soon as the gas-engine was put down, its troubles began. First of all, there was the starting difficulty; and where an engine was provided with tube ignition, it was necessary for the person responsible for starting-up to light the ignition-tube about half-an-hour before it was required to start the engine. To overcome this difficulty, gas-engine builders had to go to the electrician to purchase an electric igniter—a fact that at once demonstrated the advantages of electricity. The places where electric motors had superseded gas-engines were too numerous to mention; but he alluded to one firm in the Manchester district, makers of gas-engines, who were for power purposes replacing them with electric motors. Gas-engines above 30 H.P. were not to be considered seriously as competing with electric motors; and below 30 H.P. it was, he contended, actually cheaper in the long run to employ electric motors, owing to the less bother and the smaller space required. The following were the things they did not find with a gas-engine: Great reliability, high efficiency, low capital cost, steady drive, low cost of stores, low cost of repairs, saving of time in starting, saving of space, cleanliness, and simplicity.

Mr. C. E. TEASDALE pointed out that, despite the unfair competition practised by their opponents, especially in rate-aided electrical supply undertakings, gas yet led the way with a considerable margin. If an electrical undertaking made a loss it did not matter; and if a small profit was shown, it was considered to be doing extremely well. On the other hand, gas undertakings owned by the local authority had to give up large sums out of profits in relief of rates—a system which often resulted in those having control of the electrical works offering current for power purposes at or below cost price. To prove this, he quoted some statistics presented by Mr. Snell, in a paper recently read before the Institution of Electrical Engineers. These were as follows:—

Authority.	Actual Charge Per B.T.U. d.	Correct Charge Per B.T.U. d.
Barking . . . . .	1'686	1'747
Battersea . . . . .	1'500	1'975
Fulham . . . . .	1'000	2'024
Hackney . . . . .	1'240	1'384
Hornsey . . . . .	1'270	2'225
Ilford . . . . .	1'324	1'440
Islington . . . . .	1'370	2'214
Kingston-on-Thames . . . . .	2'000	2'370
Leyton . . . . .	1'623	1'857
Poplar . . . . .	1'430	1'686
St. Pancras . . . . .	1'000	1'838

Even under such circumstances, gas was much cheaper for power when compared with electricity. In the first place, they found that gas gave 50,000 B.Th.U. for 1d., while by electricity the consumer received 3429 B.Th.U. for the penny. He was prepared to admit that under some conditions the electric motor was preferable, even if costing more, on account of the small compass, and where required for intermittent use. Still, cost with most people was an important factor in the situation; and he directed his hearers' attention to the following table:—

Relative Costs of Gas-Engine v. Electric Motor.

Town gas, 1s. per 1000 cubic feet. Electricity, 1d. per unit.

Size in B.H.P.	Efficiency of Electric Motor.	Efficiency of Gas- Engine.	600 B.Th.U. Gas Consumption per B.H.P. per Hour.	Pence.		Pence.	
				Electricity Total Cost per Hour.	Gas Total Cost per Hour.	Electricity Cost per B.H.P. per Hour.	Gas Cost per B.H.P. per Hour.
1	87	80	24	0'86	0'29	0'86	0'29
30	91	89	15	24'6	5'4	0'82	0'18
300	93	90	15	241'0	54'0	0'803	0'18
1000	95	91	15	790'0	180'0	0'79	0'18

Looking at the table, it would be observed that the efficiencies of the motors were placed at a high figure; whereas those of the gas-engines were very moderately put. The B.Th.U. per cubic foot of gas were also low, and erred greatly to the advantage of the electric motor. A gas-engine was as efficient for 30 H.P. as for 1000 H.P. The consumption of gas was strictly proportional to the work done. One building could therefore be as economically driven as two. No extra labour was required for the engine;



and there were no make-ready expenses nor any stand-by losses. Even with gas at 2s. 6d. per 1000 feet and electricity at as low a price as 1d. per unit, gas was the cheaper mode of producing power, as was demonstrated by Mr. G. M. Brown in the "Electrical Review" some time ago. In further proof of his argument that gas was the cheaper source of power, he gave particulars of a test carried out at the works of Messrs. J. Linton and Co., Wolverhampton, by Mr. Thomas Canning. The gas-engine employed had been working six years on the same operation as the test, and was therefore, comparatively speaking, an old one. It had never been repaired from the time of its installation. The electric motor was a new one of the Byng Hawkins make, and marked 14 H.P., 260 volts, 1000 revs. The gas-engine maximum load was 16 H.P. For the test, the contractors had placed on each two identical sets of machinery by the same maker, and guaranteed to turn out the same amount of work. These machines were fully employed in the test of planing and moulding pine wood of exactly the same size. The gas-engine had 35 feet of shafting and six bearings; while the motor had only 16 feet of shafting and three bearings. Both performed their work admirably; and at the end of an hour both were stopped. The recorded readings of the meters were: Gas consumption, 110 cubic feet; electricity, 4'38 B.T.U. The cost of the latter, at 1d. per unit, would be 4'38d. per hour; and that of gas, at 2s. 10d. per 1000 feet, was 3'74d. per hour, or a saving of 0'64d. per hour. By converting this to the 1s. per 1000 rate, and working 3000 hours per annum, the saving by gas was £38 5s.; the cost by electricity being £54 15s., and of gas £16 10s.

Mr. A. R. STELLING referred to the flexibility of drive and adaptability of the electric motor to unfavourable surroundings. Next to flexibility, the marvellous capacity for overloads and sudden shocks formed the most important quality of the electric motor. The demand for small power was increasing enormously; and he maintained that this demand could only be met by the electric motor. The small gas-engine was too costly, too noisy, too dirty, took up too much space, and generally for small power was entirely undesirable.

Mr. F. THORP, on behalf of the gas engineers, said that the point in the debate so far that must have struck even the most casual observer was the remarkable disparity between the figures and diagrams shown on the screen by the partisans of both gas and electricity. This, he was afraid, was due, first, to a desire on both sides to make their case as strong as possible, and, secondly, to the methods by which the calculations had been made and the sources of the reference for the compilation of the tables. He held, however, that his friends on the gas side, having an unassailable case, were able to make their calculations on indisputable authority, and had taken the electrical engineman's own statements for the calculation of the electrical data. Searching for data in a well-known electrical book, he came across a remark that from 25 to 55 cubic feet of coal gas were necessary to produce 1 B.H.P. As a matter of fact, it was everywhere recognized that, even with an ordinary sized gas-engine, 16 feet of coal gas would produce 1 B.H.P. They could quite see, therefore, that their electrical friends had been led astray by their own tutors. Jealous of their formidable rival, the electrical engineers had missed the uses of their own product, and had that night been "flogging the wrong horse" all the time. His gas friends had proved conclusively that gas as a prime-mover was far and away cheaper than electricity at the prices arranged for the debate; and that these charges were not imaginary, was proved by the fact that at Sheffield gas was supplied for over 1000 engines at this figure, while in Widnes the Corporation charged in many cases only 10d. per 1000 cubic feet. That in these two towns there was practically very little electricity supplied from the town mains to private consumers, amply proved the contention of those on his side. In Widnes, he understood, there were no places driven electrically, except where current was produced by gas-engines; and in Sheffield they had a recent authentic case of this substitution of electric current from the town supply by two Westinghouse four-cylinder engines of 150 H.P. each working on coal gas. Scores of similar examples could be given. That gas people were not prejudiced, was plain from the fact that in gas-works they used all kinds of transmission methods—electricity, compressed air, hydraulic power, or mechanical transmission—whichever best suited their purpose. He desired to explode the two popular fallacies that gas was of varying quality, and that electricity was of uniform excellence. A gas-engine constructed for Manchester gas would be suitable, without the slightest alteration, and with very little adjustment, for practically any coal gas supply throughout the world; while, on the other side, there were scores of—should he say?—qualities of electricity which required their own special motors to be of real service. In Manchester, they had principally direct current of a certain voltage; and motors were obtained suitable for the purpose. Suppose, for instance, it was necessary to move to Trafford Park, where they had alternating current, this machine would be absolutely useless. Again, take the case of works (say) in Salford, with alternating current, and remove them to Eccles, would the machine work well? No, because the frequency was different. These cases could be multiplied indefinitely. Let them contrast this with the gas-engine, which would work equally well in any of the places. If they must have electric transmission, then by all means be independent of the varying distributing systems and generate the electricity by a gas-engine. They had the advantage of engines from 8000 to  $\frac{1}{4}$  H.P.; and he could demonstrate

that it was possible to economically use gas down to a blue-bottle power. [At this stage, Mr. Thorp drew attention to a gas-driven fan he had on the platform, designed by Mr. Brockway, of Cleethorpes, which would run for 1000 hours for 1s.] In conclusion, he asked those present to assist the gas engineers in removing from the industry the old, obsolete, and unjust restrictions, both parliamentary and municipal, which hampered them, and to cease allowing gas profits to be appropriated for the relief of rates and the bolstering-up of rivals.

Mr. J. S. MESSENT then dealt with the flexibility of the electric motor and its quiet, smooth running.

Mr. J. ALSOP (Stockport) next answered the call of the Chairman; his remarks being directed to show the disadvantages of electric heating and cooking. In most towns, he said, the cost of current for lighting was much more than 1d. per unit. Therefore, to take advantage of this price for heating and cooking, the consumer had to have an extra meter and wiring system installed, for which he generally had to pay. Again, should the unfortunate consumer remove to another town, his cooker and heater were rendered valueless, because an instrument designed to work on (say) 200 volts was quite useless on a 100-volt circuit until it was specially adjusted for that voltage, which could not be done *in situ*. On the other hand, a person could have a gas-range with all the parts standardized and suitable for use in any part of the world. A valuable feature about all gas appliances was the ease and delicacy of their adjustment by the simple manipulation of a tap. In an electric boiling arrangement, no matter what amount of liquid there might be in the pan, it was only possible to use two qualities of heat—the larger current to bring the liquid to the boil, and the smaller to keep it there. In their attempts to heat water by electricity, their competitors seemed to have been particularly unfortunate. In one system, the water was heated by a current passing directly through it. Now in proportion as the water was charged with salts, so would the water be subjected to electrolysis. When this occurred, hydrogen and oxygen were given off, and contaminated the water heated. Further, when electrolysis took place, there was a corresponding wastage of current, the work done in decomposing the water absorbing much electrical energy which ought to go towards heating the water; and, over and above all this, there was a big loss of energy due to the conductivity of the water—there being also continual decomposition of scale in the apparatus, which still further reduced its utility. Such was the magnificent efficiency of this geyser, that it would give the enormous quantity of one whole pint of lukewarm water per minute, with a consumption of 1000 watts, and an initial cost of £3 10s. As to the relative reliability of the two heating fluids, it was very rare indeed for the supply of gas to fail. On the other hand, a cessation in the supply of electricity was only too common. What would occur in the event of the current to a radiator failing during a critical period in the sick-room?

Mr. A. L. HAWES said it was a striking circumstance that gas engineers themselves were awakening to the fact that electricity was the ideal power, as there were several gas-works in the country where electricity was extensively used to drive auxiliary and coal handling plant. Again, a large English firm of gas-engine builders drove almost all their works by electric motors. He defied anyone to find a gas-fire that did not smell.

Mr. W. L. HEALD (Preston) drew special attention to the fact that with two of the largest insurance companies in the country, the premiums charged per horse power were slightly in favour of the gas-engine. He had before him a list of insured plant—namely, gas-engines and electric motors—giving the amounts recently paid by a prominent insurance company for accidents. In the case of the gas-engine, the amount paid per accident was £7 7s.; whereas in the case of motors (motors only), the amount was £10 8s. He also noticed that the National Boiler Insurance Company sent their inspectors to electrical plant three times a year, as against twice to gas-engines. He asked if they had ever heard of a gas-engine being stopped because a corporation workman had driven his pick into a gas-main. Occasionally the gas-mains were broken; but, except on the outskirts, there was no cessation of supply, on account of the network of mains being joined at so many different points.

Mr. R. H. GINMAN (Birkenhead), among others contributing to the debate on the side of gas, said that for direct-heating by fires, condensing stoves, &c., gas had now become enormously popular; while for indirect heating in steam and water radiators, it was equally largely used. Buckingham and Kensington Palaces, the Mansion House, Covent Garden Theatre, and, above all, the offices of the General Electric Company in London, were all of them heated by steam-radiator, in which the heating fluid was gas. Coming nearer home, he mentioned the case of the Central Theatre, Altrincham. During the winter of 1908, an attempt was made to heat the place by four large electric radiators. The cost of current at 4d. per unit came to the enormous sum of 27s. per week; and the management were only using the radiators from two to three hours a day. At the beginning of the present winter, the whole lot were thrown out, and gas-heated steam radiators substituted. The average cost for gas, at 2s. 5d. per 1000 cubic feet, had been only 6s. a week, notwithstanding that the gas-radiators were kept burning eight hours each day.

Mr. J. M'NICHOLL (Warrington) said that if the electric motor possessed all the advantages over the gas-engine which their friends claimed, gas-engine builders must be having a bad time indeed. But what were the facts? If they looked at the reports of the various makers, they found the trade increasing consider-



ably year by year. A great deal had been said on the other side about the convenience of very small motors. He admitted that gas-engine builders in this country did not do much to cultivate this field. He supposed the reason was it required the whole of their energies to meet the demand for medium and large sized engines. For power up to 4 or 6 horse, used only for a few hours per day, for small industries, the new quick-running gas-engine was not dearer as regarded first cost than electric motors of the same power; and it had already been clearly demonstrated how much could be saved in the cost of running. Besides, the ground area required for these was not greater than that needed for electric motors of the same power. As to reliability, he mentioned the case of the North-Eastern Railway Company. This Company had installed an electro-pneumatic signalling station at Newcastle; and before deciding upon the motive power to be employed, the claims of both gas and electricity were fully inquired into. It was found that in the preceding two years there had been six partial failures of electric supply; and a failure of gas in Newcastle had never been recorded. It was eventually decided to instal four gas-engines and two motors; and this decision had been amply justified. Some time after their installation, the gentleman supplying these particulars called, and found one of the motors not in use, as the armature had burned out.

The CHAIRMAN, in summing up the debate, said the great thing was the supply of electricity at a price to make it a commercial success. There was no doubt in his mind that gas for motive power held the advantage as to price; and, again, gas engineers could certainly claim that their system for heating and cooking was reliable, if at times a little objectionable because of the smell. From his own experience, he found that gas taken through the ordinary engine at 2s. per 1000 cubic feet and electricity at 0.55d. per unit just about compared. This being the case, it was not a commercial success to take current from the local supply company for large works.

## YORKSHIRE JUNIOR GAS ASSOCIATION.

### Visit to the Keighley Gas-Works.

The advantage of a visit to gas-works as a regular part of a Junior Association programme was well exemplified last Saturday, when the Yorkshire Junior Gas Association visited the Keighley Gas-Works. These works had been planned and erected by the late Engineer, Mr. John Laycock, whose long tenure of office had stamped them with the impress of his personality and his fertility of invention; so that wherever the visitors turned they found something of interest and often of novelty. Under such circumstances, the large attendance was only what had been anticipated; and their high expectations were fully realized. Mr. John Harrison, the Chairman of the Gas Committee, and Mr. W. Baillie, the Engineer, received the members; and, to their great pleasure, Mr. John Laycock joined the party soon after, and assisted Mr. Baillie as guide.

The great attraction, of course, was the installation of the Telfer coke-conveying plant—the first of its kind in the North of England, and the first instance of aerial conveying plant that most of the visitors had seen. It was described and illustrated in the "JOURNAL" when it was erected [see Vol. CV., p. 373]. It was closely examined in its operations, and questions were freely asked. The comparative fewness of men needed in the retort-house was much commented on, as was the celerity and ease with which 18 cwt. lots of coke were removed, slaked outside the retort-house, and delivered to the coke-breaker and screens or else run 800 feet to the end of the coke-yard. Slaking is completely under control; and the time for which the coke-skip and its contents are immersed in water is so calculated that after breaking and screening the coke is still warm, and contains a minimum of moisture. Under such conditions, it is not surprising that a large and growing demand for coke exists in Keighley and the lime-burning districts of Upper Airedale. About 25 per cent. of the coke is broken and screened; there being a considerable demand locally for the smaller sizes on blacksmiths' hearths at the local engineering establishments. One notable advantage of the Telfer system is the avoidance of the formation of breeze, as the skip can be lowered before turning over, and thus very little fall is given to the coke.

The other mechanical accessories of the retort-house are equally up-to-date. Coal is delivered direct from the railway waggons into a large hopper placed over the coal-breaker. This hopper is sufficiently large to admit of waggons being discharged from the end, sides, or bottom; and from it the coal is automatically fed to the breaker in a steady delivery. The works locomotive is appropriately named "Murdoch." The usual elevator, hoppers, &c., are provided for the De Brouwer charging-machine; the De Brouwer-Jenkins ram is used for discharging. Both are placed on the same side of the bench. The machines and the conveyor are operated electrically; each having its own Siemens plant driven by "National" gas-engines. Instead of duplicating these, they are so arranged that in the event of either breaking down the other plant can be made to work both the machines and conveyor; the margin of power being enough to manage this as a temporary expedient. The settings are in nines, with regenerator furnaces. Braddock's retort-house governors are employed, and tar-towers are installed. These received much attention; and Mr. Laycock

(to whom their special feature is due) was in constant requisition for explanations. By the addition, at the bottom of the tower, of an extra liquor-filled chamber, into which the tar is run from the tower preparatory to sending it to the tar-well, the seal is maintained unchanged, even when thus running off the tar, as the lower vessel is then shut off from the hydraulic main.

The retort-house engrossed much of the time of the visitors, but the works contain many other features of interest. Begun in the year 1876, they were planned by Mr. Laycock with the view of finally consisting of three independent units, each of a million cubic feet daily capacity. The second unit was constructed in 1886; and vacant places about the works are reserved for the third unit, whenever its erection becomes necessary. The site of the old works is between one and two miles away, and still contains a 300,000 cubic feet holder, from which 70 per cent. of the total gas supply is delivered. This is fed by a 12-inch main, which has for some time been insufficient for the work devolving on it. As special local conditions rendered the substitution of a larger new main difficult, recourse was had to "boosting;" and a Sturtevant fan, driven by a De Laval steam-turbine, was installed. This was shown in operation. It delivers gas at a pressure of about 12 inches at its outlet. The service holder is made to close a valve as it rises to its full height, and so cut off the gas supply; while, as an automatic water-loading arrangement is attached to the station governor, no constant attendance is needed at the station. It is noteworthy that during the three-and-a-half years it has been in use this plant has needed no repairs whatever, and still works with complete smoothness and satisfaction. This, of course, partly results from the almost affectionate watchfulness extended to all machinery on the works; the signs of it being noticeable throughout the whole visit.

Other features of interest were one purifier-house with hydraulic rams for lifting the lids, the other house having had its boxes extended and converted into the dry lute type, with Clapham's arrangement for tightening-up the fastenings, and a naphthalene washer which was a board-filled scrubber instead of a Livesey washer or a rotary washer-scrubber as generally used. Mr. Laycock's well-known washer-scrubber (filled with 1½-inch diameter wood balls) originated on these works, and the first machine is still in use. The gas-works are in rather an exposed situation; and the presence of horizontal wind-plates on the holder cups was explained, and proofs of their need were quoted.

At the conclusion of the visit, the company were conveyed by special tramcars to the Town Hall, where they were entertained at tea by the Gas Committee. At the close of the repast,

The PRESIDENT (Mr. S. W. Shepherd) moved a vote of thanks to the Committee and their Chairman for the permission they had given to visit the works, and for their kindly provision of refreshments, also to Mr. Laycock and Mr. Baillie. He spoke of the great interest all had felt in going through the works, of the unstinted readiness of everyone concerned to give information and explanation, and of the exceptional nature of what had been seen. They appreciated the honour of the Chairman's presence among them. He congratulated the Committee, through their Chairman, on possessing most up-to-date works, if any gas-works dared to call themselves fully up-to-date if they had no vertical retorts. At any rate, they had what was probably the last word in labour-saving devices.

The motion was spoken to by Messrs. ATLEY and CRANFIELD, and carried by acclamation.

Mr. HARRISON briefly replied; assuring the members of the pleasure he had had in welcoming and accompanying them, and of his pride in the works over which he presided.

Mr. LAYCOCK said the visitors were donning their armour; and he had just put his off. He had enjoyed meeting them, and was happy if he had in any way been able to add to their understanding of the works. He wished them every happiness and professional success—saying he could hardly wish them a happier time or more pleasant relations with employers than his had been with the Keighley Corporation. His mind had been going back and reflecting on the great changes of the last twenty-five years. A quarter-of-a-century ago they had as many retorts in operation as now, with but half the present output. He could remember when they were satisfied with 6000 to 7000 cubic feet of gas per ton of coal; whereas now they sold 11,000 cubic feet, and had designs on still higher figures. The price of gas had been 4s. 2d. per 1000 cubic feet; and it was now 1s. 11d. to 1s. 5d. Burners had joined in the general advance, and instead of an efficiency of 3 candles per cubic foot of gas burnt, they now got 30 candles and even 60 candles with compression; so that now 1s. worth of gas gave as much illumination as formerly needed 20s. to buy. This improvement was wonderful for so few years; and he was full of hope and high expectation for advances in the future such as would place gas in an absolutely unchallengeable position among illuminants.

Mr. BAILLIE thanked the members for coming in such large numbers, and assured them of the pleasure their visit had afforded him. He said they must remember that the credit for installing the Telfer system was entirely due to Mr. Laycock; and theirs was the first that actually entered the retort-house as well as traversed the yard. Their machines and conveyor had effected very considerable saving in the carbonization bill; in fact, including all charges that could in any way be classed under carbonization, it worked out at about 1½d. per 1000 cubic feet in wages, and this in spite of fairly high wages and a three-shift system.



## SCOTTISH JUNIOR GAS ASSOCIATION. WESTERN DISTRICT.

### Visit to the Broxburn Oil-Works.

Last Saturday afternoon the members of the Western District Division of the Scottish Junior Gas Association, to the number of between thirty and forty, paid a visit to the works of the Broxburn Oil Company, Limited. Arriving at the works at half-past three, they were met by Mr. G. M'Killop, the Assistant Chemist, who proved to be an exceedingly efficient guide; describing every process and product in clear, concise language, and with commendable brevity.

Beginning in the laboratory, Mr. M'Killop first exhibited a piece of shale, which he explained had been deposited as a sort of mud, and which had changed organically until it became the material it now is. Then he described the process of retorting in vertical retorts of great height, into which the black coal is placed cold, at the top, and in its downward course passes through the heat zone, and again becomes cold before the spent shale is drawn off at the bottom. He stated that at first the retorts in which the shale was carbonized were horizontal, the same as are used in gas making. When vertical retorts were introduced, they were half the size of those now employed. Vertical retorts yield more both of oil and ammonia. Four-and-a-half tons of shale are charged into a retort in a day, and it takes 24 hours for the charge to travel from the top to the bottom. During the whole time a current of steam is kept passing up the retort. The oil comes off in the upper part before the highest heat is reached, and at this heat they get ammonia and permanent gas. The vapour products, after being condensed, are separated—the crude oil going to the refinery, and the ammoniacal liquor to the sulphate works. Specimens of the various oils obtained in the distillations in the refinery (motor spirit, naphtha, burning oils, and lubricating oils) were shown; and also the other valuable product, paraffin wax. The treatment of the oil, between distillations, with sulphuric acid and caustic soda was explained; and it was also stated that, after the burning oils are extracted, what remains is sent through a refrigerator, the product being put into bags subjected to pressure, which separates the blue oil from the paraffin wax. In the working-up of the blue oil, gas oil is obtained of two qualities—one of from '840 to '850 sp. gr., and the other of '870 sp. gr. The residue is lubricating oil.

The company then started to walk round the works. The retort-bench was first visited. There it was explained that in the course of the retorting sufficient gas is obtained to heat the bench; the gas being used unpurified. The only other heat required is in the raising of the steam, for which coal is used. After inspecting the retort-bench, the sulphate-house was visited, where it was explained that two processes are used—one being a vacuum process, which produces crystals of great purity. The yield of sulphate is about 45 lbs. per ton of shale. The visitors then passed into the refinery, where it was shown how the permanent gas which comes off is collected, and so much of it as is required sent to be purified, and then used for illuminating purposes in the works and the town of Broxburn. The rest, with the tar produced in the process of refining, is used to heat the stills. The company were afterwards taken to the department where sulphuric acid is made, to the refinery for paraffin wax, and to the candle factory.

The PRESIDENT (Mr. D. Currie, of Stirling) proposed a vote of thanks to the Broxburn Oil Company for the privilege which had been afforded the members of the Association of visiting the works, and particularly to Mr. M'Killop for his services as guide. He said the visit had been most interesting and instructive; and he had no doubt all had greatly benefited by it.

Mr. M'KILLOP, on behalf of the Company, expressed the pleasure they had in receiving the Association. He hoped they had all understood what they had seen, and the explanations which had been given. The Company would be pleased to see the members again at some future time.

This concluded the proceedings.

It was announced, at the meeting of the Illuminating Engineering Society last Tuesday, that three gentlemen to whom honorary membership had been offered by the Council had accepted the nomination. They are: Professor A. G. Vernon Harcourt, Sir William H. Preece, and Sir Joseph W. Swan.

At the annual meeting of the Institution of Mechanical Engineers last Friday, the Council reported that there had been 430 additions to the membership during the past year; but as there were 305 deductions, the net increase was 125. This raised the total from 5458 on Dec. 31, 1908, to 5583 at the close of last year.

In recognition of more than thirty years' services as Hon. Secretary to the Departmental Soirée Committee, Mr. T. R. Burley, an old and esteemed official of the Manchester Corporation, was last Friday evening presented with a gold watch, subscribed for by his colleagues. The gathering took place at the gas offices; Mr. Fred. A. Price, the Superintendent of the Department, presiding, and the presentation being made by Alderman Gibson, the Chairman of the Gas Committee.

## GENERATOR FURNACES FOR SMALL WORKS.

By J. W. BEAN, of Wangaratta.

[A Paper read before the Victorian Gas Managers' Association.]

As is well known, generator or regenerative furnaces are constructed so that the primary air supply entering at the bottom of the furnace is just sufficient for the combustion of that part of the fuel lying nearest the place of ingress of the air, and that the carbonic acid (CO<sub>2</sub>) thus produced, on passing through the rest of the fuel, is formed into carbonic oxide (CO). This is delivered, in most cases, through nostrils into a space above the furnace arch, termed the combustion chamber. Here it is met with a regulated supply of secondary air, which has been heated through flues; and this supports the combustion of the carbonic oxide, and gives off a great heat. The gases from the setting, after having done their duty in heating the retorts, are led through passages to the main flue.

I have worked a generator furnace for the past seven years (2150 days' actual work); and the results are as follows: Make per ton for the past three years, average 11,220 cubic feet; sold per ton, 10,250 cubic feet. The following are results for the half year to June 30, 1909, after the retorts had been in use 911 days:—

Coal carbonized . . . . .	206 tons.
Gas made . . . . .	2,340,200 cub. ft.
Gas made per ton of coal . . . . .	11,345 "
Gas sold do. . . . .	10,053 "
Gas used on works per ton of coal . . . . .	149 "
Gas unaccounted for do. . . . .	1,143 "
Coke sold do. . . . .	6 cwt. 5 lb.

I would point out that we cannot get the same coke results as the larger works, owing to the small demand for gas on certain days; and having to keep (say) three retorts working to supply a demand two days in a week, while for the other five days a bed of two retorts would do. The bed in question, for instance, was kept fairly well going during the two months ending the 31st of August last, when 78 tons of coal were carbonized, producing 32 tons 13 cwt. of coke for sale, equal to 8 cwt. 2 qr. 3 lbs. per ton of coal. Yet the average made for sale for the half year was only 6 cwt. per ton, because in the summer months, when only making 300,000 cubic feet of gas per month, 125,000 cubic feet are used for eight days—viz., Friday and Saturday each week. As my storage is only 18,000 cubic feet, I have to keep three retorts to meet this demand; while in the winter months the make is nearly 500,000 cubic feet, and is more evenly required.

The best coke results are obtained when the setting is doing its full work. Our retorts are 22-inch by 14-inch and 9 feet long; and the most I have carbonized for 24 hours is 42 cwt.—14 cwt. per mouthpiece. This was with 2-cwt. charges, 3 hrs. 20 min. per charge.

The generator furnace has several points in its favour for adoption in small works—viz.: (1) It only requires attention every six or eight hours, thus allowing the attendant more time for his other duties. (2) The uniformity of heat—even when being cleaned or early in the morning—as no closing of the dampers is required. (3) A greater quantity of coke is available for sale. (4) More gas is made per mouthpiece and per ton of coal. (5) The life of the retorts and furnaces is longer.

I have been working regenerative and generator furnaces for some time, and I think that, for small settings, the simple generator is the best. Regenerators seem too sensitive on a small scale, and work very differently when in a bed of seven or eight retorts.

In the construction of the small setting, like that of the larger, the workmanship should be good, the bricks well fitted and tied, the flues made easy to clean, and the furnace doors well fitted and insulated from the heat. A badly-fitting door spoils results, as the air supply cannot be controlled. The feeding-door and frame should be well protected by brickwork, and the clinkering-door of good size, to allow of easy access to the bars. The lining of the furnaces should also be arranged so as to permit of easy repair, as most managers of small works have to reline their furnaces. The fire-bars should be made easy of removal, and be placed on rests not too thick, as they hold the clinkers up when cleaning. The arch over the clinkering-door should be cut away a little, so that in case of clinker forming on the front wall, it can be cleared. The water may be conducted to the bars in many ways. Personally I prefer to run it down two sloping trays—the one taking the water first sloped towards the fire, and the other protruding a little beyond the edge; first sloping towards the front so as to be easily seen, and the water then conducted from this to the fire-bars.

Mr. BEAN asked to be allowed to supplement his paper by a few remarks. As to the repairs to the lining in his setting, he had arranged for the whole of the secondary-air flues to be almost independent of the furnace lining, so that in case of the furnace requiring relining they could take out the portion of the brickwork which was destroyed without interfering with the secondary flues. The furnace referred to had not required relining since it was installed, though the retorts had been replaced. He had some trouble with clinker forming in the wrong place; and as he could not get to it when formed in that way, either from the upper or the lower part of the furnace, he had to have part of the brickwork cut away. The doors for the small set gave them some little trouble when it was first installed; but later he designed a



door in which nearly all the ironwork was insulated with brickwork. This door had been in use for 900 days without being any worse than when it was first put in; whereas in the original setting he had two doors, and the heat destroyed them. In working the settings, it was important that the primary and secondary air admitted should bear some relation. There could be no fixed rule, as each setting required different manipulation. His method of testing was to have a mica slide fitted into the sight-hole of the combustion chamber. If he found there was combustible gas passing through, he increased the secondary air. The primary air was worked in a similar manner—that was to say, when once they had the desired heat they regulated the primary air. Of course, this method was rather crude for large works, where the waste gas would be analyzed. This required chemical knowledge, and he was not able to conduct an analysis; but managers could judge pretty nearly, because they could see when the combustion of the gases was taking place. If there was an excess of secondary air, they would notice discoloration in the combustion chamber. For a small gas-works, he found a regenerative setting too sensitive. Any change in the atmosphere quickly had its effect on the furnace. He had therefore designed his setting to work as a small generator.

#### Discussion.

Mr. R. BEARUP (Stawell) asked Mr. Bean if he could give any idea of the cost of such a setting as he had described.

Mr. BEAN said he was not quite sure as to the price, as the Colonial Gas Association supplied the labour and material. He would get the price at a future date.

Mr. F. TIPPER (Fitzroy) said it occurred to him that Mr. Bean might have supplemented his paper with some items especially useful to those who were making themselves acquainted with small gas-fired furnaces. For instance, he should like to know the dimensions of the furnace, what area of damper Mr. Bean found gave the best results, how often the furnace was clinkered and filled, and whether with hot or cold coke. He would be glad to know the total area in square inches of the primary-air and the secondary-air supply that the author found necessary. With regard to the life of the furnace, Mr. Bean said it had been built for about seven years; and he further stated that its actual working life was 2150 days, or 40 days less than six years. It did not follow that the actual time the setting had been built should determine its life; one had to take into consideration the amount of work performed. If they went into the matter, they would find that Mr. Bean's furnace had consumed during its life something like 750 tons of coke, and had borne the wear and tear this brought about. The average furnace in most works would in this period have consumed something like 2000 tons of coke. With regard to the gas produced, he understood that the figures given in the paper did not represent the corrected make. This was to be regretted, because it was very necessary that the figures placed before a meeting like the present should be beyond cavil. The figures should be corrected to standard temperature; and then they might be accepted as reliable. In stating the yield of gas per ton, he thought it was also necessary to give the candle power, as the two went hand in hand. With regard to the coke made for sale, of course it was usually understood that with intermittent working the maximum amount of coke could not be produced, and therefore they could not expect to sell so much with a bed only partly working as when in continuous use. Still, a period was mentioned by Mr. Bean when his bed was fairly well employed; the working being equal then to 2½ cwt. charges every six hours. During this period, the yield of coke for sale they were informed was 8½ cwt. This was by no means a very high result for this particular time; and it was due to the absence of what Mr. Bean termed the regenerative portion of the bed. It was impossible for managers to derive full benefit from these settings unless they could recover some of the heat going up the stack; and it was only by making the very best use of the waste heat to heat the secondary air admitted to the bed that the best results were obtained. Had the setting been so designed by Mr. Bean, he would, in the period mentioned, have been able to sell much more coke than 8 cwt. per ton of coal. The importance of the coke for sale was apparent when he reminded members that if Mr. Bean had been able to raise the quantity of coke by 1 cwt. per ton it would have been worth £120 more in seven years. With regard to the quantity of coal carbonized per retort which Mr. Bean managed to get—14 cwt., or 42 cwt. for the bed for 24 hours—he should like members to note this result particularly. It was a very good performance—probably a record—as it represented something like 174 lbs. of coal per foot run of retort per 24 hours; and in the very best horizontal practice, with mechanical working, the results were only 140 lbs. He should like to know whether this was what one might call a "spurt," or whether it could be continued indefinitely. Of course, if the former was the case, it was not worth mentioning. They only wanted to hear of something that could be carried out continuously and practically. The point as to the length of time the producer would go without requiring attention would more than repay any extra cost incurred in putting in the setting. It was a very great blessing to any manager to be able to leave the works for six or seven hours without having to rush back or send a man to look after things. Mr. Bean had said that no closing of dampers was required. He (Mr. Tipper) could hardly see why. It appeared to him that the small setting described was well adapted to stand the closing of dampers without any considerable reduction of heat such as took

place in a direct-fired furnace. Another great point about these small beds was the excellent manner in which they worked when required as direct-fired beds. There was a period, as they all knew, when the coke in a furnace fell below what might be termed the effective zone. At such times, the bed became a direct-fired furnace. Small beds adapted themselves admirably to this way of working, as they could work either way. Another point in the paper he would like members to notice was the cutting-away of the brickwork in order to get at the clinker which formed on the front wall. He thought it was bad practice. The clinker formed there owing to the air slipping up the front of the drip-plates through want of packing. It went up the front wall instead of going through the fuel. He was inclined to think that by cutting the wall away it would simply make it easier for the air to flow in that direction, and cause more clinker to form. It was questionable whether it would not be better to make provision for the prevention of clinker than for its removal. In the construction of these little settings, he thought it was quite unnecessary to provide expensive fittings—such as doors, slides, &c.—as they were not needful to the proper working of the bed. He should like Mr. Bean to say whether the arch over the producer was necessary in so small a setting as the one he had described, or whether he thought a producer in a small setting with no great depth would not work as well without the arch. He (Mr. Tipper) personally regarded the arch in any small setting as by no means necessary. In some small settings which had no great depth, he would suggest that the arch should be left out on the score of economy in cost.

Mr. L. RODGERS (Warrnambool) said he would like to make a few remarks in favour of regenerative settings. He had a setting of five semi-regenerative English retorts, which had been working almost seven years; and the results obtained were as follows: The first charge was put in on Jan. 1, 1903; and the coal carbonized up to Sept. 30 last was 5491 tons. The gas made (the figures not being corrected for temperature) was 57,680,000 cubic feet—an average of more than 10,500 cubic feet per ton for the whole period. During the preceding twelve months the coal carbonized was 835 tons; and the gas made 8,749,600 cubic feet—the average per ton being 10,478 cubic feet. The best month's work ever accomplished by this setting was in May, 1908, when 81 tons 16 cwt. of coal were carbonized, yielding 87,760 cubic feet of gas—being an average of 10,513 cubic feet per ton. But the best average make per month was in October, 1908, when 75,880 cubic feet of gas were produced, or an average of 10,650 cubic feet per ton of coal, which was Hetton, about half slack. In 24 hours they made 32,000 cubic feet of gas with five retorts, using 2 tons 19 cwt. of coal; the make per mouthpiece being 6400 cubic feet. This could have been continued for about a week without damaging anything. He clinkered once in 24 hours. He found the semi-regenerator very easily regulated; it gave a regular heat, even on the bottoms of the retorts, and was no trouble whatever. They sold about 8 cwt. of coke per ton of coal carbonized; this result being obtained regularly.

Mr. TIPPER asked to be allowed to supplement his remarks. In speaking of the life of the retorts which Mr. Bean had mentioned, he would point out that in 2½ years they had carbonized something like 19 tons per foot run of retort. The average retort would have carbonized 55 tons per foot run.

Mr. E. TIPPER (Box Hill) said, in his opinion, Mr. Bean had been working his furnace with intelligence and ability. He (the speaker) had to strive hard to get anything over 11,000 cubic feet per ton; and he could not sell more coke than Mr. Bean. On the question of the amount of coke sold, he should like to ask Mr. Bean if he included breeze, and the coke-breeze and dust, and the whole of the residuals not used in the furnace. He should also like to ask him if he had ever tried heavy charges in his small retorts. He himself had been trying some 4 cwt. charges in retorts of the same size, thinking he would get better heats and more gas; but he found that the make per ton was slightly lower and the heats rather more difficult to maintain. Perhaps, however, this was because he had not carried on the experiment long enough, although it had been going for three weeks.

Mr. BARSON (Broken Hill, N.S.W.) said he should like to bear testimony to the results obtainable with the kind of settings under discussion. During the last 4½ years he had used a similar furnace to the one described in conjunction with a bed of fives. His retorts were 23-inch by 16-inch and 10 feet long. During the winter, this bed had been in use week after week—the top retorts with 4½-cwt. and the bottom ones with 4¼-cwt. charges. They had eight retorts and got from 64,000 to 65,000 cubic feet of gas per day. The lower retorts in the bed of fives would only take 3½-cwt. and 3¼-cwt. six-hour charges. He had just fitted up another bed of fives, and let down the old one after working it for 4 or 4½ years, and the retorts had been renewed. It was really a setting of three retorts in the same sized arch as the bed of fives had been built in; but the two lower retorts were left out, and the space was used for recuperation. He thought, with Mr. Tipper, that if they could get the air heated by the waste gases they would gain. He generated all his steam by the waste heat from the retorts.

Mr. W. SWINBURNE (Melbourne) said he had doubts at one time whether what Mr. Bean had described would apply to small works; but he had since come to the conclusion that his installation was of more importance to these than to large ones. Theoretically speaking, regeneration was, of course, the proper principle; but in practice it did not always work well. He had put



regenerator systems into very small works, but had found that the sensitive nature of the settings, and the degree of attention required from the manager, had conduced to make them not always successful. A similar setting to Mr. Bean's, on the separate generator system, was the best for small works. With regard to the cost of a setting of this nature, he might tell Mr. Bearup, though he had not the figures with him, that, including retorts, fire-bricks, and labour, it would be from £100 to £110.

Mr. A. G. AMBROSE (Bathurst, N.S.W.) said he had had experience of both generator and regenerative furnaces, and when he reset his furnaces he should keep to the generator type, as he did not think that in works of the capacity of those at Bathurst the putting in of a regenerative furnace was worth the trouble it entailed. The generators were easily manipulated; and he was going to get as good results from these furnaces as from regenerators. The charges per retort were about 4 cwt., put in every six hours; and the retorts were 21-inch by 15-inch and 9 ft. 6 in. long. The coal used contained  $13\frac{1}{2}$  per cent. of ash; so that they had to clinker every six hours. The clinker was not of the ordinary kind, but a short, friable ash; and they had to use steam to remove it. The steam made the clinker rotten, and practically the whole of it could be knocked off with a walking-stick. With regard to the construction of the setting, the secret was to have the producers deep and wide enough. His were 2 feet deep and 3 feet wide; the fire-bars were 5 feet long; and the length from the top of the arch to the clinkering-box was 7 feet. The producer sloped out; it was a kind of pear-shape, and held a great quantity of coke. He found the first setting he erected heated the back of the retorts; but after he made the producer of the shape mentioned, he got a uniform heat from the front to the back. He could not too strongly recommend the adoption of a system of setting similar to that described by Mr. Bean, even if there was only one retort. Judging from his own experience, he did not think it would cost quite so much to instal as Mr. Swinburne had stated. The difference between a direct-fired and a generator furnace was about £25, which included mountings, English fire-bricks, and excavation.

Mr. S. E. FIGGIS (Ballarat) said he had had long experience of regenerative furnaces, having used them solely for the last twenty years; and he should like to traverse some of the statements made by Mr. F. Tipper. He quite agreed with him in saying that the cutting-away of the front wall simply gave an opportunity for the air to go up into the wrong portion of the furnace; and he preferred to protect the furnace from the front of the setting. He must, however, disagree with him when he said that the producer arch was put into Mr. Bean's furnace simply for constructional purposes. He believed that if Mr. Bean were to do away with the arch he would certainly not get the results he did. One of the reasons for regenerative or generator firing was the proper mixture of the primary and the secondary air. If they did away with the arch, he did not see how they could get this proper mixture. Their sole aim should be to get thorough combustion at the nostril holes. He had heard a great deal about very strong heats, and thought it was quite possible to have too much heat in generator furnaces. As they got to a certain point, they would find that the attention required by the ascension-pipes and hydraulic main became excessive. He had seen for weeks together 5 cwt. of coal burnt off absolutely in a retort 9 ft. 6 in. long; but they could not continue this heat without giving great trouble in the retort-house.

Mr. J. BOWMAN (Sale) said he had put in regenerative settings using 22 in. by 14 in. retorts 9 ft. 6 in. long in a bench of six; but he found the bench required a great deal of attention. He thought that, on the whole, what Mr. Swinburne had said was true—viz., that generator furnaces were better than regenerators for small works. His furnace projected 14 inches from the front of the bench—similar to that to be seen at South Melbourne; so that the fire could be fed from the front. He had some trouble, as most managers had, through the heat having a tendency to take a short cut up the brickwork. There was a main door below the furnace-bars. When the furnace was being built, he brought in a  $2\frac{1}{2}$  course of brickwork on either side, and fitted in two lots of cast-iron doors, setting on three V-shaped bars loosely. The result was that the steam generated in the pit had no chance of working up that way. It could not possibly get in; and it, of course, went elsewhere. The doors were easily lifted out by the stoker. He had a great deal of trouble through short-circuiting with a small generator furnace; but, as a result of increasing the brickwork in various parts, the secondary air did not get heated to the same extent that it should, so he must have overdone it. He would strongly recommend the manager of small works to keep to the generator type of furnace; the regenerator being more adapted for works of large size.

Mr. J. W. BEAN, in replying to the discussion, said he had no set rule about the opening of dampers. He opened them to suit the working of each particular setting he was using. At the present time, the opening of the flue was  $1\frac{1}{2}$  in. by 12 in.

Mr. F. TIPPER: That is an area of 18 inches.

Mr. BEAN (continuing) said that on a similar setting in the Old Country he had worked with  $\frac{3}{4}$  inch. As to firing, he did it as often as possible with hot coke, but used cold coke for two charges per day. He certainly recommended the use of hot coke in the furnace. With regard to the air-flues, the same answer applied as to the damper. The area of the opening was 6 in. by 4 in., but was worked with an area of  $1\frac{1}{2}$  in. by 4 in.; the primary air opening being just under 1 in. by 4 in. As to the life of the furnace,

he had not had a chance of judging, having only been in the State eight years. It had been in actual use under fire for 2150 days, and he had not had to reline it. The greatest trouble he had with it was through cheap firing-doors. Mr. Tipper had asked about ironwork. He did not think the door which cost the least money was the cheapest. For instance, they had two sets of doors on the furnace in three years, and each of the doors cost £1 15s. He designed a door which he thought would suit, and it had been in constant use for upwards of 200 days. To all appearance it would last twenty years; so he thought it was far better to spend an extra pound on a good door than try to save money by using an inferior article. Firing-doors that were not good buckled, or else the door-frame gave way, and the air found its way into the upper part of the arch, which not only affected the illuminating power of the gas, but also tended to injure the arch. With regard to the correction for temperature, he explained that he was not in a position to correct the make, and could not see his way clear to do so. As a guide, however, he had given them the quantity of gas he sold per ton of coal; and as he had to account for his gas, the figures could not be very far out. He might mention also that he had no means of testing the gas for candle power. All he could say on this point was that all his consumers were satisfied with their lighting; and he had no trouble either with gas-stoves or gas-engines. With regard to coke, he had given the weight; and this was the best he could do. In reference to generators as compared with regenerators, his experience showed that for his work it was preferable to use a generator, because its operation was more regular; and he contended that with a bed of three retorts he could get a larger quantity of gas per annum than with one of four retorts on the regenerative principle. But when it came to a bed of six or eight, the regenerator seemed to work differently. He would certainly, if putting in a larger setting, or one or two beds side by side, prefer the regenerator. As to the arch, he did not know how he should concentrate the gas sufficiently to bring it in proper contact with the secondary air if he did away with it. The primary gas had to be brought in a certain volume to meet the secondary air; and if the gas were brought lazily to meet the air, he questioned whether the combustion would be satisfactory. As to the life of the retorts, he had mentioned that his had been in use for 911 days. They were not yet done for, and he could not tell when they would be; but he hoped they would last another 911 days. As to the dampers, he did not quite follow Mr. Tipper about the necessity for closing them on small works. He had never tried the closing of them. As to the weight of the charge, he found that the heavier charges were better for them than the lighter ones, as they got better coke, and, if anything, a better make, though he could not vouch for the latter. He would certainly recommend the use of the heavier charges in small works during the summer months, because when once the heavy charge was burnt off, it kept the heat up better in the setting than the lighter ones. They had sold every ounce of coke they made; and they did not make a very great deal of breeze. Mr. Figgis had mentioned about bringing the furnaces forward. He (Mr. Bean) fell in with this suggestion, and thought it would be an improvement. They clinkered the furnace, on an average, about once in ten days. They cleaned the fire just before the last charge went in each night; and though they had used the present furnaces for seven years, he had never found it necessary to have the clinkering-bars repaired, and had not had to renew the spears. With regard to the ascension-pipes, he might say that, of course, there was generally a little trouble with stoppages; but he had not had any since he inserted screens.

The PRESIDENT (Mr. P. C. Holmes Hunt) said he thought the members were very much indebted to Mr. Bean for his paper, and for the lucid manner in which he had replied to the points raised upon it.

## VALUABLE ADJUNCTS TO CARBONIZING PLANT.

By A. G. AMBROSE, of Bathurst (N.S.W.).

[A Paper read before the Victorian Gas Managers' Association.]

The object of this short paper is to prove that, even in the smaller works, it is possible, without any large expenditure, to considerably augment the yield of gas per ton of coal carbonized, and that without loss of illuminating power.

When I took charge of the Bathurst Corporation Gas-Works, in February, 1906, the retort-house consisted of a bench of six settings of six retorts in a bed, 21 in. by 15 in.  $\square$  section, 9 ft. 6 in. long, heated by regenerative furnaces, and with the hydraulic main, which was one of continuous length without division-plates, resting on the brickwork of the setting, with the natural result that the unequal expansion of the brickwork had considerably altered the seals of the dip-pipes, which, instead of being at one uniform seal, had  $\frac{1}{2}$ -inch seal at one end and 3 inches seal at the other—or a difference of  $2\frac{1}{2}$  inches in the length of the hydraulic. During the winter of 1906, it required all the six beds, or 36 retorts, to cope with the demand.

The following year, we erected an entirely new retort-house, containing a bench of four ovens of seven retorts, 21 in. by 15 in.  $\square$  section, 9 ft. 6 in. long, heated by regenerative furnaces. The four ovens had four separate hydraulic mains; and to these were afterwards attached the two valuable adjuncts which are the



subject of this paper—viz., a retort-house governor and a tar-tower. During the past winter, these furnaces only were under fire, though nearly 6 million cubic feet more gas was made than in 1906, when 36 retorts were in commission.

As already mentioned, to each of the four settings in the new retort-house there is a separate hydraulic main, quadrant-shaped, carried by the cross girders connecting the buckstays. Iron saddles carry the 9-inch foul main, to which the hydraulic is also connected by internal screw gas-valves. Each section of hydraulic is also connected by a valve at the bottom to a 4-inch take-off tar-main, which, in turn, is coupled up to the tar-tower at the end of the retort-house. The top of the tower is connected by a 1½-inch equilibrium pipe to the foul main; and this ensures the pressure or vacuum, as the case may be, being the same in the column or tower as in the hydraulic main. Attached to the tower at the seal-level is an adjustable overflow-valve, which regulates the amount of seal decided upon on the dip-pipes. At the base of the column there is a valve, by means of which the tar is run off into the tar-well. The tar deposited in the hydraulic main immediately gravitates to the bottom through the open valves into the 4-inch tar take-off pipe, and thence into the tar-tower. Every eight hours, or at the change of the shift, the tar deposited in the tower is run off into the tar-well, liquor from an overhead tank replacing the tar; the liquor simply being turned off when it shows at the overflow-valve. Town water, of course, would do equally as well for the purpose required; but, as we produce both sulphate of ammonia and concentrated ammonia, the town water would dilute the crude ammoniacal liquor too much.

When the retort-house governor was fixed on the foul main, it was found that the vacuum was so steadily maintained, and the illuminating power of the gas so uniformly constant, that the seals in the hydraulic mains could be reduced with perfect safety; so that we are now working with a seal of 3-10ths and a steady vacuum of 2-10ths. We find that a vacuum of 4 or 5 inches at the outlet of the governor gives the steadiest gauge, though for experimental purposes we have had to pull as high as 20 inches, and still maintained a steady gauge of 2-10ths on the hydraulic main, as before.

I will briefly summarize some of the advantages claimed by the adoption of these additions:

Working under old conditions, the make of gas per ton was 9577 cubic feet. Now the make is 10,713 cubic feet, or an increase of 1136 cubic feet.

On account of a steady gauge, the deposit of carbon in the retorts is greatly reduced.

The gas produced is of a more uniform quality than before. Remarkable absence of naphthalene.

In conclusion, I may state that no claim is made to the originality of the methods adopted, as described in this paper. They are merely the result of a diligent study of the "Transactions" of the various Gas Associations, as reported in the Gas Journals.

#### Discussion.

Mr. AMBROSE said he wished to supplement his paper by a few remarks. As mentioned, the real trouble he had was tar-seals. The reason of the tar thickening in the hydraulic mains was not due, as some people thought, to the radiant heat from the settings, but was caused by the hot gas from the retort passing through the tar and distilling or evaporating the light oils. If one had a liquor seal, nothing of the kind would happen. Since he had put in the arrangement described, they had had no trouble with the tar; and only a few weeks ago he had had an end plate of one of the sections of hydraulic main opened for inspection, and found the inside as clean as when first brought into commission. The cost of the whole installation, including valves and retort-house governor, was only £27 10s. The retort-house governor was "home made," and was manufactured from the scrap-heap. It was an adaptation of the Charles Hunt equilibrium gas-governor, which, for simplicity and sensitiveness could not, in his opinion, be improved on. Having no available room in the retort-house for the tar-tower, they had to erect it outside. At Bathurst, they had very cold and severe winters at times; and he was afraid the tar in the tower would become too thick to run off. Therefore a steam-pipe was fixed, in order that the tar could be made quite fluid at will. So far, however, the aid of steam had not been required. The tar-tower was simply made out of a 12-inch pipe. Coming to the statement in the paper as to the remarkable absence of naphthalene, the whole of the naphthalene gas must of necessity pass up the ascension-pipes, where the greater portion was absorbed by the hot-tar vapour; and this, on being deposited in the hydraulic main, was at once removed with the tar into the tar-tower. Under old conditions—with the hydraulic main full of tar to the overflow-level—the only means of removing the naphthalene was by way of the foul main. The tar as it cooled down gave up part of the naphthalene it had absorbed while hot, as the tension of the naphthalene vapour was so greatly affected by difference in temperature. Then, again, the ammoniacal liquor in the hydraulic main absorbed phenol from the tar vapour; the phenol, in turn, having a well-known power for absorbing naphthalene. He was now finding naphthalene in the liquor concentrator. Where sulphate was manufactured, the heat of the saturator would drive off any phenol present in the ammoniacal liquor; but in Bathurst the liquor was concentrated to about 85 oz. strength, and they found an oil floating

on the top which, when cooled, showed a large crystallization of naphthalene.

Mr. M. ALLAN (Hobart, Tasmania) stated that he had tar-towers worked on similar lines to Mr. Ambrose's, and also a Cowan retort-house governor. He could testify to their great usefulness, though if they were improperly attended to, they were liable to give considerable trouble. However, he was able to get on the average 12,000 cubic feet of gas per ton from Pelaw Main coal; and this result he partly attributed to the use of the tar-towers and the governor. The towers were 18-inch pipes 12 feet long.

Mr. E. TIPPER (Box Hill) said that, dealing with the two portions of the plant under consideration, he thought they were all pretty well agreed as to the advisability of having them. He had recently put up a couple of tar-towers in conjunction with two separate sections of a retort-house, on very similar lines to the one erected by Mr. Ambrose. All that had to be purchased was two portions of 12-inch pipe; the rest being provided on the works. The Cowan governor was very helpful as an addition to the tar-tower, as it prevented any pulling, and enabled one to get the seal down to a much finer margin, though personally he would not care to go down below a ¾-inch or ½-inch seal. By his gauge, he got 1-10th of back-pressure. In constructing a tar-column, he thought it advisable to so make it that any man on the works who might manipulate any of the valves would find it impossible to open the column to the atmosphere. If they took the tar off from the bottom of the tower without any sealing, and the valve happened to be open, they would not only open the hydraulics and run away all the liquid, but would at once throw the pull into the atmosphere. In handling the tar, he had a compensating supply. He had a trial-tap level with the hydraulic; and until he found the tar at this level, there was no necessity to run it off. There was no doubt a lot of advantage to be gained by keeping the hydraulic free from tar. He had a 6-inch pipe in use for a tar-column, and had never had any trouble with it. One had to be careful to put the column in a warm place—if possible, inside the retort-house. But if they were forced to put it outside, it would pay better perhaps to get a little larger pipe.

Mr. E. RABBIDGE (Invercargill, New Zealand) said he had done something similar to what had been accomplished at Bathurst. When he took over the works at Invercargill, he had the same trouble, as the hydraulics always got off the level, and there were no means of keeping the seal regular. In the new works, he had altered this—practically following the same lines as Mr. Ambrose. They had a tar-column of similar construction, and ran it off into one of the condenser-dips. Of course, the size of the column should be proportionate to the size of the plant. In a small works in which he was, situated in the north island of New Zealand, he made a tar-column of a 6-inch pipe, and stood it alongside the condensers. Retort-house governors seemed to be generally regarded as advisable; but when designing the new works he was now in, he could find no one who had had any experience of them, so he decided not to instal one. They had Bryan Donkin exhausters in duplicate, and paid great attention to the exhauster compensators. They never had any variation in the quality of the gas, and there were no complaints. He was not going to contend that a retort-house governor was not necessary. One could no doubt work with a smaller margin of seal with a retort-house governor close at hand; but the results that he obtained were very satisfactory, and he had not heard sufficient yet to make him decide to go in for one. Even in the smallest works, a man should put in a tar-column. When these were in use, it was no trouble to keep the hydraulic main free from tar.

Mr. N. KENNEDY (South Melbourne) said that at the works where he was stationed, there were two retort-house governors. The pressure in the ascension-pipe was about 2-10ths when the retort was first charged; and when the charge was completely carbonized, the gauge stood perfectly level. He would like to know whether Mr. Ambrose had any fluctuation in the pressure on the ascensions.

Mr. AMBROSE said he could not exactly tell that, as he had not got a pressure-gauge on the ascension-pipes.

Mr. C. W. HOWLETT (South Melbourne) said that at their works Cowan governors were used; and since they had been put on the bench, it had been much easier to regulate the make of gas. There was no doubt that tar-towers were also very useful. There was difficulty in getting a sufficient fall to the syphon sometimes, and in maintaining a regular seal. They had overcome these difficulties; and, with the addition of the governors, the pull was more easily controlled. They also had a better chance of keeping the gas at regular candle power. There was no doubt it would be a very great advantage for the smallest works to have these fittings.

Mr. HUNGERFORD (Dunedin, New Zealand) remarked that the tar-towers he was using were about three years old; and they were put to three settings of retorts. In regard to the size of tar-towers and tar-mains, he thought it very hard to get any guide. He could instance a case in Dunedin. In one installation of old direct-fired beds, they never had a stopped pipe in two years; but there was very little improvement when they came to work the regenerators, which was due to dust getting into the hydraulics. The area, size, and shape of the hydraulic mains had a lot to do with the efficiency of the tar-columns. He first had experience with round mains about 20 inches diameter; and there was too much room between the bottom of the dips and the bottom of



the hydraulic. In the new installation, there was only 6 inches between these points. In the tar-main was placed a rod working through a stuffing-box with a heavy washer on the bottom. This rod was worked right up and down occasionally. The system he adopted in Dunedin was to run the columns off every eight hours; and they were then filled up. Previous to that, it was customary to go to the columns every hour or two and run a little of the tar off. At one time they ran a  $\frac{3}{4}$ -inch steam-pipe right through the tar-main. Every morning a man would shut off all the tar-valves on one side excepting one, and then turn on the steam. As to retort-house governors, he did not think anyone would say that there could be a better system of working than could be obtained by using them; but there were nevertheless many things that could be said in favour of leaving them out in working a small place. It was customary in New Zealand to work with a pull up to 2 inches, and slacken the exhauster to 1 inch at charging time. A very good pull could be obtained by governing the exhausters. Retort-house governors, of course, rendered the retort-house independent of neglect in the exhauster-house; and, further, they maintained a uniform condition of things that was more conducive to efficient work in the retort-house. He was using local coal, and a very good gas coal; but it was harder to carbonize, and required higher heats. They were more liable when using it to hydraulic main troubles than was the case with New South Wales coal. New Zealand coal was being used in Dunedin when they had trouble with the tar.

Mr. BARSON (Broken Hill) referring to pressure, asked whether Mr. Ambrose had 4 or 5 inches exhaust on the outlet.

Mr. AMBROSE, in reply to the discussion, said that, as to fluctuation in the hydraulic main, it was barely half-a-tenth. He attributed this to the splendid work of the throttle-valve governor, which, in his opinion, was infinitely superior to the parabolic of Cowan's governors. It stood to reason that, having a "couple," equilibrium was more readily established. As to what Mr. Barson had said, he (Mr. Ambrose) was afraid he had been misunderstood. His gauge-glass was fixed, not on the exhauster but on the outlet of the governor; and then it showed an average of 4 inches exhaust, though it sometimes ran up to 6 inches. It depended entirely on the steam pressure in the boiler. To overcome this, a pressure-reducing valve was put on, set to 45 lbs., by means of which a very steady steam pressure was maintained. Though the pull at the exhauster might vary an inch or so, it made practically no difference on the gauge set between the governor and the hydraulic main; and even when the pull was as high as 20 inches, the gauge on the hydraulic main was uniformly maintained. Regarding the query as to the quality of the coal, it was all practically the same, and came from the Lithgow district of New South Wales. The average yield had been taken over a whole year's carbonizing. They had a full coal-testing plant; and when contracts were advertised for, they tested the various coals. The coal he was now using gave a yield of 11,500 cubic feet of gas per ton; and they tested for illuminating power as well, which was usually about 16½ candles.

The PRESIDENT (Mr. P. C. Holmes Hunt) said he thought the discussion showed a general consensus of opinion that retort-house governors and tar-towers were certainly two very valuable adjuncts to a carbonizing plant. They evidently conducted very largely to Mr. Ambrose's peace of mind. With a tar-tower, one could certainly run with a smaller seal and less risk; and with this steady state of affairs, the unsealing of the dips should be an unknown condition. One secret in arranging the plant was to get as much fall as possible on the tar-mains. In the installation they had inspected at South Melbourne, the mains were arranged with 3 inches fall per bed. Mr. Ambrose had made a great success of his installation. He thought he was correct in saying that Mr. Ambrose sold the cheapest gas in Australia, and what he had described was evidently one of the ways that permitted him to do this. By the small expenditure of £27 odd, he had increased his make by about 1200 cubic feet per ton.

## DIFFICULTIES IN COUNTRY GAS-WORKS.

By THOMAS FOSTER, of Oakleigh.

[Extracts from a Paper read before the Victorian Gas Managers' Association.]

Before passing to the subject of my paper, I wish to state that I am not a trained gas man, like most of the members of the Association. My experience is somewhat unique; it is certainly limited in years, and very circumscribed in character. Therefore the subject-matter of my paper must be somewhat crude and limited. About sixteen years ago I accidentally dropped into a gas-works for the first time, and, after stoking and general labouring for six months, I was put in charge. Consequently, the difficulties met with were numerous and often perplexing; but I have managed to pull through without any serious mishap, and with, I think, a fair amount of success. Since becoming associated with so many "masters of the craft," I hope to be able to give a better account of myself in the future than in the past.

One of the greatest difficulties met with in a country gas-works is the difficulty of obtaining expert assistance and advice in cases of emergency. The onus of the whole thing falls, as a rule, on the manager; and this, of course, necessitates that he should be a man of many parts, and very resourceful at that.

The first difficulty I experienced arose from this cause: An eight-way valve connected with the purifiers had become unworkable on account of being allowed to remain in one position for a number of years. The tar and dirt had set hard in the parts, and the whole thing was glued together. I was informed that several pounds had been spent in employing men who professed to know something about machinery, but they failed to shift the valve. While labouring on the works, I had seen the manager, with two assistants, spend two days trying to move it, but without success. It was most inconvenient to have this valve out of use, as it meant the suspension of gas-making when the purifiers needed renewing; so I determined to try my hand at shifting it. I am pleased to say that my first experiment proved successful. I simply put a good upward strain on to the valve by means of an endless chain pulley, then kindled a small fire round the barrel, and in less than 15 minutes it jumped out, and has been working ever since. Last month I shifted a similar valve, which had become glued up in like manner, by the same process of heating the barrel.

Another difficulty experienced was occasioned by the small firing capacity of the furnaces then in use on the works. These furnaces required firing every two hours, which, of course, meant running to and fro from the works when engaged on any job outside. To remedy this waste of time, I fixed another door above the two small ones, and by this means was able to extend the time between the firings to four hours by putting in the furnace a greater quantity of fuel. At the same time, I adopted heavy charging, regulating the charges to come off every eight hours. This method of working the retort-house afforded better facilities for attending to outside duties, and also relieved us of the necessity of all-night work. I found that the consumption of coke was very considerable to keep up good heats all the time; so, in order to save fuel, I tried the hot-air principle on a small scale, and found it work very well indeed. I applied it by running two flues—one on each side of the furnace—under the two main flues from the back wall of the bench forward to the extreme front, back again, and then forward; delivering through the cheeks of the furnace just above the coke line. This process saved about 50 per cent. of fuel, and gave equally good results in carbonizing.

Another difficulty I met with was through the breaking of the main outlet-pipe of the holder, 5 feet below the water-line. The main flooded in a few minutes, and, consequently, left the town in darkness. I met this difficulty by making the inlet answer for both purposes, connecting the temporary supply with 4-inch galvanized iron down pipe, which answered admirably. To repair the broken pipe, I had to pump the water down below the break, and pull down the wall of the tank. The break extended all round the pipe, and about 3 inches in a longitudinal direction; but the pipe was not out of position. I treated the break in this way: I got a yard of canvas, 12 inches wide, and bound it tightly round the pipe with white lead, clipped it with a 12-inch clip, and then cased the whole 5 feet of pipe in cement concrete.

The instances I have named are a few of the difficulties met with in my short experience, and the methods adopted to deal with them.

### Discussion.

The PRESIDENT (Mr. P. C. Holmes Hunt) said the paper was distinctly one which should call forth some interesting remarks.

Mr. SCOLES (Ipswich, Queensland) said the paper recalled to his mind an experience he had about ten years ago. He arrived at the works just before Christmas, 1889. There was an exhauster, worked by a gas-engine of 3½ N.H.P. It had been fixed about twelve years before, and had run for about an hour. It would not work. Apart from that, they were getting about 6000 cubic feet of gas per ton of coal carbonized. The men had to fire-up every half-hour, and sometimes every quarter-of-an-hour. The retorts had been built above the top of the furnace to allow 6 or 8 inches of flue, and the heats were not retained. He got to work on the engine, and tried to find out where the service came from; and he found it was connected at the purifier. He then put the service on to the outlet to the town, and got good results. He could not do much to the benches for some time; but he effected some improvements, and soon raised the make of gas from 6000 to 9000 cubic feet per ton. After the benches were properly going, he made 10,000 cubic feet per ton. He was about to improve the whole thing, and put in regenerators.

Mr. A. HUMPHREY (Hamilton) remarked that very nearly every piece of machinery about a gas-works was bye-passed, and yet the inlets and outlets of the holders were not. He saw in one works that they had a bye-pass from the outlet to the inlet. When engaged in a small works, especially on Saturday nights, and standing on the edge of the gasholder wondering whether or not it was on the bottom, the need of such things came home to one. Mr. W. H. Kelly, who was many years ago in Melbourne, was at one time at Maryborough, in Queensland; and he remembered that at about a quarter to ten one night, when the consumption was greatest, he found that his holder was nearly grounded, and he could not get any gas through, owing to the inlet being blocked; the pipe for pumping the water out having split. Mr. Kelly put down a half-inch pipe to the pump, and in this way got over the trouble. At another time the inlet-pipe became choked with naphthalene very suddenly. They had enough gas to carry them through; but from that sent out there was some trouble with naphthalene, and consequently he had to put in a bye-pass. By this means, in cases of emergency, they



could still keep all the lights in the town burning ; otherwise they would go out.

Mr. J. BOWMAN (Sale) said the accident Mr. Foster had with his gasholder was interesting, and must have been very exciting while it lasted. About 25 years ago, there were 2 inches of rainfall in an hour-and-a-half at Sale, and the water got into the holder. The stoker had put in a charge of coal ; but the town lights went out. This happened in the middle of a Saturday night. They set to work on the syphon-pipe, and managed to get going again in about 20 minutes ; but by the time the gas supply was restored, the people had closed their shops.

Mr. R. BEARUP (Stawell) said he could supplement what Mr. Bowman had said in regard to the flooding of the holder, as he was present on the occasion. As Mr. Humphrey had truly said, the trouble would have been avoided altogether if there had been a bye-pass. Before they were able to pump the water out of the inlet, they had to make a hole in the brickwork of the tank ; and by the time this had been done, and the gas set going again, the people had, as Mr. Bowman said, closed their shops. A bye-pass going in at the outlet would have remedied the thing altogether. The difficulties which had to be met in country gas-works were very numerous ; and they often cropped up very unexpectedly. With regard to the furnaces, he put in the upper door as mentioned in the paper, and could fill up and leave the works for half-a-day. After dinner he could put on the fire, and need not return again until five or six o'clock in the evening. During this time, he was free to do his collecting, &c.

Mr. KEMPSTER (Waratah, N.S.W.) said his works were somewhat antiquated ; and he had had charge of them ever since they were started 21 years ago. One of his difficulties was that he was under the control of a Municipal Council. The councillors did not understand a great deal about the business, and there was always trouble in getting them to find the money with which to carry out any improvements. His greatest worry was that they were growing from a consumption point of view ; but the gas-holder was not growing. It was 6 ft. 4 in. by 18 feet, and was very substantially constructed. It was in first-rate condition, and what he wanted was to put a lower lift on ; the holder being originally constructed so that another lift might be added when required. Between the cutting and the edge of the brickwork of the tank, there was a space of about 22 inches. The proposition was to build the lower lift round the existing one first, and then lower it into position without interrupting the supply of gas.

Mr. J. LORD (Williamstown) said that about four years ago they had a telescopic holder, and whenever the lower lift was raised it was not level. One day he took the weights off one side, and put them on the other, and got the holder (which was full) fairly square. He then tried to test it by passing the gas from it into a second holder, which was nearly empty. He noticed the holder come down slowly for about 9 inches ; but all at once he heard a bubble, and saw the inner lift drop suddenly, leaving the outer one jammed and hanging in the columns. It was a most alarming situation ; and, of course, as was usually the case, it was a Saturday afternoon and very little gas was in stock. The plan he adopted for lowering the bottom lift was to fix timbers under the guide-wheels, and by shortening these 3 inches at a time he gradually lowered the lift into the tank. It was not long before he put the weights back again ; and the holder had gone all right ever since. If the holder went crooked for another fifty years, so long as it acted correctly, he would not touch it again.

Mr. W. FROST (Mornington) said he remembered when at Portland having to be out pretty nearly all one night. Owing to the holder being very low, and the tide very high, he had to see that there was sufficient space for the water to pass out again. But the most serious thing that had happened to him during his thirty years' experience in gas-works was at Box Hill. They had had a very heavy storm, and the yard was flooded. He found the purifiers blowing—the storm water having filled the holder tank and flooded the inlet and outlet pipes. The water was flowing over the brickwork. He had to knock out a course of bricks very quickly ; and during the time he remained at Box Hill he took good care not to put them back again.

The PRESIDENT, in closing the discussion, remarked that, in regard to the point raised by Mr. Humphrey, he did not think there was any reason why there should not be a bye-pass between the inlet and outlet of a gasholder ; and at times it would be of use, more particularly in small works. He would suggest to Mr. Kempster that he should put one on his holder, if he had not done so already ; for if he determined to carry out his proposition—which was characterized by a certain amount of boldness—he might find it very helpful.

Mr. FOSTER said he did not think there was anything to reply to ; and therefore he would simply thank the members for the remarks which had been brought out by his paper.

Alderman Robert Gibson, the Chairman of the Gas Committee of the Manchester City Council, last Friday completed his 78th year, and was the recipient of hearty congratulations from his many friends.

The death occurred on Monday last week, at the age of 50, of Mr. "Pete" Curran, the general organizer of the Gas Workers and General Labourers' Union. He was President of the General Federation of Trades Unions, and for some time represented the Jarrow Division in Parliament. He was, however, defeated at the recent General Election by a majority of 67.

# CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

## The Flow of Gas Through Pipes.

SIR,—Mr. Chandler's article on the above subject in the "JOURNAL" for the 8th inst. is most interesting. Having been accustomed to using Dr. Pole's formula when determining the size of mains or services necessary to supply a certain quantity of gas with a minimum loss of pressure, and so often finding the actual flow to be greater than that given by Dr. Pole's formula, I was much surprised to read the results of Mr. Chandler's tests. My figures, being mostly obtained from rough tests, are suitable only for the practical purposes for which they were originally intended ; but I venture to give in tabular form a few practical tests which I have corrected for temperature and pressure and aqueous vapour, and to which I have added some results obtained in a similar manner, but with the terminal end of the pipe open to the atmosphere, and the corresponding figures calculated from Dr. Pole's formula. From this, it will be seen that, for practical purposes, the old tables are sufficiently accurate, at least so far as ordinary service-pipes are concerned.

TABLE Showing the Flow of Gas, in Cubic Feet per Hour, through 1-Inch Wrought-Iron Service-Pipe, 41½ Yards Long.

Pipe Open to Atmosphere at Terminal End.				Pipe Partly Closed at Terminal End.				
Pres- sure in Tenths of an Inch.	Flow as Calcula- ted by Dr. Pole's Formula.	Flow.		Pressure.			Flow.	
		Ob- served.	Correct'd for Temp. and Pressure.	Inlet.	Outlet.	Differ- ence.	Ob- served.	Cor- rected.
1	105	75	77	14½ to 13½		1½	96	99
2	149	115 124	144 156	..	..	..	..	..
3	182	149	187	40½ "	37½	3	162	203
4	208	160	200	30 "	26	4	172	215
5	232	181	227	21 "	16	5	182	227
6	255	205	256	..	..	..	..	..
7	270	226	282	42 "	35	7	232	290
8	295	257†	321†	36 "	28	8	243	304
9	314	242†	302†	30 "	21	9	259	323
17	429	360	450	..	..	..	..	..
2*	275	..	..	30 "	28	2	300	..

\* 1½-inch service 110 feet long. † These figures appear to be reversed.

Mr. Chandler suggests that the variation between his carefully-observed results and Dr. Pole's formula may be due to "viscosity" (if this be a correct term to use in reference to gases) ; and the tables which he gives, and the conditions under which the tests were made, do, I think, very strongly support this suggestion. If a pipe be open to the atmosphere at one end, and the whole of the pressure be converted into velocity, the effect of "viscosity" (or may we say eddying action due to skin-friction?) would be at its maximum. Then, again, the smaller the pipe the greater the effect of viscosity, because the surface is so large in proportion to its capacity. These seem to me to be the two conditions under which Mr. Chandler's tests were made : (1) Pipe open at one end to atmospheric pressure, and (2) pipes of very small diameter, so that the effect of viscosity would be most marked under these conditions.

In nearly all practical cases, the conditions are entirely different. The pressure is comparatively great and the velocity very low, and the sizes of pipes are very much larger ; and, consequently, I venture to think that we may still use the old tables without fear of erring on the wrong side.

Would not this be a most useful subject to refer to the Special Purposes Committee of the Institution of Gas Engineers for further investigation?

Cleveland Gas-Works. Feb. 19, 1910.

JOSEPH HARGER PYE.

## "The Times" Controversy, Gas v. Electricity.

SIR,—I have read your notes on the controversy which has been going on in "The Times" as to the relative costs and advantages of electric lighting and gas lighting.

It is not the first time that I have been led to admire your paper ; for it must be a valuable one to the gas industry. The consistency of your misrepresentations in the matter of the advantages and cost of gas lighting are worthy of a better cause. There is no doubt that your continual sticking to absurd statements must have some effect on the public who are lucky enough to get your paper.

As to the cost of electricity and gas, you will remember that months ago I cited some instances of relative cost—one case of which you looked into ; and up to the present even your ingenuity has not supplied the solution to what is to you a mystery. Of course, in my own mind, there is no doubt that electricity at anything below 4½d. per unit is cheaper than gas ; and this has been proved over and over again in my experience.

In saying cheaper, I again say, as I have said so many times before, that I am talking of practical conditions. Even I have doubts as to whether electricity at the prices mentioned can compete with gas at 2s. 8d. per 1000 cubic feet on the score of lighting cost, when the gas lighting is run under laboratory conditions. But the whole crux of the matter is that gas lighting is never run under laboratory conditions in practice.

Let me tell you of an instance that came to my knowledge, and which you can verify if you wish. In a big Public Institution in West Ham



(not owned by the Municipality), I quoted an estimated figure for the cost of electric lighting in place of gas. I was not aware of the amount of the gas bill, but estimated that also, on the basis of 5 to 5½ cubic feet per burner. When my quotation came before the Committee, one particular gas enthusiast on the Committee spoke for ten minutes on the absurdity of my statements regarding gas consumption per burner. When he had finished, the Secretary stated that he had also doubted the statements I had made; and, to elucidate the matter, he had had a number of the gas-burners tested, with the result that he found my estimate was absolutely correct.

Now these particular burners are the type which are so often cited by you as taking 3 to 3½ cubic feet of gas per hour, and giving 60-candle power. You will understand then what I mean when I say that electricity is cheaper than gas—both being run under practical conditions. You are probably aware that laboratory and practical conditions are identical so far as electric lighting is concerned.

Now with regard to the hygienic advantages of gas, I have never yet had from you an explanation as to why plants will not thrive and live in a gas-lighted room. Dealing with the public every day of my life, it is a most common occurrence to find this disadvantage of gas lighting quoted by consumers. Surely if your statements as to ventilation are correct, plants should be better off in a gas-lighted room than in an electrically lighted room; but, as you are well aware, for all you may say and write to the contrary, such is not the case.

Referring to gas heating, the same objections may be raised as regards gas lighting. It is no uncommon thing for people to come into our show-rooms and condemn gas heating on the score that it gives them bad headaches, makes them sleepy, and aggravates chest troubles. These people are the public for which electricity and gas suppliers both cater; and it is their opinion that really matters.

If I were given to prophecy, I would tell you that the competition the gas companies are beginning to feel in lighting, and which they would feel much more keenly had electricity supply the same admirable commercial organization as the gas supply, will extend to gas heating and gas cooking in the not very distant future.

H. H. HOLMES, Sales Manager,  
Borough of St. Marylebone Electric Supply.

York Place, W., Feb. 12, 1910.

[It is with profound regret that we see removal from West Ham to Marylebone has not improved the courtesy of our correspondent. He speaks of our "misrepresentations" and "absurd statements." He cannot object to our appropriation and application of the elquent terms as being admirably fitted to his own frequent epistolary work. We have asked him on more than one occasion to put the matters of what is possible with gas lighting, and what is impossible with the best forms of electric lighting, for domestic use to positive test, but he carefully and silently slips away through the back door, and the action and silence speak volumes. It is true he has in the past cited some instances of relative cost; and so has Mr. Hanbury Thomas. It is equally true that Mr. Holmes has given us no categorical statement as to hours of use and illuminating power obtained, nor has he been able, except by guesswork, to discriminate between the quantities of gas respectively used for lighting and cooking. Gas companies and local authority gas departments all over the country can quote instances of modern gas lighting having evicted electric lighting, to the financial benefit of the consumer. Mr. H. N. Clark, in his Southern Association paper, mentioned what had been done in this way at West Ham; Mr. Holmes does not controvert those published assertions. Again, it is true that we asked Mr. Holmes, for the purpose of investigation, for the names and addresses of the consumers whose accounts he has quoted. He refused them; but gave us a single instance, in respect of which it was shown conclusively in our issue for June 15 last that the consumer could not have been getting (if he was using proper incandescent gas-burners) the same illuminating power from his electric lamps that it was possible for him to obtain from the quantity of gas that he consumed. Constant reticence and shuffling are all that can be secured from electricians who venture into controversy on these points. The illuminating value that can be realized by us from such an uncomplicated thing as an incandescent gas-burner can be realized by anyone by running the burner under "practical" conditions. Conditions that are "practical" are those that "may be used in practice or applied in use;" and will Mr. Holmes tell us of any condition that is applied in testing photometrically and for consumption an incandescent gas-burner, that cannot be applied in ordinary use? We shall be interested in his reply. He speaks of a public institution in West Ham in which the burners were of the upright type, commonly consuming 3 to 3½ cubic feet an hour, and giving an illuminating power of 60 to 64 candles. These burners, he avers, were found (by what means, or by whom he keeps secret) to consume 5 to 5½ cubic feet an hour; but he does not say what illuminating power they were giving. Two cubic feet of gas per burner were wastefully used, if each burner was only giving 60 candles. We seem to remember asking Mr. Holmes on a previous occasion for a sample of burner to which he ascribed an extraordinary consumption, in order that we might test it. But no burner came to hand. We should like one of the burners from the public institution to ascertain the cause of the abnormal consumption. Perhaps Mr. Holmes can arrange to oblige us. In exchange for it, the public institution can be supplied with a burner of the type named that will not consume more than 3 to 3½ cubic feet an hour, and will give the illuminating power named,

or if preferred an inverted incandescent burner giving 50 candles on a consumption of 2½ feet an hour. But taking the consumption of the burners referred to at 5 cubic feet, the Gas Company would have been very pleased to maintain them in a condition that would have given much more than 60 candles. Taking 60 candles, and Mr. Holmes's 5 feet, the efficiency was equal to 12 candles per cubic foot; so that 3d. of gas gave 1116 candle-hours, as against 800 candle-hours from a unit of electricity. And the same amount of gas used in modern burners would have given about 2400 candle-hours. Does Mr. Holmes deny this? If he does not, then the consumer has got to lose two-thirds of what is possible with gas—or 1600 candle-hours—before there is cost-equality on a light-for-light basis. Where is the "misrepresentation" or the "absurd statement" here? Real absurdity is found in electricians and sales managers building for themselves a Fool's Paradise as a suitable place for residence. What is more, it is a wrong thing for consumers to use exposed metallic filament lamps. Only their reflected light should be utilized; and reflected light is a costly means of illumination. For proof of which, read the testimony of electricians in the discussion on "Glare" published this week. Mr. Holmes complains that he has never yet had from us an explanation as to why plants will not thrive and live in a gas-lighted room. It is not within our recollection that he has ever asked for an explanation; and what is more, writing as we are doing in a gas-lighted room in which there are plants—the friends of years—we are not prepared to run contrary to the truth, and say they will not live and thrive in rooms so lighted. Mr. Holmes's studies seem not to extend to plant life; they have apparently been largely limited to consumers' accounts that show a "saving" on gas, and have not even extended to those that show the contrary. If treated properly, plants in a gas-lighted room should not die, but (if the assertions of electricians on another point are correct) they should improve in growth and strength. Carbonic acid is the principal source of the solid material of plants; but they must digest and assimilate it under the influence of sunlight. That is the whole secret. If a plant is placed away in the back part of a room where the sunlight cannot fall upon the chlorophyll in the leaves, its energy in performing its proper functions is depreciated, with the natural result—decline. There is a little elementary work by Grant Allen entitled "The Story of the Plants;" and in the chapter on "How Plants Eat," Mr. Holmes will find an answer to his inquiry. As to our correspondent's remarks about people going into the Marylebone electricity show-rooms and complaining of gas-heating causing bad headaches and sleepiness (bad headaches do not conduce to sleep), and aggravating chest troubles, of course there are such people, just as there are people who go into gas show-rooms, and complain of the stuffiness (and headaches thereby occasioned) of electrically lighted rooms, of the heaviness of electric lighting accounts, of the poor heating capacity of electric radiators, of their cost, of the frights consumers of electricity have received from wires fusing, of their annoyance from failures of the current, and so forth. Does Mr. Holmes deny that the Glasgow experiments published in our issue of Jan. 4 showed that the air of the rooms in which the trials were conducted was changed 5·2 times an hour through the use of the gas-fires (this would not happen with electric radiators); does he deny that the Gaslight and Coke Company have on their registers 1000 medical men in London who are themselves users of gas-fires; does he deny that last half year the increase in the number of gas-stoves let out on hire by the Gaslight and Coke Company was 35,153; and that there has been a perfect boom in gas-fires in the country this winter, so much so that certain gas-fire factories have had to work night and day to keep pace with the demand? True, as our correspondent says, it is the opinion of the people for whom electricity and gas suppliers both cater that really matters; and we are very pleased to see that their opinion produces such substantial figures for gas undertakings. Concerning the semi-prophecy in the last paragraph of the letter, with all deference to Mr. Holmes's prescient gift, we may say it has not caused us even a momentary flutter or a twinge of misgiving.—ED. J. G. L.]

**Gas Supply for Liphook.**—It was announced in the "JOURNAL" some time ago that a Company had been formed, with a capital of £5000, in £10 shares, to supply gas in Liphook. It appears that the Company will be supplied with gas in bulk from the Woolmer and District Gas Company, who have power to purchase the Liphook Company's undertaking any time within seven years at 20 per cent. premium.

**Gas Poisoning in a West-End Hotel.**—A case of gas poisoning occurred last Saturday at Lock's Hotel, Bedford Street, Strand. At about three o'clock in the afternoon a constable reported at Charing Cross Hospital that a man was lying in a serious condition, and that prompt medical assistance was necessary. A doctor from the hospital went to the hotel, where in an upper room he found an elderly gentleman lying unconscious. An examination showed that he was suffering from the effects of gas poisoning. The man, who was conveyed to the hospital, where he remained for several hours in an unconscious condition, appears to have been staying at the hotel. His name is given as Mr. F. Williams, residing near Bristol. When he was found, the gas was turned on, but was not alight.



## PARLIAMENTARY INTELLIGENCE.

### OPENING OF THE SESSION.

The Third Parliament of the present King was opened by Royal Commission last Tuesday afternoon; the State ceremony being performed yesterday by His Majesty, who was accompanied by the Queen, when, as customary, he read the Speech from the Throne.

The first business in the House of Commons was the election of a Speaker; and the Right Hon. James William Lowther, who had filled the position in the preceding Parliament, was unanimously chosen for the office.

The House was occupied until Thursday in swearing-in the members, and then adjourned till yesterday.

#### Petitions against Private Bills.

The following petitions have (among others) been presented against the Bills named:—

Brighton and Hove Gas Bill, by the East and West Sussex County Councils, the Brighton and Hove Corporations, the Portslade-by-Sea, Southwick, and Shoreham Urban District Councils.

Bristol Gas Bill, by the Bristol Corporation, the Bristol Tramways and Carriage Company, and the Staple Hill Land Company.

Chipping Norton Gas and Electricity Bill, by the Corporation of Chipping Norton.

East Grinstead Gas and Water Bill, by the East Sussex County Council, the East Grinstead Urban District Council, and inhabitants of Forrest Row.

Egremont Urban District Council (Gas) Bill, by the Cleator Moor Urban District Council.

Kingswood Water Bill, by the Surrey County Council and the East Surrey and Sutton District Water Companies.

London County Council (General Powers) Bill, by the Gaslight and Coke Company and the Metropolitan Water Board.

London County Council (Tramways and Improvements) Bill, by the Gaslight and Coke Company and the Metropolitan Water Board.

Mallow Gas Bill, by the Mallow Urban District Council.

Mallow Urban District Gas Bill, by the New Mallow Gas Company.

Mountain Ash Water Bill, by the Breconshire County Council, the Aberdare Urban District Council, and the Neath Rural District Council.

Pontypridd and Rhondda Joint Water Board Bill, by the Cardiff Corporation, the Barry and Caerphilly Urban District Councils, and the Llandaff, Dinas Powis, Llantrisant, Llantwit Fardre, and Neath Rural District Councils.

Pontypridd Water Bill, by the Barry Urban District Council and the Neath Rural District Council.

Shirebrook and District Gas Bill, by the Derbyshire and Nottinghamshire County Councils, the Mansfield Corporation, and the Warsop Urban District Council.

Slough Water Bill, by the Conservators of the River Thames, the Middlesex and Buckingham County Councils, the Slough Urban District Council, the Eton Rural District Council, and the Rickmansworth and Uxbridge Valley Water Company.

South Hants Water Bill, by the Southampton Corporation and the Winchester Water and Gas Company.

Staffordshire Potteries Water Bill, by the Staffordshire County Council, the Burslem, Fenton, Hanley, Longton, Newcastle-under-Lyme, and Stoke-upon-Trent Corporations, the Tunstall Urban District Council, and the Stone Rural District Council.

Tipperary Gas Bill, by the Tipperary Urban District Council.

Whitland Water and Gas Bill, by the Narberth and Whitland Rural District Councils.

Workshop Urban District Council Bill, by the Lincoln Corporation and the Workshop Water Company.

### Coal v. Coke for Pumping Water.

At a recent meeting of the Ryde Town Council, the Water Committee submitted a report in which they recommended the purchase of 700 chaldrons of coke from the Ryde Gas Company for steam-raising purposes. Mr. Weeks said it was no doubt within the recollection of the Council that a test had been made to ascertain the relative values of coal and coke. It was then said by the Resident Manager (Mr. J. T. Harvey) in his report that there was a direct saving of 13s. 2½d. per million gallons of water pumped by using coke instead of coal. This amounted to a saving of £3 rs. 6½d. per week. The Water Committee did not care whether coke or coal was used, so long as they employed what they considered to be the best fuel at the lowest cost. If there was to be a saving of £3 per week by using coke, he thought it would be criminal on the part of the Committee not to employ it. The recommendation gave rise to a long discussion, in the course of which Mr. Barton said he knew of no water-works save those at Newport and Ryde in which coke was used in preference to coal; and the Council would be going a very long way back if they preferred coke, which was only the refuse from coal. Nobody looking at the question with an unbiased mind would say that coal with the gas extracted was better than it was before. Mr. Weeks, in reply, said the Resident Manager ought to know something about the requirements of the water-works; and he told the Council to try using coke mixed with small coal. He could get all the steam he required with a saving of £3 per week compared with Welsh coal. He asked the Council, as business men, whether they should not get the best fuel at the lowest price. If it were not as Mr. Harvey had said, why was he kept in his position? The members of the Water Committee ought to back him up in his opinion, and get the best they could, in the interests of the ratepayers. The recommendation was carried by eleven votes to five.

## LEGAL INTELLIGENCE.

### THEFT OF A GAS METER AND FITTINGS.

#### Meter Stolen and Gas Allowed to Escape.

At the County of London Sessions last Thursday, before Mr. Robert Wallace, K.C., sitting at the Sessions House, Newington, Alfred Spooner and Joseph Beckett, labourers, pleaded "Guilty" to stealing a gas-meter and the sum of 3s. 5d., the property of the South Metropolitan Gas Company. Mr. Purcell, who prosecuted, said the case was more than usually serious, because some of the London Magistrates had frequently commented on the facility with which automatic coin-receiving meters were robbed of their contents, and on the temptation there was to some persons of finding money within reach. For some time the Company, owing to numerous robberies, considered the question of strengthening the boxes; but they were afraid that thwarted thieves would go the length of removing meter and box, and leaving the gas escaping, thereby causing grave danger to persons living near. The Company did, in fact, strengthen the boxes; and in the present case their fears were justified, because the prisoners left the gas escaping at a house in Livingstone Road, Clapham Junction. But for the promptitude of two police officers, who, though almost overpowered by the gas, succeeded in cutting it off, the results might have been most disastrous. Detective-sergeant Purkiss said that during the past year 250 gas-meters had been broken open in the district. Two previous convictions were proved against Spooner and six against Beckett; and the former was sentenced to nine months' and the latter to twelve months' imprisonment.

On the same occasion, Henry Cheeseman and George Gallant, labourers, and William Abberley, a costermonger, were charged with stealing a quantity of gas-fittings from an unoccupied house in Maypole Road, Battersea. A detective said that the prisoners did no work. They went about looking for unoccupied houses, which they entered and stripped of the gas and water fittings, causing an enormous amount of damage for very trifling gain. One of the witnesses—a milkman named Newbury—who interfered with the prisoners in their operations, stated that Abberley struck him several blows with a gas-pendant, inflicting a wound on his head. Cheeseman was sentenced to twelve months', Gallant to four months', and Abberley to fifteen months' imprisonment. In sentencing Abberley, Mr. Wallace said he was very lucky not to be standing on his trial for seriously injuring the witness Newbury. He (the Judge) highly commended the witness, and thanked him sincerely. He expressed regret at Newbury's injury, and awarded him £1 in addition to his expenses.

#### Incandescent Mantle Company, Limited.

A petition for the compulsory winding-up of this Company, presented by Mr. Ernst Hildebrandt, which has been pending for some time, was mentioned to Mr. Justice Neville last Tuesday. Mr. Lailey stated that the parties had come to terms, and it had been arranged that the petition should be withdrawn, the Company paying the petitioner's costs. His Lordship sanctioned the agreement.

#### Rawcliffe and District Gas and Coke Company, Limited.

Last Saturday, a debenture holder's action, brought by Mr. Reed against this Company, was before Mr. Justice Warrington. The action came on as a short cause upon a motion for judgment in default of defence. His Lordship asked whether the Company resisted the motion. Mr. Willett, who represented them, said he could not oppose the motion. Mr. MacKay appeared for the plaintiff, and asked for the usual order for accounts and inquiries; and his Lordship at once made it.

#### Charge of Theft by a Clerk.

At the Marylebone Police Court, last Saturday, Arthur Percival Jemmett, 26, for eleven years a clerk in the service of the Gaslight and Coke Company, was charged, before Mr. Plowden, with stealing two postal orders and two penny stamps, to the value of £1 3s. 8d., belonging to the Company, and forging and uttering two postal orders and thereby obtaining £1 3s. 8d. Mr. Humphreys, who prosecuted on behalf of the Company, explained that for a long time their consumers had complained that postal orders sent in payment of accounts to the branch office at Kilburn had not been acknowledged; and in some instances, in consequence of the supposed non-payment of accounts, the Company had cut off the gas. Inquiries made by the Post Office and the police showed that since Sept. 16 last thirteen postal orders which had been sent to the office had not been paid in, and eleven had been cashed after the signatures had been forged. The defendant had been employed at the Kilburn branch office for eleven years; his salary being £95 a year. Mr. A. E. Houstead, the Inspector in charge of the office, said the defendant was one of the Company's most trusted servants; and during the eleven years he had been with them thousands of pounds in cheques and postal orders had passed through his hands. The irregularities in the office commenced about twelve months ago. The accused was remanded.

**Prestwich and its Gas Supply.**—The Prestwich District Council have under consideration the question of promoting a Parliamentary Bill with the object of acquiring the Radcliffe Gas Company's interests in their district; and at the last meeting of the Radcliffe Council, a letter was read from the Clerk to the Prestwich authority asking for an expression of opinion on the subject. A resolution was adopted by the Radcliffe Council to the effect that they are not at present in a position to express an opinion.



## MISCELLANEOUS NEWS.

### SOUTH SUBURBAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Friday at De Keyser's Royal Hotel—Mr. CHARLES HUNT presiding.

The SECRETARY (Mr. Charles M. Ohren) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

#### THE FRUIT OF A PROGRESSIVE POLICY.

The CHAIRMAN, in moving the adoption of the report and accounts, said in the first paragraph of the report prominence was given to the increase in the gas consumption of 3.41 per cent. as being the largest which had been experienced by the Company for several years. The significance of this increase lay in the fact that considerable additions were made to the number of consumers during those years; the comparative leanness of which in regard to consumption being largely accounted for by the change to more economical methods of using gas. It was already well known to the proprietors, but might bear repetition, that almost before the inroads made by the substitution to a great extent of Welsbach mantles for flat-flame gas-burners had been compensated for by increased consumption in other directions, the inverted burner began to take the place of upright incandescent burners, to the further advantage of the consumer. As they were also aware, the Company had done, and continued to do, their best to encourage this use of improved methods—not only for lighting, but also for heating and cooking—in the firm belief that to give satisfaction to the consumer was to the ultimate advantage of the undertaking, even though involving temporary loss of revenue. It was gratifying, therefore, to be able to feel that this policy was now bearing fruit; and that it was enabling the Company to more than hold their own against electricity, the competition of which, he need hardly say, did not tend to diminish in activity. From this competition, however, gas, when judged according to merits, had nothing whatever to fear. Of the two illuminants it continued to be both the cheapest and the best, as proved by the preference given to it for street lighting whenever the selection was not swayed by other considerations. As a matter of course, they could not, nor did they, in the least object to competition from whatever source this might arise, so long as it was fairly conducted. Such competition they were at all times ready to meet, and entertained no apprehension as to the result. But they did think it hard that local authorities should be placed by the Legislature in the position of trading competitors; and that rates, to which gas companies largely contributed, should be made to serve as security for a business which was carried on in active competition with theirs. However, things being as they were, they could only continue to do the best under the circumstances for both consumers and shareholders. Speaking of the Legislature reminded him that they had to congratulate—which he was sure they all did most heartily without reference to politics—their friend and Director, Sir Fortescue Flannery, on having been returned as a member of the new Parliament.

#### IMPROVED OUTLOOK FOR GAS HEATING.

The depression of trade, which was acutely felt a year or two ago, appeared to be happily passing away; and the general opinion seemed to be that better times were in store for the industrial world. In these—if they should come—the Company might hope to share; if, indeed, they were not already sharing in the shape of the greatly increased demand which, as mentioned in the report, had set in for gas-heating appliances of all kinds for domestic use. As regarded gas-fires in particular, this increased demand was evidence that the prejudice which formerly existed against their use was giving way to the inexorable logic of facts. Medical opinion had declared itself in their favour; chiefly because they could be easily controlled to give any required temperature. A local doctor told him quite recently that, whereas he formerly objected to their use in sick rooms, he now recommended them. Hot-water circulators heated by gas, and other similar gas-heating appliances, were also being increasingly used; so that the prospect in this respect might be regarded as distinctly good. The Company's Sales Department had, as the proprietors were aware, been strengthened in order to bring under the notice of consumers, among other things, the cleanliness, convenience, and economy of gas as a heating agent; and those who were engaged in this department were, he thought, to be congratulated upon the success which had already attended their efforts under the new arrangements.

#### DAYLIGHT CONSUMPTION.

Hitherto, cooking-stoves and boiling-rings had represented the chief use of gas as a heating agent in the household; and of these there were now more than 26,000 in use in the Company's area of supply. They were, as the proprietors knew, used chiefly in the daytime, and more in summer than in winter, when they often enabled the coal-fire to be dispensed with. They were, consequently, important aids to daylight consumption—a class of consumption which it was particularly desirable to cultivate, because it meant increased output without corresponding increase of distributing plant. It might interest the proprietors to know that already daylight consumption was answerable for above one-half the annual output, and that the disproportion which formerly existed between summer and winter consumption had been reduced by nearly one-half. This levelling-up of summer consumption was a good thing, if only because it tended to improve labour conditions by giving greater permanence to employment; casual or intermittent work being a fruitful source of inefficiency and unemployment.

#### A REVIEW OF THE ACCOUNTS.

The accounts showed that their coal bill was less, though more coal had to be used owing to the larger output of gas. This was chiefly due to lower prices; but there had also been a small increase in the quantity of gas sold per ton of coal carbonized. What might be the position in respect of prices when they were next in the market for coal, it was not at all easy to say; but it was to be hoped that reason-

able counsels would prevail, notwithstanding those visions of high prices in which the coal owner was so prone to indulge. The unrest by which in some districts the Coal Mines Regulation (Eight Hours) Act was ushered in seemed to be gradually subsiding. It did not to any great extent directly affect the districts from which the Company were drawing supplies; and these, throughout the winter, had been good and abundant. The course of coal prices was naturally a matter of considerable anxiety to the Board, because upon it depended almost wholly the price at which it was possible to supply gas. But the only control they could exercise over this most important factor was to do their best to purchase in the cheapest market. Carbonizing wages showed a reduction; and these were the lowest in London. The cost of repairs and maintenance exhibited some increase, which was fully justified by the necessity for maintaining the works and plant in a condition of complete efficiency, and for keeping pace with modern requirements and improvements in manufacturing methods. Somewhat higher figures also appeared under the head of distribution charges; and there was a probability of still higher figures in the future. Gas companies were like railway companies in this respect, that modern conditions imposed on them the necessity of catering more and more for the convenience of their customers. However, the money was well spent, because the surest way to retain the confidence of consumers was to give them reason to feel that they were well looked after. For the increased cost of rates, there was, he was afraid, no remedy; but most careful watch was being kept over the proprietors' interests in this respect. The item for rents was a new one, and represented the rents paid for the additional show-rooms. At these show-rooms information was given on all matters relating to the use of gas; and cooking lectures were held throughout the season. They had already proved a great convenience to the consumers; and the business done in connection with them was increasing very satisfactorily.

#### GAS AND RESIDUALS RECEIPTS.

On the other side of the account, the increase of consumption, as stated in the report, had almost balanced the reduction of price which took effect as from the 1st of July last year, so that the receipts for gas showed only a very slight falling off. The increase of £209 in the rental derived from meters and stoves was one result of the expansion of business to which he had already referred. Lower prices had had to be submitted to for coke; but a larger quantity was made for sale, so that the returns for this residual showed substantial improvement. The return for tar was also better, both in regard to price realized and yield per ton of coal. Tar was in increasing demand for road-making purposes, and hopes were entertained of a more extended use of one of its constituents—benzol—as a substitute for motor spirit. It was not, however, advisable to build too much upon the realization of these prospects, because tar values had a disappointing history, and had for a long time depended less upon new uses for it, or its derivatives, than upon the quantity produced from other sources than town gas manufacture. Similarly, the markets for sulphate of ammonia were affected by the increase of production from other sources. The Directors could not, of course, complain that the example set by the gas industry in the recovery and utilization of residuals should be so extensively followed as it now was wherever coal in large quantities was used for industrial processes. The world was all the richer for this practice of economy, though gas consumers had to pay a little more for their gas.

#### CAPITAL AND DIVIDEND AND BONUS.

There had been added to capital the sum of £2564, which was due partly to additions to manufacturing plant, and partly to the provision of meters, services, and stoves for the 685 consumers who, he was glad to say, were added during the half year. After payment of all fixed charges, the Directors were in a position to recommend payment of the full dividend to which the shareholders were entitled in consequence of the reduction of rd. per 1000 feet made last year. This was an increase of 3s. 4d. per cent. per annum, and was the highest dividend ever paid by the Company. It represented an addition to the sum to be distributed among the shareholders for the half year of £524, while the saving to the consumers by the rd. reduction was for the same period £2700; the employees' share being an additional bonus of  $\frac{1}{2}$  per cent.—increasing the bonus upon their earnings to 6 $\frac{1}{2}$  per cent.

#### CO-PARTNERSHIP—A LIVESY MEMORIAL HALL.

The re-election of Mr. George Ross as Employees' Director, which was referred to in the last paragraph of the report, was additional proof that the employees were to be trusted, not only to select a good man, but to keep him when they had got him. Of co-partnership generally, he was glad to be able to repeat what had been already said on many occasions—namely, that it continued to give satisfaction to all concerned. It formed a true bond of union between employers and employed, and continued to be mutually, and in a very high degree, beneficial. Last autumn the Board had the satisfaction of assisting at the inauguration of a memorial to their late Chairman (Sir George Livesey) which had been subscribed for entirely by the employees. This was in the form of a bronze bust of their late friend, and was mounted on a suitable pedestal, and placed in a conspicuous position on the works near the entrance gates. The ceremony was attended by from 400 to 500 of the employees, and great interest was taken by them in the proceedings. He might also say, in concluding these remarks, that the Board had had under consideration the desirability of founding some memorial to Sir George, indicative, not only of the great services he rendered to the Company, but also of the aims and objects with which he was so closely identified. After careful consideration, it had been decided to erect upon the works, and adjoining the Catford Road, a recreation room for the employees, to be called "The Livesey Memorial Hall." Bearing in mind the very great interest which was always taken by Sir George in all matters affecting the well-being of the employees, the Directors felt sure the proprietors would agree that a more suitable memorial could hardly have been decided upon. Plans had been prepared; and it was expected that the building—which it was hoped would be a model one of the kind—would shortly be commenced. When completed, it was under contemplation to break through—for once at any rate—the tradition which obliged them to hold their general meetings on the North side of the river, and give the share-



holders an opportunity of inspecting the new building, and also the works, which probably many had not seen.

#### THE ADOPTION OF THE REPORT.

Sir J. FORTESCUE FLANNERY, Bart., M.P., said he had great pleasure in seconding the motion which had been put to the meeting in so full a speech by the Chairman, and in associating himself with every word that had been said. Mr. Hunt had so thoroughly set forth the work of the Company, and everything that affected the undertaking, that it was only necessary for him (the speaker) to second the resolution quite formally. He did, however, wish to remark that the points that had been mentioned, including the question of daylight consumption, were full of interest for the Company. There was no doubt whatever that when they could steady employment so as to make it as nearly as possible equal at all seasons of the year, they were benefiting not only the proprietors but those whom they employed. In the case of most gas-works, something like one man out of six had, under the old conditions, to be discharged during the height of the summer, or other employment found for them. Now, this was a serious proportion of the labour that such undertakings employed during the winter time; and therefore every help they could give towards the reduction of such fluctuation was in the mutual interest of employer and employed. But there was also, as the Chairman had pointed out, the very important question of utilizing the plant to its fullest capacity. It was evident that the plant must be large enough to cope with the maximum winter demand; and therefore a portion of their investment was idle when it was only being utilized at the minimum. Thus when they could advance, as they were advancing, in the utilization of the plant during the daylight as well as during the hours of darkness, they were advancing in the direction of improving the position of both employer and employed. These were points which were not always prominent in the minds of investors in gas; but they were having the closest attention on the part of the Board. Then the Chairman referred to the very important question which was so clearly brought out by their friend Mr. Carpenter at the recent meeting of the South Metropolitan Gas Company—that was, carbonizing efficiency. The figures that Mr. Carpenter mentioned were very remarkable—that in a period of ten years the efficiency in carbonizing had increased some 25 per cent. In other words, for every ton of coal carbonized 25 per cent. greater volume of gas was yielded. This might also be said to apply to the South Suburban works. Figures had not been definitely named, nor need they be; but the advance which their neighbours in the Old Kent Road had obtained had also been secured in very nearly the same proportion in the works at Sydenham. And this was being done, as their neighbours were doing it, under very adverse conditions with regard to coal—that was, with coal that was less favourable for gas making than that which was easily obtained ten years ago. Thus the shareholders would see that even in a well-established industry like gas manufacture, there was room for great advancement, and that every possible opportunity for utilizing this room was being made use of. Then one word about co-partnership, which he was glad had had so much attention devoted to it in the Chairman's speech. Every year—every day, they realized the increasing benefit of co-partnership. Every day they were confirmed in their appreciation of the splendid reform which their late departed friend Sir George Livesey initiated, and which he (the speaker) believed would last as long as existing social conditions lasted in this country. Co-partnership was every day bringing forth fresh proofs of its advantages. A short time ago, the Directors heard of one or two men employed in the works—that was to say, co-partners—who, in the course of their walks abroad in the evening, had been making special excursions over the district to find out streets where new houses were being built, and where consequently fresh opportunities for extending the gas service-pipes might arise, and quite voluntarily, quite because of *esprit de corps*, quite because of their being co-partners, they had brought back the information to the works, where it was utilized. This was only a small illustration; but it showed the spirit in which co-partnership was being carried out in connection with the Company. He was sure one of the happiest days for shareholders generally who were not employees of the Company would be when—perhaps at the next half-yearly meeting, or certainly the one afterwards—they accepted the Chairman's invitation (as the Board hoped they would do in large numbers), and went down to the works to hold the meeting and shake hands with their brother co-partners who were engaged there.

No shareholder having any questions to ask, the resolution was then put to the meeting and carried unanimously.

#### THE DIVIDEND.

The DEPUTY-CHAIRMAN (Mr. Jabez Light) moved that a dividend for the half year ended Dec. 31 last be declared at the rates per annum of 5 per cent. on the preference stock and 5½ per cent. on the ordinary stock, less income-tax. He remarked that the Chairman had fully explained the result of the past half-year's business; and no doubt all the proprietors would have the same feeling—that it had been a great success. Of course, their competitors the electrical people were exceedingly busy at all points; but in spite of this, the South Suburban Gas Company had had an extremely good half year. They had reduced the price of gas 1d. per 1000 cubic feet, which meant, he believed, a concession of something like £2500 to the consumers; they were able to pay an increased dividend; and they had placed to the credit of the co-partnership account a sum of £1700. All these facts spoke for themselves.

Mr. W. G. WALLER (an Employee Director) seconded the proposition; and, in doing so, took the opportunity of thanking the proprietors for the generous way in which they treated the employees. Every man, he said, was happy and contented, and had a desire to do better to-day than he did yesterday.

The resolution was agreed to.

#### RE-ELECTIONS.

Mr. ROBERT MORTON, in proposing the re-election of Mr. Hunt as a Director, remarked that he had listened with great interest to the comments that the Chairman had made on the transactions of the Company during the last half year. They were certainly very satisfactory to all the Board, and must be so to the shareholders as well.

It had not all depended on Mr. Hunt as Chairman; but very largely it had done so. He gave all possible encouragement to the officers of the Company, and was well backed up by them.

Mr. JOHN BORASTON seconded the motion; saying that the removal of the dominating and magnetic personality of the late Sir George Livesey might well have led to some little disturbance in the midst of the Board; but this had not been the case. The Board was a pleasant one, and the members were a very happy family. This was testimony to the tact and ability of their Chairman, and at the same time one of the best guarantees for the effective carrying on of the business. They all felt that the mantle of Sir George Livesey had fallen upon shoulders capable of bearing it with dignity, honour, and credit.

The resolution having been carried,

Mr. HUNT, in acknowledgment, said he took a very deep interest in the welfare of the Company, not only as an old shareholder (he believed he became one as long ago as 1878), but chiefly because of its association with the work of the late Chairman. He felt it a great privilege to be able to assist in some measure in carrying this work on.

Mr. Charles Carpenter was also re-appointed, on the motion of the CHAIRMAN (who remarked that he was one of the most valued and valuable members of the Board), seconded by Mr. G. ROSS.

Mr. CARPENTER, in returning thanks, said he felt it a great honour when he was put upon the Board to follow in the footsteps of his dear late friend Sir George Livesey.

On the motion of Mr. T. GUYATT, seconded by Mr. T. P. FISHER, Mr. Samuel Wood, F.C.A., was re-elected an Auditor of the Company.

#### VOTES OF THANKS.

Dr. TURNER proposed a vote of thanks to the Chairman and Directors; remarking that everything was most satisfactory. He lately had to go over something like thirty of the largest houses in the most fashionable parts of London; and nothing struck him more than, on going into the kitchens, to see the universal use of gas-stoves. These were houses where large entertainments would be given; and it proved what could be done with gas-stoves in the way of cooking. It was a wonder to him that gas-cookers were not more used by the middle and poorer classes. No doubt, from what the Chairman had said, they were much more largely employed than was formerly the case; but, even so, he thought they could be used a great deal more. It seemed to him that, had it not been for the competition of electricity, they would not have had the improvements in gas that were to be seen. It had made those who studied the illuminating and heating power of gas strive to overcome their difficulties; and they had overcome them, and had got far ahead of electricity. The results they had had put before them that day would not have been attained except for the Board taking great care of the proprietors' interests. The increased consumption would not of itself have enabled the payment of the extra dividend of 3s. 4d.

Mr. H. GUNDY seconded the vote; and it was heartily accorded.

The CHAIRMAN, in the course of his acknowledgment, said he thought they were all agreed that the electric light had done good work for gas; but they felt that gas was superior to electricity, and intended to push it for all it was worth. The Board was a perfectly united one, with only one desire—to further the interests of the Company. He proposed a hearty vote of thanks to the officers and employees. They were greatly indebted to them for their loyalty and devotion; and he could not too strongly express himself with regard to the manner in which they had one and all discharged their duties.

Mr. T. WILKINS seconded the motion, which was agreed to.

The vote was responded to by Mr. S. Y. SHOUBRIDGE, the Engineer, on behalf of himself and his staff, and by Mr. OHREN for the Secretarial department.

#### CROYDON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts.

#### SATISFACTORY PROGRESS.

The CHAIRMAN, in moving the adoption of the Directors' report and accounts, said he thought the latter could be regarded, without reserve, as very satisfactory. In all departments, the Company's business showed that gratifying headway had been made. In the output of gas, there was an increase for the half year of 33 million cubic feet, or 5·54 per cent. Closely related to this was the pleasing increase in the use of gas for heating, as shown by the additional number of gas-fires sold and let on hire; these representing for the half year more than 1500—by far the largest growth in this direction the Company had so far experienced in any half year. The number of consumers had increased in the half year by 1177; and the gas accounts now reached the large total of 35,644. As would be seen from the accounts, the revenue from the sale of gas was £2754 more than a year ago; and it must be remembered that for three months of the half year they were comparing with a period when the price of gas was 2d. higher than it was now—this reduction representing a gain to the consumers in the quarter of £2000.

#### COAL AND COKE AND OTHER RESIDUALS.

The lower prices at which the Directors were able to enter into contracts for coal last year, and the more favourable prices of gas oil, had enabled a considerable saving to be effected in the expenditure on raw materials. This he pointed out last August; and he then said that against this saving was to be set an anticipated considerable loss of revenue from the lower price of coke. He was glad to say that this loss had been much less than was expected—in fact, the actual revenue from coke was, as the proprietors would see, £250 more; and the average price had been only 7d. per ton less, against a saving in the price of coal of 1s. 4d. per ton. This satisfactory price of coke was largely due to a demand that sprang up in the late autumn, in consequence of a spurt of cold weather, and to the small stocks then existing in London.



In their own case also, it was partly due to the increasing proportion of the make which they were able to sell locally. At all times, they had to send away by rail the larger part of the coke made. But the Company did all they could to encourage its local use; and it was satisfactory to find that this use was extending. It now represented about 30 per cent. of the coke they had for sale. They were producing a coke in pieces of small and even size, specially suited for domestic grates and small greenhouses; and this was finding its way into favour. Another satisfactory residual was tar. For many years this had been a disappointing product to all makers of gas; the price realized being extremely low, owing to the quantity manufactured at gas-works tending to increase faster than did the demand. Now, however, there was found a use for large quantities in treating roads. Recognizing the value of this local outlet, their Engineer had for some time past paid special attention to the treatment of the tar to adapt it to the requirements of local authorities; and the quality of the tar sold in this direction had been very well reported on. The importance of using for road treatment a suitable tar could not be too strongly insisted on; and they might congratulate themselves that they stood to secure a fair share of the demand that was springing up. In each of the last two years, the local sales of tar had improved; and the average price realized showed a corresponding improvement—representing in the two years 14 per cent. Briefly, the gain from the prices of coal, if set against the results from residuals, showed a net saving equal to rather over 1d. per 1000 cubic feet of gas. The gain on coal would have been greater, had not it been thought desirable to hold a large stock in view of the unsettled state of the coal trade. Had this not been the case, the question of lowering the price would have had the serious consideration of the Directors. They felt, however, that it would be unwise to do so for the present; but if the course of events in the coal districts became more favourable, he hoped shortly to announce a reduction.

#### CO-PARTNERSHIP.

The Directors had every reason to be satisfied with the results of the co-partnership with the Company's employees which he announced a year ago; and no doubt this had in some degree helped to produce so good a half-year's trading.

#### FREE MAINTENANCE—SERVICE GOVERNORS AT LOW RENTAL.

Reference was made in the report to the favour with which consumers were receiving the Company's offer of free attendance to their incandescent gas-burners. The new system came into force only in October last; and in the three months to December, the number of consumers whose burners were under the Company's direct supervision had increased from 800 to more than 2000. The cost of this service to the Company was considerable. But it could be safely said that the gain to consumers was much greater than was represented by the cost to the Company. A yet further benefit was experienced by those consumers who had availed themselves of the Company's offer to fix governors to their service-pipes at low rentals. These governors enabled uniformly good results to be obtained from incandescent burners, and from gas cooking and heating stoves. So far as lighting was concerned, consumers who had governors, and who allowed the Company to keep their burners in order, might safely congratulate themselves on having by far the cheapest, most reliable, and most satisfactory artificial light that was at present obtainable under any conditions. They had in the staff of their distribution department (to whose energies much of the recent development of their business was due), the means of giving expert advice free to any consumer on any point relating to the use of gas; and it was to be hoped the number of consumers who availed themselves of these services would continue to increase.

#### THE STANDARD BURNER BILL.

The proprietors had had notice that this meeting was to be immediately followed by one at which the Directors would ask them to approve the Bill being promoted in Parliament dealing with the standard burner for testing. The provisions of the Bill would then be explained by their Engineer. At present, therefore, he (the Chairman) would only say in regard to it that it should receive the support of every stockholder and of every consumer; for its ultimate result, if passed by Parliament, would be for the benefit of both.

#### LOCAL DISTRIBUTION OF PROFITS.

He was not sure whether it was generally known how intimately the affairs of a gas company were connected with those of its district, and thought it might be interesting if he gave some particulars as to the money the Company circulated in the neighbourhood. Taking last year, to begin with they paid in local rates alone nearly £8000, and in salaries and wages (practically the whole of which were spent in the district) £48,000; to local contractors for gas-fitting work—chiefly, therefore, for wages—£4400; and to other local tradesmen amounts reaching a total of £5000. In addition, a large proportion of the dividends paid—in fact, more than £18,000—went to residents in the neighbourhood, as a large number of the stockholders were also consumers. In all, well over £80,000 would be spent in the district in the year. He thought this statement might be interesting to some of the stockholders and consumers present. There was often an idea, too, that a gas company was a corporation taking large profits out of the users of gas for the benefit of wealthy capitalists who held its stock. Well, each of the 1500 odd stockholders in this Company obtained an average income from his holding of rather less than 11s. a week. Really a gas company such as this was, in large measure, a co-operative undertaking; and while its interests were absolutely dependent upon those of the residents in the district it served, the interests of those residents were also very intimately connected with those of the gas company.

#### AN EXHIBITION AT SHEPHERD'S BUSH.

Many of the proprietors probably knew that there was to be a Japan-British Exhibition at Shepherd's Bush this year, on lines generally similar to those of the Franco-British Exhibition held two years ago. The London and Suburban Gas Companies were uniting in organizing an exhibit which would, it was hoped, bring vividly home to many of the visitors there the great advantages which gas offered to the householder; and he was sure the proprietors would approve of the action

the Directors had taken in agreeing to share in the cost of this up to a certain amount.

#### SOME FINAL FIGURES.

It would be seen that £2310 was charged to net revenue account in respect of disused plant at the old Carshalton works; thus writing this balance entirely out of the Company's accounts. The renewal fund was charged with £1500, the value of the old sulphate house and plant now pulled down to make room for the new coke plant at No. 2 house, and £1000 was carried to the fund from the net revenue account. After these charges were borne, there remained a balance of profit sufficient to pay the usual dividends, and add £913 to the carry forward—making the substantial sum of £7465.

The DEPUTY CHAIRMAN (Mr. T. Rigby) seconded the motion; remarking that he quite agreed with the Chairman as to the results of co-partnership. The effects of the mutual co-operation thus established could be seen in the accounts.

The motion was unanimously carried.

Mr. WILLIAM CASH proposed that dividends be declared at the rates per annum of 14½ per cent. on the "A" stock, 11½ per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock, all less income-tax. He observed that the accounts were very satisfactory ones. The dividends had been well earned; and there was a substantial balance over. The 5½ per cent. increase in consumption was very gratifying, though there was no doubt whatever they had been, in some measure, assisted by the climatic conditions prevailing during the latter part of the half year. The Directors looked with confidence to the half year they had now entered upon.

Mr. PERCY H. HALL seconded the proposition, which was unanimously carried.

Moved by the DEPUTY-CHAIRMAN, and seconded by Mr. MAITLAND, the Chairman was unanimously re-elected to his seat at the Board, as was also Mr. Samuel Spencer, on the motion of Mr. WILLIAM CASH, seconded by Mr. W. EDGAR.

The CHAIRMAN acknowledged the renewed confidence of the proprietors, as also did Mr. SPENCER. The latter, who was elected to the Board on the amalgamation of the old Carshalton Company fifteen years ago, stated that, when those works were taken over, the sales in the district were only about 30 million feet a year, now they were 190 millions, or about six times more. He should think that was a record for any district in the country in such a period.

Moved by Mr. DYER, and seconded by Mr. LAMBERT, the retiring Auditor (Mr. J. C. Benwell) was re-appointed.

Proposed by Mr. TAYLOR, and seconded by Mr. SAMSON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the vote on behalf of himself and his colleagues. Proceeding, he moved a similar recognition of the services of the Engineer and General Manager (Mr. Helps), the Secretary (Mr. Topley), the Assistant-Engineer (Mr. Caddick), the Distributing Superintendent (Mr. Sandeman), Mr. Anderson (Assistant Secretary), and Mr. Haines (Assistant Accountant), the staffs, and workmen generally, of all of whose services he said he could not speak too highly.

Mr. SPENCER seconded the motion; and it was heartily agreed to.

#### THE LARGEST DISTRICT.

Mr. HELPS acknowledged, on behalf of himself, his staff, and workmen, the kind words used and the cordial endorsement of the proprietors. He added that the scheme of co-partnership had met with the great approval of all who had joined it. He was pleased to see present a considerable number of the men whom the scheme of co-partnership had made proprietors. The gas industry he believed was just as strong now as ever it was. The indication was, he thought, when they could show 5½ per cent. increase, that gas was by no means dear, that it was flourishing, and would hold its own for many years to come. He believed their district was larger than that owned by any gas company in the country—even larger than that of the Gaslight and Coke Company, at any rate prior to their taking over the West Ham Company. They (the Croydon Company) had something like 78 square miles to supply. This was a considerable amount of ground to cover; and it was a matter of no great ease for the officials in the distribution department to look after it. But he was glad to say they did it very thoroughly.

Mr. TOPLEY also spoke of the appreciation of himself and staff at the kindly way in which the vote had been received.

#### The Standard Burner Bill.

A Special General Meeting was then held, for the purpose of considering, and, if thought fit, approving of, the Standard Burner Bill, in the promotion of which the Company are joining.

The CHAIRMAN moved a resolution accordingly. He remarked that this was a matter that should receive the support of proprietors and consumers alike, because it would be to their advantage. It might be of interest to know that the Directors had received proxies from 90 proprietors, representing a holding in the Company of £28,875. He would ask Mr. Helps to explain the Bill.

Mr. HELPS read the preamble and provisions of the Bill, explaining, as he did so, the object sought to be attained.

Mr. C. E. BOTLEY seconded the motion. He remarked that there was no doubt about it the proposed change of test-burner would confer a benefit on the consumers, as it would give the Company greater freedom of action. They were simply asking by this Bill to have the same privilege and right as neighbouring companies. They had the South Suburban Company on the one side, and the Mitcham and Wimbledon Company on the other, who had the authority of Parliament to have their gas tested by this burner. The present burner, owing to the alterations in the manufacture of gas which had been necessitated of late years, did not give a true reading of the actual quality of the gas. As the proprietors were aware, the consumers derived the largest amount of benefit, under modern legislation, from any economies realized in the manufacture of gas. Moreover, it would not pay the gas companies, in view of municipal competition in electricity supply, to distribute an inferior article.

Mr. BALDOCK and Mr. DYER also spoke in support of the resolution; and it was unanimously carried.



## COMMERCIAL GAS COMPANY.

## The Half-Yearly Report and Accounts.

The following is the report that the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit for the half year of £70,598 13s. 11d., which, added to the balance of £23,058 15s. 3d. brought forward from last year, produces a net revenue balance of £93,657 9s. 2d. Deducting therefrom £8832 4s. 10d. for interest, there remains standing to the credit of the net revenue account a balance of £84,825 4s. 4d. available for dividend. The Directors recommend the payment of dividends at the rates of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. Having regard to the continual fall in value of trustee securities, in which the Company's investments on account of the insurance and reserve funds are placed, the Directors have written these investments down to market prices on Dec. 31, 1909. Under the powers of the Commercial Gas Act, 1902, the Directors made an issue of £20,000 of 4 per cent. stock in September last to the consumers and employees of the Company.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 31st of December amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remain unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,606,065 4s. 5d. The expenditure stands at £1,443,767 10s. 9d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,656,580 0s. 9d. There is consequently a balance of £50,514 16s. 4d. carried to the balance-sheet. The net expenditure on capital account in the half year was £9691, apportioned as follows: New and additional mains, services, &c., £1837; stoves, £4032; prepayment meters and fittings, £3822. The reserve fund amounted at the close of December to £37,107; and the insurance fund to £35,100. The following is the

## REVENUE ACCOUNT.

## Expenditure.

## Manufacture of gas—

Coal and oil, including dues, carriage, unloading, and trimming . . . . .	£91,320 13 11	
Salaries of Engineer and officers at works . . . . .	2,417 3 0	
Wages (carbonizing) . . . . .	13,484 0 9	
Purification, including labour . . . . .	1,410 10 4	
Repair and maintenance of works and plant, materials and labour (less £315 5s. 5d. received for old materials) . . . . .	32,884 11 5	
Profit sharing . . . . .		£141,517 17 5
Distribution of gas—		2,783 7 4
Salaries and wages of officers (including rental clerks) . . . . .	£4,484 4 9	
Repair, maintenance, and renewal of mains and services, material and labour . . . . .	5,992 15 5	
Repair and renewal of meters . . . . .	2,211 9 6	
" " " " stoves . . . . .	7,827 9 2	
" " " " prepayment meters and fittings . . . . .	10,545 13 11	
Incandescent mantle maintenance . . . . .	569 7 8	
Public lamps—lighting and repairing . . . . .		31,631 0 5
Rent, rates, and taxes . . . . .		2,472 19 8
Management—		12,698 8 10
Directors' allowance . . . . .	£1,250 0 0	
Company's Auditors . . . . .	75 0 0	
Salaries of Secretary, Accountant, and clerks . . . . .	1,235 7 6	
Collectors' salaries and commission . . . . .	1,678 15 0	
Prepayment meter collection . . . . .	2,947 19 1	
Stationery and printing . . . . .	913 7 6	
General charges . . . . .	1,409 16 3	
Bad debts . . . . .		9,510 5 4
Law and parliamentary charges . . . . .		910 19 10
Superannuations and allowances . . . . .		146 5 9
Official officers, &c. . . . .		1,238 7 9
		103 18 0
Total expenditure . . . . .		£203,013 10 4
Balance carried to net revenue account . . . . .		70,558 13 11

## Receipts.

Sale of gas—		
Common gas per meter at 2s. 6d. per 1000 cubic feet (98,485) . . . . .	£197,998 14 8	
Public lighting and under contracts, common gas . . . . .	5,666 8 9	
	£203,665 3 5	
Less discounts and allowances . . . . .	3,635 10 11	
		£200,029 12 6
Rental—		
Meters (23,764) . . . . .	£2,846 17 1	
Stoves (59,143) . . . . .	9,429 18 10	
Prepayment meters (73,951) . . . . .	14,394 9 4	
Incandescent mantle maintenance . . . . .	557 9 7	
		27,228 14 10
Residual products—		
Coke, less £ 012 1s. 9d. for labour . . . . .	£27,326 10 6	
Breeze, less £1173 5s. 2d. for labour . . . . .	2,311 14 9	
Tar . . . . .	7,516 15 7	
Ammoniacal liquor and sulphate of ammonia . . . . .	9,145 13 1	
		46,300 16 11
Miscellaneous receipts—		
Rent recoverable . . . . .	£14 15 0	
Transfer fees . . . . .	8 5 0	
		5, 0 0
Total receipts . . . . .		£273,612 4 3

The following are the statements relating to the manufacturing operations of the Company in the half year.

## Statement of Coals and Oil.

Description of Coal.	In Store June 30, 1909.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1909.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . . . . .	29,859	101,947	101,939½	601½	29,565
Cannel . . . . .	177	..	30	..	147
Total . . . . .	30,036	101,947	101,669½	601½	29,712
Oil—gallons . . . . .	397,134	1,386,605	1,315,460	..	468,279

## Statement of Residual Products.

Description.	In Store June 30, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1909.
Coke—tons . . . . .	4,090	62,272	12,315	52,815	1,232
Breeze—tons . . . . .	5,512	12,156	..	13,751	3,947
Tar—gallons . . . . .	478,307	1,236,287	..	1,160,308	554,286
Ammoniacal liquor—butts of 108 gallons . . . . .	7,302	35,696	32,719	..	10,279
Sulphate of ammonia—tons	80	945	..	895	130

## Statement of Gas Made, Sold, &amp;c.

QUANTITY SOLD.				Number of Public Lights.
Quantity Made.	Public Lights and under Contracts (estimated).	Private Lights, per Meter.	Quantity Accounted for.	
Thousands. 1,786,258	Thousands. 36,656	Thousands. 1,585,618	Thousands. 1,649,067	3917

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £24,291; coke and breeze, £927; tar, ammoniacal liquor, sulphate of ammonia, &c., £9212; sundry stores, £33,852—total, £68,282. The figures this time last year were: Coal, oil, &c., £23,389; coke and breeze, £8545; tar, ammoniacal liquor, sulphate of ammonia, &c., £8989; sundry stores, £34,969—total, £75,892. A sum of £13,508 stands in the balance-sheet as employees' bonus and savings, compared with £16,956 at the end of December, 1908.

## LIVERPOOL UNITED GASLIGHT COMPANY.

Presiding at the Half-Yearly Meeting of the Company last Tuesday, the Chairman (Mr. H. Wade Deacon) said the result of the past half-year's work had been very satisfactory; there having been an increase (in all classes of consumers) of about 3 per cent. in the quantity of gas consumed, as compared with the corresponding six months of the preceding year. The report was adopted, and a dividend was declared (less income-tax) for the half year to Dec. 31 of 5 per cent. on the ordinary consolidated stock of the Company, and of 3½ per cent. on the consolidated 7 per cent. stock created under the Company's Acts of 1865, 1882, and 1886.

A special meeting was subsequently held, when the Directors approved of the terms of the Bill which is to be introduced into Parliament entitled "A Bill to provide in the case of certain gas companies for the adoption of the 'Metropolitan' argand burner No. 2 as a standard burner in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them, and for other purposes." The Chairman pointed out that the Bill was being promoted by 47 gas companies; its object being to bring into operation one standard burner by which the gas of all these companies would be tested. If the burner was adopted, the Company would be enabled to supply at a lower power than at present, but at the same time to manufacture gas which could be favourably compared with other towns.

## SHEFFIELD UNITED GASLIGHT COMPANY.

## Half-Yearly Report and Accounts.

In their report for the six months ended the 31st of December, which will be presented to the proprietors at the ordinary general meeting of the Sheffield United Gaslight Company on the 14th prox., the Directors express their pleasure in stating that they are able to present a favourable account of the half-year's working; the consumption of gas having increased by 107,415,000 cubic feet, or 6·35 per cent., as compared with the corresponding period of 1908. The profit, after payment of interest on the debenture stock, amounts to £43,632, which is £208 more than is required for the dividend. This added to the amount brought from last half year leaves a balance of £74,975 to be carried forward. The Directors add that the average price at which gas was sold last half year was 1s. 3·04d. per 1000 cubic feet.

The accounts accompanying the report show that the sale of gas in the half year produced £111,702, the rental of meters and stoves came to £9437, residuals brought in £63,478, and the total revenue was £186,089. The expenditure on the manufacture of gas amounted to £111,363 (coal costing £68,396, and repair and maintenance of plant £21,701); distribution, £13,905; management, £6073; rents, rates, and taxes came to £9621; and the total expenses were £142,432. The amount carried to the profit and loss account is £43,657; and the balance on this account is £118,400.



## NEWCASTLE AND GATESHEAD GAS COMPANY.

## The Mining Dispute and Gas Supply.

The Annual General Meeting of the Newcastle and Gateshead Gas Company was held last Wednesday—Sir W. H. STEPHENSON in the chair.

The Directors reported that the quantity of gas sold during the year was 2,987,042,000 cubic feet—a small increase of 19,603,000 cubic feet, or 0.66 per cent., upon the sales of the previous year; but a satisfactory feature was that the improvement was entirely in the second half of the year, which it was hoped was a sign of the passing of the long-continued depression in the trade of the district. The revenue from gas sold was £281,260, against £266,467, and from residuals £110,079, against £116,563, in the previous year. The number of consumers on Dec. 31 last was 109,276—an increase of 4011 prepayment and 953 ordinary; and the number of cooking-stoves out on hire was 62,845, being an increase of 1310 prepayment and 446 ordinary. Advantage was taken of the necessity to carry out extensive repairs to one of the gasholders at Redheugh, to erect on the same site a practically new holder of larger capacity on the spiral-guided principle, by which means the capacity of the holder was increased from 1,750,000 to 3,315,000 cubic feet.\* The cost was £18,406. Reference was made by the Directors to the resignation by Mr. W. Doig Gibb of his position of Chief Engineer of the Company, to take office under the South Metropolitan Gas Company, and to the appointment of Mr. Thomas Hardie, who has been with the Company since 1896, and Manager of the Redheugh station since 1899, to fill the vacancy. They stated that all the further changes necessary upon the appointment had also been made by promotions from the existing staff. The accounts accompanying the report showed that the revenue last year was £425,899, and the expenditure £317,589; leaving £108,310 as the profit for the year. Adding the balance of £547 brought forward, there was produced a total of £108,857. The Directors recommended the payment of dividends at the rate of £4 and £4 7s. 6d. per cent. per annum on the preference and ordinary stocks (less income-tax). These with the interest on debenture stock, loans, &c., to Dec. 31 last would absorb £104,328, and leave a balance of £4529 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, gave some figures from it and from the accounts for the past year. Passing on to general matters, he remarked that, whatever might have been the state of trade in other parts of the kingdom during the past year, on Tyne-side it had moved very slowly towards betterment; and it certainly was better in the later months. He trusted that during the present year they would see continued improvement, as there was abundant room for it. Coals were purchased more favourably for the yearly contracts commencing in July; and the coal bill for 1909 was £22,233 less than in the previous year. The present disturbed condition of the coal industry of the district owing to the Coal Mines (Eight Hours) Act of 1908 coming into operation on the 1st of January last, had been, and continued to be, a source of anxiety to the Company. The coming into operation could not have taken place at a more awkward date for gas undertakings, being the period of the largest consumption of the year. Considerable stocks were accumulated by the Company during the later months of 1909, in anticipation of difficulties in obtaining supplies. Almost without exception, the collieries of the Company's contractors were idle during some considerable portion of January, and in consequence no coals were obtainable against contracts. However, with the stocks, with the purchase of a few thousand tons from collieries working (at a greatly enhanced price, of course), and with the aid of their oil-gas plant, they had managed to pull through without causing any inconvenience to their consumers. He trusted they were approaching the end of the trouble brought about by the introduction of an unnecessary, and so far as their district was concerned, an uncalled-for Act. Referring to the recent labour troubles, the Chairman said that, of course, the vote which had been taken in the county of Northumberland, the result of which was declared on the previous Saturday, showed that, according to the rules, no strike could take place; but, on the other hand, it showed that a majority of men had voted for a suspension of work. So far as they as a gas company were concerned, it was a matter of vital importance. No greater calamity could come to the district they served, with its population of about 500,000, which relied upon them for its light, than if it were put into darkness. They were trying to avoid inconvenience; and he hoped good sense and reasonable fair dealing would bring present difficulties to an end, and that the Company would be able to get sufficient coal to supply all legitimate wants.

The DEPUTY-CHAIRMAN (Sir Walter Plummer) seconded the motion; and it was carried.

The dividends recommended were then declared, the retiring Directors were re-elected, and the proceedings closed with a vote of thanks to the Chairman.

\* The holder was described and illustrated in the "JOURNAL" for Jan. 26, 1909 (p. 231).—ED. J.G.L.

**Warrington Corporation Bill.**—The result has been declared of a poll at Warrington to decide whether the Corporation should proceed to Parliament for a Bill for the construction of a bridge over the Mersey, river works, and street works; and for powers relating to gas, electricity, land, &c. The opponents of the Bill were in favour of Local Government Board procedure. The Corporation carried both points by large majorities.

**New Issues of Gas and Water Capital.**—It will be seen, from an announcement which appears elsewhere, that next Tuesday Messrs. A. & W. Richards will offer for sale at the Mart, Tokenhouse Yard, E.C., by order of the Directors, £5000 of 5 per cent. ordinary stock, £10,000 of 5 per cent. preference stock, and £5000 of 4 per cent. perpetual debenture stock of the South Essex Water Company; and on March 22, £5000 of consolidated stock, £6500 of 5 per cent. preference stock, and £3000 of 4 per cent. perpetual debenture stock of the Hornsey Gas Company, also under instructions from Directors.

## BOURNEMOUTH GAS AND WATER COMPANY.

## Price Reduction and Prosperity.

The Ordinary Half-Yearly Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting; and the Directors' report and statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, for several half years it had been his pleasure and privilege to lay before the proprietors a series of very satisfactory accounts and encouraging reports. In fact, he had almost exhausted his vocabulary in congratulating the proprietors on the position in which they found themselves as a Gas Company. On the present occasion, therefore, as could be imagined, he had additional difficulty in presenting the accounts, because the Company had an increased output, an increased revenue, an increased balance, and a decreased amount of unaccounted-for gas; and they had therefore got beyond, and considerably beyond, what he had ventured to call the record on previous occasions. With this state of things, his first idea would be to be perfectly silent; and to ask the proprietors to carry the accounts and accept the report. To use the language of the present day, the state of the Company's affairs were all "Gains" and no "Losses;" and, as far as the dividend was concerned, "No change." Therefore, if his remarks had been silver in the past, his silence on this occasion would be golden. He would, indeed, be content to paraphrase the well-known epitaph on Sir Christopher Wren, and say: "If you want a monument of the last six months' working, look round at these accounts." It might, however, be well to say a few words as to what had been going on during the past half year. In the first place, he would remind the proprietors of his prophecy—he did not often prophesy from the chair—a year ago, to the effect that, although they had made a reduction in the price of gas, if things went on as they were doing, the Company would soon recover itself, and be able to show a return independent of the loss sustained by the reduction of the price. His prophecy had come true because they had completely recovered themselves before the end of the year. And the question now remained as to how they should deal with the successful accounts before them. It would be noted that, acting on the policy they had adopted for many years, the Directors proposed to give the benefit of the state of affairs to the consumers by again reducing the price of gas. The proposed reduction of 2d. would make a total reduction of 5d. during the last two years; and he thought they would have to go far before they would find a more satisfactory half year, or a more satisfactory state of affairs, than this. The reduction represented on the present output about £14,000 a year. But at the same time he need not say, the Directors would not have attempted to make the reduction if they did not think the accounts fully justified them in taking the step. It was a moot point, he believed, as to how far a reduction in the price of gas brought fresh business; but it certainly would assist the Company and their canvassers, and all their friends at Bournemouth, in meeting the constant conflict they had with electricity. Looking to the future, it was, of course, possible there might be troubles ahead with regard to the coal market; but he might say as to the future cost, it was not likely to be too serious for the Company to deal with on the present accounts and the present successful working. Therefore they would be prepared for any contingency with reference to coal. Nor had they by any means come to the end of the economies in working. Nor had their Engineer and General Manager (Mr. Harold W. Woodall) ceased to promote those reforms which would still further strengthen the Company. He need not say that they had maintained the plant in the highest state of efficiency; and they had carried out, as they were always doing, improvements from beginning to end—improvements that offered themselves in any way, and were valuable. There was one other matter to which he might draw attention—that was, the purchase of the freehold of their properties at Alderney and Longham. He did not want to suggest that these were not perfectly safe before with the long lease they had; but, however safe they might have been with the lease, they were safer still having the fee-simple now in the possession of the Company. When they were dealing with the water supply of a town like Bournemouth, it was very desirable that the property connected with the supply should be absolutely under their own power and control. Therefore he might congratulate the proprietors upon their having possession of all the property in their own hands. This was the short story of the Company during the past six months. If he might be allowed to say so, it was in a sense a triumph for their Engineer and General Manager and his staff, as it was the result of their energetic and enthusiastic work. Knowing their Engineer as they all did, he might say that any position they had gained would not be used as a halting-place, but merely as a vantage ground for further reforms and greater success in the future.

Mr. WILLIAM CASH, in seconding the motion, said there were one or two small matters to which he might refer, and upon which the Chairman had not touched. In the past half year, they had had a certain amount of assistance from the reduction in the price of coal; their new contracts having been entered into on more favourable terms. On the other hand, if reference was made to the statement of coals, it would be seen that they started the half year with nearly 12,000 tons of coal in hand; and they carbonized during the half year more than 20,000 tons. It followed, therefore, they had not had the full effect of the reduction of price. Therefore, should it unfortunately happen that the price of coal should slightly rise again when they made their new contracts in one or two months' time, practically they would be in as good a position as they were in during the past year. The carbonizing results had also been assisted somewhat by the fact that they had to pay rather less for oil than they had to do in the corresponding period of the previous year. The increase in the gas business was extremely satisfactory. It worked out to over 8 per cent. for the half year. This showed the business was growing in lighting, cooking, and heating. Then with regard to the price of gas, it was worthy of note that while they had reduced the price by 5d. in Bournemouth since



1903, they had reduced it 7d. in Poole in the like period, or would have done so with the present reduction. The price in Poole would then be only 2s. 11d., which was a big drop from the figure at which gas was supplied before they took over the undertaking of the Poole Company. The reduction in price would also enable the Directors to do what they always hoped would be a necessary sequence to the scheme inaugurated last year—that was, pay a slightly increased bonus to their co-partners in respect of the year ending June, 1910. When they had received the full benefit of the reduction, the bonus would be considerably more. All these things were carefully thought of and estimated before the reduction was made.

Mr. A. B. BOSHER congratulated the Directors upon the excellent report. He was pleased to see in the report that the price of coal had gone down. In the North, he was sorry to say, they could not hold out much hope that coal was going to be cheaper. If it only remained at somewhere about the price at which it was to-day, they would be very satisfied indeed. The wretched Coal Mines (Eight Hours) Act had been an absolute *bête noir* to the coal trade during the last six months or so; and it had been found that the Act was not wanted by anybody. The great peculiarity was that our statesmen had brought into being something that had been found to be absolutely useless. How long it was going to remain on the Statute Book was a question. He hoped it would be abolished, or, at any rate, amended. The sooner this was done, the better for all users of coal. He noticed that rates and taxes were £4500 for the half year, which he believed was a little more than in the corresponding period of the previous year. Something would have to be done in this matter to protect such concerns as gas, water, and railway companies against this ever-increasing expense. He was glad to say that he believed some action would soon be taken to fight this question; and he hoped it would be successfully fought. He trusted the gas companies would fall into line with the railway companies when this came about.

Mr. GLEN inquired if there were any workmen shareholders yet under the co-partnership scheme, and, if so, how many?

The CHAIRMAN pointed out that they were only just beginning; but several co-partner workmen already held shares.

The SECRETARY observed that the whole of the funds were necessarily placed in shares. The money was held by trustees on behalf of the men until a man had enough to secure a whole share. At the present time, they had about 25 workmen shareholders; and the number would gradually increase.

The motion was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. CASH, dividends were declared, less income-tax, at the rate per annum of 6 and 7 per cent. on the preference and "B" ordinary shares respectively, and 15 per cent. on the original share capital of £50,000.

On the proposition of the CHAIRMAN, seconded by Mr. R. HESKETH JONES, Mr. Corbet Woodall was re-elected a Director. The Chairman remarked that Mr. Woodall was one of their best friends, devoting, as he unstintingly did, his great talents and knowledge to the interests of the Company. The Board valued his services very highly indeed.

Moved by Mr. GLEN, and seconded by Mr. BOSHER, Mr. F. G. Barrett, the retiring Auditor, was also re-appointed.

#### The Standard Burner Bill.

A Special General Meeting of the proprietors was then held to consider, and, if thought fit, approve, the Joint Bill for the substitution of the "Metropolitan" No. 2 burner for testing the illuminating power of the gas in place of the existing standard burner—the Company being one of the body of promoters.

Mr. R. HESKETH JONES, in moving a resolution approving of the Bill, explained that, up to some five years ago, the "London" No. 1 argand was the recognized test-burner, and was almost universally used. Some five years since, Mr. Carpenter produced the "Metropolitan" burner No. 2, which burner was accepted by the Metropolitan Gas Referees, and also by Parliament. Its use had been sanctioned by Parliament in respect of about 80 gas undertakings—both company and local authority. It had been thought by many companies that the new burner should be made still more universal; and the present jointly-promoted Bill was the result. At Bournemouth they had to test their gas by the old Sugg burner; and it had been so far satisfactory that they had no cause to complain. There was no friction whatever between the Company and the local authorities. But it did seem to the Directors that the Company should go in with other companies for power to use what they hoped and believed would become the universal test-burner. No doubt there would be a certain amount of opposition. The Bill had passed the preliminary examination of the authorities of the House of Parliament. The Lord Chairman had passed it; and it was now ready to be introduced into the House of Lords. As to Bournemouth, he was pleased to say their General Manager had, with his usual suavity, approached the Town Clerk, and had explained the Bill to him. The Bill was merely of a formal character, and was not at all likely to cause any friction, or interrupt the good feeling existing between the Company and the Corporation of Bournemouth.

The CHAIRMAN seconded the resolution, remarking that, of course, the local authorities had their eyes open, and were careful to protect the interests of the consumers.

The motion was unanimously agreed to.

#### VOTES OF THANKS.

Mr. A. W. OKE proposed a vote of thanks to the Chairman and Directors, the officers, and their respective staffs.

Mr. RICHARDS seconded the motion.

The CHAIRMAN first acknowledged the compliment; and he was followed by Mr. WOODALL, on behalf of himself and the Bournemouth staff. Speaking first of co-partnership, he said that practically the whole of the money paid under the scheme has been invested in the Company's shares, or with trustees with the view of ultimately being invested in shares. But quite a considerable amount of money had also been paid in by the co-partners in addition—a large number of

the men making a weekly payment from their wages in the hope of getting their shares at an earlier date. He noticed a great desire on the part of the men to maintain the largest amount of money possible with the Company, and to keep increasing it. He was glad to know that proprietors were satisfied with the results of the half year. He might fairly say these excellent results were practically cumulative ones due to the policy of the Directors in building the new gas-works at Poole, and in connection with their Wimborne water supply, because these large works were now coming into full play. But with regard to the satisfactory increase this year, he thought one ought to discount it, seeing that it was an increase that had been shared by nearly every gas company, and had been due to climatic conditions. The winter had been an uncomfortable one; and it had certainly tended to the use of gas-fires during a considerable period. With regard to the Standard Burner Bill, he was glad to feel the Corporation were most friendly towards the Company; and the fact that they were going in with the other local authorities in opposing the Bill was quite a natural proceeding on their part, because when a collection of gas companies went to Parliament in this way, the corporations as a matter of course went also to see what (if anything) they could get, and they might do this in the most friendly fashion.

Mr. PLUMB also briefly responded.

#### WANDSWORTH AND PUTNEY GAS COMPANY.

##### Half-Yearly Report and Accounts—Another Reduction in Price.

The accounts for the six months ended the 31st of December last, which will be presented at the half-yearly meeting of the Company to-day (Tuesday), show a gross profit of £15,582. The revenue from the sale of gas was £52,628; from the rental of meters and stoves and the maintenance of incandescent mantles, £10,611; from residual products, £18,965—the total receipts being £82,596. The expenditure on manufacture of gas was £49,066 (coal and oil costing £30,927, and repair and maintenance of plant, £11,951); on distribution, £10,626; on management, £3149—the total expenses being £67,014. After providing, out of the above-mentioned £15,582, for interest on the debenture stock and on deposits and loans, there remains to the credit of the profit and loss account, with the balance brought forward, £20,933 available for distribution. The Directors therefore recommend that dividends should be declared at the statutory rates per annum of 8 2s. 6d. per cent. on the consolidated "A" stock, £6 12s. 6d. per cent. on the consolidated "B" stock, and £5 13s. 9d. per cent. on the ordinary "C" stock. The report closes with an expression of the Directors' pleasure in announcing a further reduction of 1d. per 1000 cubic feet (from 1s. 11d. to 1s. 10d.) as from Christmas last.

#### GAS SUPPLY IN NORTH LONDON.

At the Meeting of the Southgate and District Gas Company last Thursday, the Directors reported that the sales of gas in the six months ended Dec. 31 last showed an increase of 4,671,800 cubic feet, or 6.21 per cent., compared with those for the corresponding period of 1908. The new retort-house and carbonizing plant, to which reference had been made in a previous report, had been completed and successfully brought into use. Several alterations and additions which had been made to the works had necessitated considerable replacement of the plant, and a correspondingly heavy charge against the revenue account, which had been partly met out of the renewal fund. The accounts accompanying the report showed that the receipts from the sale of 79,892,300 cubic feet of gas were £14,048; and that the total revenue in the half year amounted to £17,197. The expenditure being £13,572, there was a sum of £3627 to go to the profit and loss account, on which there was a balance of £5887 applicable for distribution. The Directors recommended the declaration of dividends at the maximum rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital. The payment of these will absorb £2750, and leave £3137 to be carried forward.

The report to be presented at the half-yearly general meeting of the North Middlesex Gas Company to-morrow sets forth that, in comparison with the second half of 1908, the sales of gas in the six months ended Dec. 31 show an increase of 1.8 per cent.; and there was an improvement in the revenue derived from residuals. The quantity of gas sold was 98,141,000 cubic feet, and it brought in £17,074; the total receipts being £21,081. The expenditure in the six months amounted to £15,991; so that there was at the close of the year a balance of £5990 to go to the net revenue account. The amount available for distribution is £7506; and dividends at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital are recommended. These, with £473 carried to the reserve fund, will amount to £3681, and leave £3824 to be carried forward.

**Sale of Stocks and Shares.**—Three new issues, by order of Directors, were the outstanding features of the first sale conducted by Messrs. A. & W. Richards this year at the Mart, Tokenhouse Yard, E.C. It took place last Tuesday, when there was an excellent demand for all the stocks and shares offered. The first lots consisted of a new issue of £4000 of "C" consolidated stock and £4000 of 4 per cent. consolidated preference stock of the Aldershot Gas, Water, and District Lighting Company. The "C" stock (5 per cent.) was sold at from £106 15s. to £107 10s., and the preference stock at from £95 to £96 per £100. A new issue of £7500 of 5 per cent. preference stock of the North Middlesex Gas Company fetched from £115 to £116 10s. per £100. The third new issue was by the Southgate and District Gas Company, who offered £5000 of 5 per cent. preference stock and £2500 of additional ordinary stock (7 per cent.). The former was sold at from £113 to £114 10s., and the latter at from £145 to £147 10s., per £100 of stock. By instructions of a private owner, a few £10 fully-paid original ordinary shares in the same Company, carrying 10 per cent. dividend, fetched £21 10s. each.



## PROVINCIAL GAS COMPANIES.

### Satisfactory Development of Business at Aldershot.

At the recent half-yearly meeting of the Aldershot Gas, Water, and District Lighting Company, the Directors reported that the business is developing satisfactorily; the sale of gas in the six months ended the 31st of December (exclusive of special contracts) showing an increase of  $7\frac{1}{2}$  per cent. According to the accounts accompanying the report, the total revenue was £30,537, and the expenditure £22,215; leaving a surplus of £8,322. After providing for dividends on the preference shares and consolidated preference stock, and interest on preference stock, mortgage, and debentures, the Directors recommended a dividend at the rate of £12 2s. per cent. per annum on the "A" shares; £9 2s. per cent. per annum on the "B" shares (these rates being in accordance with the sliding-scale); £7 per cent. per annum on the "E," "F," and "G" ordinary shares; and £5 per cent. per annum on the "C" consolidated stock for the past half year; also a dividend at the rate of 3s. per cent. per annum on the "A" and "B" shares for the six months ended June 30, 1909—all less income-tax. The Chairman (Mr. A. F. Wilson), in moving the adoption of the report, said the revenue of £30,537 compared with £31,230 for the second half of 1908; and he explained at some length the cause of the difference. The total expenditure was £22,215 against £23,441; but in connection with their new Act they had paid £530 on account of opposition, and they had put £1566 to a special purposes fund, which the Act gave them power to create. Had it not been for these two items, the expenditure would have been only £20,100. There was a balance of £8322, compared with £7788 for the corresponding half of 1908, which was amply sufficient to pay the dividends recommended. As their Chairman, he felt convinced that the accounts of the Company were in a sound condition; and they showed that a considerable amount of progress had been made in relation to the actual consumption of the principal part of their revenue—viz., that derived from gas. They were now supplying the new balloon factory at Farnborough; and the Directors had hopes that gas would be used also for power purposes. The Chairman concluded by announcing his intention of resigning his position, but said he would be happy to remain an ordinary member of the Board. The report was unanimously adopted. The dividends were declared, and a vote of thanks was accorded to the retiring Chairman and the staff of the Company, which was duly acknowledged by Mr. Wilson and Mr. R. W. Edwards, the General Manager and Secretary.

### A Satisfactory Position at Annfield Plain.

The report that was submitted at the general meeting of the Annfield Plain and District Gas Company, which was held last Wednesday, at No. 50, Cannon Street, E.C., showed that the undertaking had continued to make steady progress. The accounts dealt with a period of twelve months to Dec. 31 last; and the net profit amounted to £2000, as compared with £1452 for the previous nine months. Dividends at the rate of 5 per cent. were declared both on the preference and on the ordinary capital; and after placing £196 to the reserve fund, a balance of £113 remained to be carried forward to next year. The number of consumers increased during the year by 294; there being at Dec. 31 2103 consumers, as compared with 852 when the Company acquired the undertaking in March, 1908. In moving the adoption of the report and accounts, the Chairman (Mr. W. A. Schultz, F.C.A., J.P.) said the output of gas during the twelve months had been 27,662,000 cubic feet, against 20,736,000 feet in the nine months covered by the previous accounts, or an increase of 6,926,000 feet. The quantity sold was 21,305,000 cubic feet, as compared with 14,023,000 feet, or an increase of over 50 per cent. The difficulty which all companies in mining districts had to deal with was in regard to the leakage; and this, he was pleased to say, had in their case been reduced by a matter of  $7\frac{1}{2}$  per cent. The sale of gas (including public lighting) had produced £4345, against £2982; while the total revenue had been £5563, compared with £3774. They had had some little trouble to contend with during the year in regard to the supply of coal, consequent on the difficulties among the Durham miners; but the only additional expense they had been put to was the extra cost of carting, owing to their having to get supplies from a colliery that was farther off. Looking towards the immediate future, the only capital expenditure probable would be in respect of extensions of mains and services and the addition of a sulphate plant and house, now being erected. While alluding to the question of capital, however, he ought to mention that the Burnopfield works on the north of the district (which they had had to buy) were still being carried on independently of the two works at Kyo and Dipton. When, however, they were able to link up the whole of the district, there would in all probability be a large increase in the output of gas, as there were many houses waiting to take a supply. The Directors were desirous that the local people should come forward and take up capital. When they did this, the Board would be in a position to consider a linking-up scheme, which would make the shares more valuable; and there would no doubt be a dividend of 7 per cent. on the ordinary capital. Such a scheme would not, however, be undertaken until the Company could afford it. At present, the capital expenditure stood at £15 per 1000 cubic feet of gas made; and considering that the Company was so young, and that the outlay provided a much greater manufacturing capacity than was now required, this was not an unsatisfactory figure. After the report had been adopted and the dividend declared, the retiring Directors (Mr. Charles Comins and Mr. W. C. Parkinson) and the Auditors (Messrs. Davies Bros.) were re-elected. The Managing-Director (Mr. C. Comins), Secretary (Mr. W. H. Kent), Manager (Mr. C. L. Ireland), and staff were thanked for their services. In response, Mr. Comins said he considered the Company had in Mr. Ireland an exceedingly capable officer. He had had many difficulties of a special character to contend with; and the accounts proved that he had dealt with the situation successfully. Mr. Kent, who had succeeded to the office of Secretary, had also fulfilled his duties to the satisfaction of everyone who came in contact with him. A vote of thanks to the Chairman and Directors brought the proceedings to a close.

### Progress at St. Austell.

The St. Austell Gas Company continue to more than hold their own in the competition which they have to meet. In the year ended Dec. 31, there was an increase of 45 consumers and of 875,000 cubic feet in the quantity of gas sold—a very creditable result in the circumstances governing the district. Considerable improvements have been carried out at the works, including the installation of a washer scrubber and the widening of the retort-house. The price of gas was reduced at Midsummer, and a sliding-scale of discounts introduced. The profit and loss account showed a balance of £772; and out of this it has been decided to pay a dividend of 8 per cent., to put £100 to the reserve fund, and to carry forward a balance of £31.

### Improved Relations at Coatbridge.

At the recent annual general meeting of the Coatbridge Gas Company, at which Mr. James Johnston, J.P., the Chairman of the Company, presided, the Directors reported that, with one exception, the accounts for the six months ended the 31st of December were satisfactory. The consumption of gas amounted to 91,234,917 cubic feet; being an increase of 2,934,824 cubic feet on that of the corresponding period of 1908; the gas lost by leakage was 5.45 per cent., against 5.16 per cent.; and the average illuminating power had been 20.46 standard candles, though the Company had the right, since the 21st of September, to reduce it further. There had been increases of 58 in the number of ordinary and prepayment consumers, and 158 in cooking and heating appliances let out on hire. The gross revenue amounted to £15,825, and the expenditure to £12,660; while the capital expenditure had been £486. Maintenance, renewals, and depreciation had been amply provided for, at a total cost of £2037 18s. 4d. The Directors expressed regret that the cost of the Provisional Order of last session, which they did everything possible to avoid, should have amounted to £1793; but as the accounts had been paid, they hoped the shareholders would only look upon the outlay as an unpleasant memory. They recommended the payment of dividends at the rate of  $11\frac{1}{2}$  per cent. per annum on the original stock, and 8  $\frac{1}{2}$  per cent. per annum on the three issues of £10 shares, less income-tax. The Chairman, in moving the adoption of the report, and the declaration of the dividends recommended, said the Directors had every reason to be satisfied with the present position of the Company. It was to be regretted that such an outlay had been incurred in connection with the promotion of the Provisional Order, which had been granted. They had always been on the most friendly terms with the Town Council; and now that their little differences had terminated, he had no doubt their relations would be of a satisfactory nature. The motion was seconded by ex-Provost Sharp, J.P., and unanimously agreed to. The retiring Directors and Auditor having been re-elected, ex-Provost Sharp moved that the Secretary (Mr. W. Johnston) be instructed to record in the minutes a special appreciation of the services of the Chairman in connection with the promotion of the Provisional Order. Mr. Johnston had not spared himself, at the three inquiries held in London, in his endeavours to put the facts, as they affected the interests of shareholders and consumers alike, before those who had to decide on the merits of the case; and it was to his painstaking efforts that they had to lay a great deal of the credit for the success they had achieved. Mr. Peter Barclay endorsed these remarks in seconding the motion, which was carried with enthusiasm. The meeting terminated with a vote of thanks to the Directors and the management for their services, and also to the Chairman for presiding; the Chairman returned thanks for the acknowledgment of his personal services and of those of his colleagues.

### Reduction in Price at Derby.

The report submitted at the meeting of the Derby Gas Company last Friday stated that the gross profit for the year to Dec. 31 last, less interest on bank account, amounted to £43,621, which, after deducting the interim dividend for the June half year, interest on debenture stock and deposits for the whole year, and also income-tax, left a balance of £27,581. This, with the balance of £2691 brought forward from last year, made a total sum of £30,272 available for dividend. The Directors recommended the payment of the standard rate of dividend on the consolidated stock at the rate of 5 per cent. per annum for the half year ending December, with an additional  $\frac{1}{2}$  per cent. for the whole year—making  $5\frac{1}{2}$  per cent., less income-tax. The rental showed an increase in the sale of gas, and also that a considerable saving in the cost of production had been effected. Satisfactory prices for residual products had been obtained. The purchase of the Belper Gas and Coke Company's undertaking had been completed; and there was a marked increase in the consumption of gas in the added area. A steady increase in the use of prepayment meters, gas-fires, and cooking-stoves had continued throughout the year. In moving the adoption of the report, the Chairman (Colonel Gascoyne) remarked that the results of the working were not less satisfactory than those of the previous year. Coal, which was always by far the largest item of expenditure, had cost £45,191, compared with £47,300; being a decrease of £2109, though they had carbonized almost 2000 tons more, and made nearly 40 millions cubic feet of gas more. The saving in coal was mainly due to lower prices. Purifying showed a reduction of £1127, due entirely to the installation of new purifiers and the substitution, to a large extent, of oxide of iron for lime. Carbonizing expenses totalled up to £6408. This was a reduction upon the previous year, due solely to improvements in the system of charging the retorts, whereby they were more perfectly filled. The results were much better, both in regard to the quantity and quality of the gas produced, and also the residual products; and it was expected that the results might be yet further improved. The total cost of manufacturing all the gas for the year, including the charges for purifying, for salaries, for carbonizing, for repairs, and maintenance, and all the expenditure for renewals, amounted to only £670 more than the previous year. This satisfactory position was eminently due to the installation of up-to-date plant, and modern processes, for which the shareholders were mainly indebted to the industry and ability of their Engineer and Manager, Mr. J. Ferguson Bell. The receipts from sales of gas, at £102,381, were £5949 more, mainly owing to the addition of the Belper and Milford districts. This, he thought, was most satisfactory, in face of the bad state of trade. There was also an item on the credit side of the accounts which had not appeared



before. The Company's waggons had earned £763. Some years ago, the Board purchased 50 twelve-ton waggons in order to carry coal from the collieries in their own waggons, instead of paying 6d. per ton for the hire of colliery company's waggons. The cost of these waggons had been gradually paid off, and their earnings now appeared as revenue. The Directors were always anxious the consumers should participate in the prosperity of the undertaking. Since the introduction of the sliding-scale, the consumers had become, as it were, partners in the concern; and the Board were fully alive to the desirability of selling gas at the lowest price consistent with the meeting of their engagements. The possibility of giving effect to these ideas, was afforded by the adoption of a bold and enterprising policy, by the incorporation of outlying concerns, and by their inclusion under one central administration. This course had been adopted; and the Directors now considered that they could see their way to a reduction in the price of gas. It was impossible to foretell the future; but if the Company remained unaffected by outside interference, or by imposition of unexpected burdens, there seemed a reasonable probability of their being able to make the reduction permanent. The Directors had authorized a reduction in the price of gas of 2d. per 1000 cubic feet to the great bulk of the household consumers; and this reduction would apply, not only to the central area, but to the outside districts as well. In the case of those customers who use prepayment meters there would be a reduction in all the districts of 4d. per 1000 cubic feet. This reduction of 2d. per 1000 feet would also be made on the initial price of gas for power. As regarded the consumers who take large quantities of gas which already brought them under a lower scale, they had a very substantial reduction some three years ago. The proposed concessions would cost the Company about £6000 per annum. It was calculated that out of the 28,475 consumers now on the books more than 27,000 would benefit to the extent of 2d. per 1000 feet on their gas bills. The reductions would commence in the quarter succeeding March next. In seconding the motion, Alderman Newbold pointed out that the concessions meant the reduction of the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet in Derby, and from 2s. 10d. to 2s. 8d. in the outside area. The report was adopted, the dividend recommended was declared, and the Chairman, Directors, Engineer, Secretary, and staff were thanked for their services. In responding for the staff, Mr. Bell referred to the question (mentioned by the Chairman) of the danger of the water-slide chandelier, and explained that it had already been decided by the Board to convert all such chandeliers, without any expense whatever to the consumer, so as to prevent possible explosions.

#### Increased Capital Sanctioned at Salisbury.

At the half-yearly meeting of the Salisbury Gas Company last Wednesday, the Chairman (Mr. George Fullford), in moving the adoption of the report and statement of accounts for the six months ended Dec. 31, and the payment of the usual dividends, directed attention to several items in the accounts, and said that though the Company did not go in for large or extensive schemes of improvement, they spared no pains in the utilization of any novelty that promised a reduction in working costs. The new retort-house erected last year, for example, enabled them to economize in more than one direction. The same might be said with regard to the new purifiers. As compared with other companies of similar size and circumstances, they were able to sell gas cheaply, and to give an article of excellent quality. They secured this result by careful attention to financial matters in buying and selling, and especially by keeping the capital outlay moderately low. It was easier to pay interest on a capital of £50,000 than on one of £80,000 or £90,000. At the same time, they did not hold back when outlay was really necessary, and they were always prepared to consider the requirements of growing and increasing districts. The sales of gas were increasing; and the whole of the plant was maintained in good order. Mr. W. Young seconded the motion, which, after some discussion on the accounts, was carried unanimously. A special meeting was then held at which the Directors were authorized to raise £2000 of additional capital, to provide for the needs of the Company's extending business. A vote of thanks having been accorded to the Chairman, Directors, and staff of the Company, Mr. S. R. Atkins responded on behalf of the Board, and Mr. Norton H. Humphrys, the Engineer and Manager, expressed the acknowledgments of the staff for this recognition of their work.

#### Steady Expansion of Business at Wellington (Salop).

The annual general meeting of the Wellington (Salop) Gas Company was held last Tuesday—Mr. H. Shepard, the Chairman, presiding. The report presented by the Directors showed that the revenue in the past year amounted to £9356, and the expenditure to £7243; leaving a surplus of £2113. The profit and loss account, after allowing for mortgage and debenture interest and an interim dividend at the rate of 5 per cent., showed a credit balance of £3257; and the Directors proposed to pay a dividend for the six months ended Dec. 31 at the rate of £5 13s. 4d. per cent., free of income-tax—making £5 6s. 8d. for the year, and leaving £2040 to be carried forward. The Directors stated that the Company's business continues steadily to expand; the sale of gas during the year showing an increase of 3½ per cent. In moving the adoption of the report and balance-sheet, the Chairman gave a résumé of the history of the Company, and said he thought the shareholders might congratulate themselves on the position the undertaking now occupied. The Directors were doing their best to keep the property up to the mark and increase the dividends legitimately. Under their new Act, they had a sliding-scale, so that they could do nothing wrong; and he and his colleagues had not a single regret in going to Parliament for new powers. It had placed them among the first-class companies in the country. Mr. C. W. Leake seconded the motion; and it was carried. The retiring Directors and Auditors having been re-elected, a vote of thanks to the Directors and also to the Manager (Mr. H. J. Woodfine), for the able way in which the affairs of the Company had been conducted during the past year, was carried by acclamation. At the conclusion of the meeting, the Directors and shareholders made an inspection of the works. The new plant which has been put in was pointed out and explained by the Manager to the assembled proprietors.

#### Satisfactory Year and Reduced Price at Scarborough.

At the annual meeting of the Scarborough Gas Company on the 12th inst., the Directors reported a continued satisfactory increase in the sale of gas in the past year; nearly 6½ million cubic feet having been sold more than in the year 1908, notwithstanding a reduction of almost 3 millions in the public lighting. The accounts showed a sum of £10,103 applicable for distribution; and the Directors recommended the payment of a dividend at the rate of 5 per cent. per annum for the six months ended Dec. 31 (less income-tax)—making, with the interim dividend 5 per cent. for the year. This will leave a balance of £3515 to be carried forward. The Directors announced their intention of reducing the price of gas by 2d. per 1000 cubic feet to the ordinary consumers in Scarborough, and by 3d. per 1000 cubic feet to those in Newby and Scalby; these reductions to take effect after the end of the present quarter. The Chairman of the Company (Mr. B. Fowler) was unable to preside on account of his health; but he wrote to the effect that the shareholders should be satisfied with the year's operations. The balance-sheet did the Secretary and Manager (Mr. A. Allan) credit, as without his care and hard work the result shown could not have been attained. Mr. W. S. Rowntree, who occupied the chair, read a statement prepared by Mr. Fowler. He congratulated the shareholders on the financial position of the Company, as shown by the accounts, and mentioned that the number of consumers continued to increase—235 being added during the past twelve months, bringing up the total to 10,727. The total income was £53,243, against £54,311 in 1908—a decrease of £1068. On the expenditure side, the cost of manufacture was £150 in excess of the corresponding year—chiefly due to the larger quantity of coal carbonized and the higher price paid for it during the first half of the year. The balance carried to the profit and loss account was £16,033, compared with £17,267 in 1908. The surplus brought forward was £3591, to which was added interest on investments, bank interest, and the balance on the revenue account; making a total of £20,295. Allowing for interest on mortgages and the interim dividend paid in August, the balance remaining on the profit and loss account was £10,103. The payment of the usual dividends would absorb £6588; leaving a surplus of £3515 to be carried forward. Mr. Fowler then referred to the reduction in price which the Directors had decided on making, as stated in the report, and concluded by referring to the appreciation by the consumers of the advantages of gas for heating purposes, as evidenced by the larger number of gas-fires sold by the Company. The Chairman moved the adoption of the report and accounts; and the motion was carried. The dividend recommended having been declared, the retiring Directors and Auditor were re-elected; and the meeting concluded with votes of thanks to the Directors and staff. A special meeting was subsequently held, at which the shareholders expressed their approval of the Standard Burner Bill, in the promotion of which the Company have joined.

#### A Record Year at Uxbridge.

The report presented at the ordinary meeting of the Uxbridge Gas Company last Thursday showed that the net profit on the working in the past year was £6756, and that there was a sum of £6023 available for distribution. The Directors therefore recommended the payment of a dividend of 5½ per cent. (less income-tax) on the consolidated stock, which would leave a balance of £25 to be carried forward. The progress of the Company was shown by the fact that the sale of gas increased by 11 per cent. in the year; while 243 services and 304 slot-meters were added to those previously in use. The Chairman (Mr. H. E. Jones), in moving the adoption of the report, said he might state with confidence that the Company never had better accounts to place before the shareholders. The report showed the sale of gas had increased by 11 per cent., which was a very large increase over the previous year. The Directors were enabled to recommend a dividend of 5½ per cent., and to do so with the knowledge that they were making the fullest allowance for the maintenance and upkeep of the works, plant, and buildings as well as mains and service-pipes. Mr. W. B. Fassmidge seconded the motion. Mr. A. Bailey said the accounts were very satisfactory from every point of view; and, as shareholders, they were perfectly satisfied with 5½ per cent. under the present conditions. He was pleased to hear that there had been no cheeseparing or starving by the manner in which the mains and services and general upkeep of the works had been maintained. The report was adopted. The retiring Directors and Auditor having been re-elected, the Chairman, alluding to the work of the Secretary (Mr. G. J. Bristow), said his duties had been carefully and thoroughly carried out. Mr. Bristow showed such capability, diligence, and loyalty in their service, that they had voted him, subject to the approval of the shareholders, an increase of 10 per cent. They had not neglected their Engineer and Manager (Mr. Charles Hulme), and had voted him a similar increase. The shareholders unanimously agreed to the proposal. An extraordinary general meeting was then held at which the Directors were authorized to raise £20,000 of additional capital; and the proceedings closed with a vote of thanks to the Directors, officers, and staff to which the Chairman, Mr. Hulme, and Mr. Bristow briefly replied.

#### Increased Make per Ton at Wakefield.

At the 126th ordinary half-yearly meeting of the Wakefield Gaslight Company, which was held at the Company's Offices on Monday last week, the Chairman (Dr. W. A. Statter, J.P.), in moving the adoption of the report, congratulated the shareholders upon the satisfactory nature of the balance-sheet and accounts. He pointed out that the gas sold increased during the half year by 2.45 per cent.; and also that, for the first time, all the gas had been made in regenerative retort-settings, and that, as a consequence, the quantity produced per ton—11,215 cubic feet—was the highest in the history of the Company. This showed that the modern plant was on the right lines. The Chairman likewise directed attention to the fact that the gas burnt during the Christmas week broke all previous records for a week's consumption. The report having been adopted, cordial votes of thanks were given to the Chairman and Directors, in acknowledging which Dr. Statter proposed a hearty vote of thanks to the staff; and it was suitably acknowledged by the Engineer and Manager (Mr. H. Townsend), and the Secretary (Mr. R. B. Wilson).



## GAS COMPANIES (STANDARD BURNER) BILL.

## Further Resolutions to Oppose.

The question of opposing the Bill promoted to obtain sanction for the substitution of the "Metropolitan" No. 2 burner for the various burners used for the official testing of gas was considered by several local authorities last week; the views expressed in all cases being very similar.

## Plymouth.

The Mayor of Plymouth (Mr. John Yeo) presided at a meeting of the Corporation yesterday week, and moved the adoption of the report of the Special Purposes Committee, who, as mentioned in the "JOURNAL" on Tuesday last, recommended that the Bill should be opposed. He said it was a grievance with traders that the illuminating power of the gas in the borough was low; and if it were reduced as a consequence of the adoption of the new burner, they would have a still worse light, while householders would have to burn more gas not only for lighting, but for heating and cooking. The effect of the Bill might be to reduce the price of the gas; but the Companies which had combined to promote it had forgotten to include this in it. Mr. Munday pointed out that the proposed burner was now invariably prescribed as the test-burner in all Gas Acts and Provisional Orders granted to companies and corporations; while as to the question of price, if there was any additional profit to the Gas Company, the consumers would, under the sliding-scale, get four-fifths of it. Alderman Woolcombe said the objection was not to the mode of testing the gas. What they wanted to ensure was that the gas supplied should not be of less illuminating power than was the case at present. Therefore, instead of asking, as the Special Purposes Committee did, that Plymouth should be excluded from the Bill, he thought that they should endeavour to secure such a difference in the test as would adjust the illuminating power to the new conditions. The resolution was agreed to.

## Exeter.

In accordance with the decision come to at their meeting on the 10th inst., as reported in the "JOURNAL" last week (p. 451), a special meeting of the Exeter City Council was held on Wednesday last to consider the question of joining other authorities in opposing the Bill. Mr. Munro having moved a formal resolution sanctioning this course, and Mr. C. J. Ross having seconded it, Mr. F. T. Depree (Chairman of Messrs. Willey and Co., Limited) moved, as an amendment, that the matter be referred back to the Committee. He pointed out that the proposed new standard burner was selected by the Metropolitan Gas Referees some time ago. The whole of the London Gas Companies, and a large number of those in the Provinces, used it. A great many of those present did not understand the gas question. They must take into consideration the wonderful change that had come over gas since the introduction of the incandescent mantle. With an ordinary burner, if they did not get a light of 18-candle power it was not particularly bright; but from a 14-candle power burner with an incandescent mantle, they now obtained a much better light. This being so, it was a question whether the maintenance of an 18-candle standard

was not putting pressure on gas companies without any benefit to the consumer. The 14-candle gas in Exeter was, for lighting and motive power purposes, a little better than the 18-candle gas; and if they could get a better result through the incandescent mantle than before, it seemed a pity to challenge the action of the associated gas companies. The Exeter Company had offered a reduction of 2d. per 1000 cubic feet in the cost of gas; and in face of this, the Council were immediately going to take action against them. The Company had been of some benefit to the city; and certainly the gas industry had. It was possible, if the Council were going to oppose them, the Company might not see quite eye to eye with them in future—though he did not say this would necessarily follow. At the same time, he submitted that, in spending money over an imaginary grievance, they were not doing what was right. Mr. Glanfield seconded the amendment. He said the object of the new burner was rather to lessen the cost of gas production; and if they did this, the companies must necessarily be in a position to supply gas at a cheaper rate. The Council, as a public body, ought not to oppose the Bill. If they wanted concessions from the Gas Company, and they were reasonable, they might get them. Mr. Hodson also supported the amendment, remarking that he could not see the slightest use in carrying the recommendation. Why should they fight the Company when they had no grievance? Mr. Campion pointed out that if gas companies were allowed to adopt the new standard burner for testing purposes, it would reduce the quality of gas by nearly 2 candles, which meant that the illuminating power in Exeter would be brought down to just over 12 candles, instead of 14. They had to consider the small consumer. After some further remarks, the motion was carried.

Resolutions to oppose the Bill have also been passed by the Corporations of Bootle, Shrewsbury, and Swansea, and by the Urban District Councils of Caversham (Reading) and Twickenham.

**Sunderland and South Shields Water Company.**—At the annual meeting of the Company last Thursday, the Directors reported an increase of £1305 in the revenue from water-rents in the past year compared with 1908; it being £100,164, against £98,859. The amount carried to the profit and loss account was £46,542; and the balance on this account was £35,093. The total dividends declared for the year were £9, 6s. 6d., and £4 10s. per cent. (free of income-tax) on the various stocks.

**Radcliffe's Spent Liquor Purification Process.**—The Cambuslang Gas Company have given an order for sulphate of ammonia plant to the Chemical Engineering Company, and also to Mr. John Radcliffe, of East Barnet, for purification plant for the spent liquor. The latter process was described in an article which appeared in the "JOURNAL" on Oct. 2, 1906 (p. 22); but we learn that since then Mr. Radcliffe has made certain improvements. There are now no costs for labour or materials; the working being automatic and continuous. The system was installed some time ago at the St. Albans Gas-Works; and after being in operation for nine months, Mr. A. F. Phillips stated that it was continuing to work satisfactorily.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 492.

Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,474,000	Stk.	Oct. 14	5	Alliance & Dublin Ord.	86 88	..	5 13 8	4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	1,235,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	Oct. 23	6 1/2	Bombay, Ltd.	6-6 1/2	..	5 4 0	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
40,000	5		6 1/2	Do. New, £4 paid.	48-48 1/2	..	5 6 8	561,000	Stk.	"	10	Liverpool United A	227-229	..	4 7 4
50,000	10	Aug. 26	15	Bourne 10 p.c.	29 1/2-30 1/2	..	4 18 4	718,100	"	"	7	Do. B	16-16 1/2	..	4 2 10
311,810	10	"	7	Bournemouth Gas B 7 p.c.	10 1/2-11 1/2	..	4 1 2	306,083	"	Dec. 29	4 1/2	Do. Deb. Stk.	103-105	..	3 16 2
75,000	10	"	6	and Water Pref. 6 p.c.	15 1/2-15 3/4	..	3 16 2	75,000	5	Nov. 26	6	Malta & Mediterranean	4 1/2-5	..	6 0 0
380,000	Stk.	Aug. 12	12 1/2	Brentford Consolidated	250-259	..	4 16 6	560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99-102	..	4 18 0
300,000	"	"	9 1/2	Do. New	192-194	..	4 17 11	250,000	100	"	4 1/2	Melbourne 4 1/2 p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3 1/2	Monte Video, Ltd.	12 1/2-13 1/2	..	5 5 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	1,775,892	Stk.	July 29	4 1/2	Newcastle & Gt. S. & D. Con	118-109	+	4 0 3
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218-221	..	4 19 7	529,435	Stk.	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	91-93	..	3 15 3
246,320	"	"	8	Do. A Ord. Stk.	154-157	..	5 1 1	55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
460,000	20	Oct. 14	10	British	42 1/2-43 1/2	..	4 11 11	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	119-121	..	4 19 2	60,000	5	Sep. 10	8	Ottoman, Ltd.	122-124	..	6 5 6
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	89-91	..	4 18 11	31,800	53	Aug. 26	13	Portsea Island A	137-139	..	4 19 0
82,278	"	"	5 1/2	Do. C 5 p.c.	106-108	..	5 1 10	60,000	50	"	13	Do. B	129-131	..	4 19 3
55,000	"	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	50	"	12	Do. C	122-124	..	4 16 9
143,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14 1/2-15 1/2	+	4 11 10	114,800	50	"	10	Do. D and E	102-104	..	4 16 2
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	Oct. 25	7	Primitiva Ord.	78-79	+	4 8 11
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	58-59	+	4 8 11
100,000	10	"	—	Do. 4 1/2 p.c. Pref.	5 1/2-5 3/4	..	—	488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 1/2	1,000,000	10	Oct. 14	8	River Plate Ord.	17 1/2-18	+	4 8 11
100,000	Stk.	Dec. 29	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	80-82	..	5 9 9	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108 1/2-110 1/2	..	4 10 6	250,000	10	Sep. 29	8	San Paulo, Ltd.	14 1/2-15 1/2	..	5 4 11
1,513,280	Stk.	Aug. 26	5 1/2	Commercial 4 p.c. Stk.	109-111	..	4 13 8	62,500	10	"	6	Do. 6 p.c. Pref.	11 1/2-12 1/2	..	4 18 0
560,000	"	"	5 1/2	Do. 3 1/2 p.c. do.	105-107	..	4 13 6	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	5 1/2-5 1/2	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	409,984	"	"	10	Do. B	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 9	523,500	"	"	10	Do. C	233-235	..	4 5 1
491,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	South African	12 1/2-12 1/2	..	7 16 11
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/9 1/4	South Met., 4 p.c. Ord.	119-121	..	4 10 4
141,995	"	Oct. 2	5	Do. 5 p.c. Ord.	98-100	..	5 0 0	1,895,445	"	Jan. 13	3	Do. 3 p.c. Deb.	82-84	..	3 11 4
486,090	10	Jan. 27	12	European, Ltd.	21 1/2-22 1/2	+	4 17 0	209,823	Stk.	Aug. 26	8	South Shields Con. Stk.	161-162	+	4 18 9
354,060	10	"	12	Do. £7 Ord. paid.	18 1/2-19 1/2	+	4 16 0	605,000	Stk.	Aug. 12	5 1/2	S'th Suburb'n Ord. 5 p.c.	122-124	..	4 11 3
15,144,545	Stk.	Feb. 10	4 1/2	Gas 4 p.c. Ord.	104 1/2-105 1/2	+	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	121-123	+	4 1 4
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	87-89	..	4 18 8	117,000	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121-123	+	4 1 4
3,799,735	"	"	3 1/2	and 4 p.c. Con. Pref.	103-105	+	3 16 2	502,310	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
4,193,973	"	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
238,740	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	95-97	..	5 3 1	453,940	"	"	5 1/2	and B 3 1/2 p.c.	111-113	+	4 15 2
82,590	"	"	6 1/2	Do. do. 5 p.c.	119-121	..	5 7 2	149,470	"	Dec. 29	5 1/2	Edmonton 4 p.c. Deb.	98-100	..	4 0 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17 1/2-18	..	4 8 5	182,350	10	Dec. 29	8	Tuscan, Ltd.	94-95	..	8 4 2
131,000	Stk.	Sep. 10	6 1/2	Ilford A and C	14 1/2-14 7/2	..	4 10 11	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,782	"	"	5	Do. B	108-110	..	4 10 11	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	113-115	+	4 6 11
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,000	Stk.	Aug. 26	6 1/2	Wands- B 3 1/2 p.c.	141-144	..	4 12 0
								79,476	"	Dec. 29	3	worth J 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



### THE CORNER IN THORIUM.

Writing on this subject in yesterday's issue of the "Financial Times," a correspondent said: "Much interest is being taken in the fight being waged between the Thorium Syndicate on the Continent and certain other producers, who are also consumers of the commodity. As an illustration of 'trust busting,' the story is interesting. The great increase in the demand for incandescent mantles led a number of producers of thorium on the Continent to endeavour to corner the supplies; and they succeeded so well that ultimately every independent producer had been compelled or cajoled into falling in line with the Syndicate, or disposing of their businesses to it. The Thorium Syndicate then advanced prices by fully 100 per cent.—to between 32 marks and 40 marks per kilogramme. Master of all the available supplies of this most important raw material, the Syndicate used their powers so dictatorially that the mantle manufacturers felt themselves compelled to endeavour at all hazards to secure independent supplies. The first serious competition to the Syndicate was the acquisition of 7000 tons of monazite sand at Wissensee by the German Incandescent Gas Company. Then Vienna and Hamburg firms succeeded in acquiring considerable quantities of the sand; and last year the Welsbach Incandescent Gas-light Company purchased the Atzgersdorf thorium works, and reduced the price of thorium nitrate to 22 marks, and subsequently to 16 marks per kilogramme, though the cost price was estimated at about 18 marks. In the course of a few days, the Welsbach Company had sold a quantity equal to a quarter of the world's annual consumption, and then raised their prices; the Syndicate being forced to reduce their quotations to the same level as their competitors. It is reported that the Syndicate are now endeavouring to come to some arrangement with their competitors, with the view of raising prices to the previous high level."

### THE DOMESTIC USES OF GAS.

Lecture by Mr. Walter Grafton.

The second of the series of lectures arranged by the Gas Department of the Corporation of Glasgow, with the view of enlightening the public on subjects bearing upon the checking of air contamination by smoke—the first of which, by Mr. A. Wilson, the Gas Engineer, was noticed in the "JOURNAL" last week (p. 439)—was delivered last Wednesday night by Mr. Walter Grafton, the Assistant Gas Manager, in the Springburn Hall, Glasgow. The subject was "The Domestic Uses of Gas," and it was illustrated by about 90 lantern slides.

The lecturer pointed out that the aim of the department was not only to sell a low-priced gas to the consumer, but to enable him to get the most effective light, heat, and power from it. He emphasized the need for having distribution show-rooms as a means (if they were judi-

ciously managed, and the staff were technically trained) of educating customers in the use of their gas appliances. He said that he considered all properties, especially new ones, should be fitted up with iron piping under the flooring of the rooms to be supplied with gas, instead of running the pipes overhead, as was done now—a method which at times was most inconvenient for the tenant above. The ordinary soft pipe (compo.) was detrimental to the gas supply, since it was readily crushed, and thereby had its gas-carrying power reduced.

With regard to light for reading, Mr. Grafton said that from 2 to 3 candle-feet were necessary for the comfortable illumination of printed matter; but if the volume of light was 6 candle-feet and upwards, the brilliancy was painful and fatiguing to the eyes. The aim should be to reproduce in the dwelling the soft diffused light of day. Dealing with the fallacy of bad light from gas, the lecturer showed by demonstration that a rich gas consumed with an incandescent mantle produces less light than when the quality is only 14 candles. He said the parliamentary standard of Glasgow gas was 16 candles; but the reports of the City Analyst showed that it was from 2 to 4 candles higher. A bad light might be due to defective pipes, antiquated burners, or incandescent burners which had become choked with dust, &c. The slight advantage which electricity had over gas lay in the convenience of lighting and extinguishing lamps; but it had become less pronounced since the introduction of the pneumatic switch, spark ignition, and other devices for lighting gas at a distance. An interesting demonstration was given with a small ventilating fan worked by the combustion of gas, which showed that heat produces not only light but power. It was stated that the cost of working this apparatus was about 1d. for 24 hours.

Turning to the subject of the movement for the purification of air, the lecturer pointed out that it was a matter as much for the citizen as for the Corporation to deal with. If householders would only realize that for every ton of coal they burnt, they were sending upwards of 1 cwt. of noxious gases into the air, they would soon adopt and utilize fuels other than smoky coal; and this would put a stop to the wasteful practice of polluting the atmosphere. It was one of the paradoxes of life that while many people were most careful about not drinking polluted water, they were willing to breathe the polluted air, forgetful that one was quite as dangerous to their health as the other. Tobacco smoke gave off more carbon monoxide than gas did—a fact which few people would credit when they entered the smoking compartments of trains and tramcars. Mr. Aitken, a Scottish scientist, had said that a puff of tobacco smoke added to the atmosphere some 4000 million particles of dust. The lecturer asked his audience to think of that.

Passing on to the subject of cooking by gas, Mr. Grafton said the combustion of coal in an ordinary domestic closed coal-range was more wasteful than an open fire. About 82 per cent. of the heat was lost by way of the chimney; whereas that lost from the burning of gas did not exceed 15 per cent. if the cooker had been properly managed. The best cookers were those which retained the greatest amount of heat from any quantity of gas consumed in them. He showed what could be done with Glasgow gas in the way of cooking, and dwelt upon the

### THE MANCHESTER & LIVERPOOL DISTRICT BANKING COMPANY, LTD., PRESTON.

1st February, 1910.

Dear Sir,

We have had for many years several Gas Fires in the House and Bank, and our experience of them has brought us nothing but disappointment; the new fire, however, is a revelation to us, and is doing everything that you promised on its behalf—it warms the room quickly and efficiently, is easily regulated, and, above all, does not dry up the atmosphere.

The old unpleasant odour of "Gas Fire," which we objected to so much has now entirely disappeared.

Yours faithfully,

(Signed) W. R. EASTERBY,

Sub-Manager.

Samuel Tagg, Esq.,

Engineer and Manager,

Preston Gas Company.

The Gas Fire which has proved such "A Revelation" is—

### The "MASCOT."

The following Fires are fitted with the Patent "Thermo" Firefront:—The Patent "N.V."—"Salon"—"Stadium"—"Wizard"—"Mascot"—"Druid"—"Hotspur" and "Forum."

JOHN WRIGHT & CO., Essex Works, BIRMINGHAM.

*A User  
Who Says  
Of the  
"Thermo"  
What We  
Predicted  
of It!*



advantages of the gas-cooker over the coal-range as a labour saver and also as a preventer of the pollution of the air.

As to gas-fires, the lecturer said that to be successful they should at least take the place of the present coal-fire in respect of the area of grate front. It was useless to fit into a room a gas-fire having 8 inches width of fire, and expect it to replace efficiently an 18-inch coal-fire. Equal scope should be given to the "smokeless one." Mr. Grafton pointed out that the great feature of the self-contained gas-fire is its portability. He said it could be taken from room to room, if needed, provided the gas supply was there, and could be easily connected by the householder, so that one fire would do for several rooms.

Passing next to the subject of the heating of water, the lecturer said the kettle method was the most important; and to illustrate this he exhibited a quick-boiling kettle. Since hot water is considered a luxury for such purposes as baths, &c., he instanced the geyser as a more economical method of heating water than the ordinary boiler fixed behind the kitchen range, as it could be used at all times. He said he believed in the type of geyser which heated the water on the principle of "no water, no gas."

In conclusion, Mr. Grafton said his advice was: "Have gas, use it well, and it will use you well."

As bearing upon the lecture, all the latest domestic gas appliances—including fire-lighters, rapid toasters, curling-tongs, washhouse boiler, and drying-press—were exhibited in the hall.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

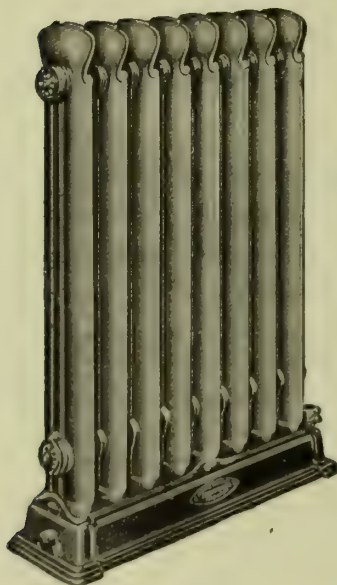
Saturday.

The visit of the Western District of the Scottish Junior Gas Association to the Broxburn Oil-Works this afternoon was greatly interfered with by the weather, which was of a very boisterous description. All the same, the visit was a most instructive one. Apart from the working of vertical retorts, which is carried on to perfection in shale oil-works, the persistence with which all the products are worked up is a lesson to gas engineers. At every point of a long-continued process of refinement, when the product which is desired has been obtained, the remaining residue is sent back for treatment again, in the hope that it may yield still more of the same or of some other product; and when such a product as permanent gas comes off, or when, at last, the resultant liquid is tar, from which no more oil is to be obtained, it is harnessed to heating duty, and is thus made to contribute to the economy of the works.

On the completion of new plant in the Alloa Corporation Gas-Works, the time was considered opportune for an official visit of inspection, and more particularly so because there had not been such a visit for four years. The inspection took place on Tuesday afternoon. Although it was the new plant which was to be inspected, the councillors were first shown the working of the coal breaker and elevator, and the De Brouwer charging-machine. Then they had the new Telpher railway, 40 feet

above ground, explained to them, as well as the arrangement for elevating the hot coke to the railway, and its being quenched on its way to the yard, by being dipped into a water-tank on the roof of the engine-house. It was also shown that the coke could be discharged from the skips into the yard, or into hoppers of 30 tons capacity, to which screening plant is attached, as well as a bagging-machine. The beautiful lavatory for the workmen which has been fitted up was also looked at, as well as several other changes which have been made. Then tea was served in the office of the Engineer and Manager—Mr. J. W. Napier. Provost Duncanson having briefly extended a welcome to the Council, Bailie Pearson, the Convener of the Gas Committee, said that Mr. Napier had put into their hands a statement in which he gave very clear and exhaustive details in regard to the equipment of the works generally and of the improvements which might be required in the near future. The new railway would cost about £1600; but he was sure that, from the demonstration they had witnessed, they would be satisfied that this latest addition to the works would be of very great assistance in carrying on the work in connection with the coke department, and would also save a considerable amount in wages. They had also seen what the coal-charging machine could do; and he thought they would be satisfied Mr. Napier's anticipations had been fully realized, and his recommendation to purchase the machine been more than justified. In his statement, Mr. Napier referred to one or two improvements which would require to be faced in the near future. The first was the enlargement of the sulphate-house; the second was the extension of the retort-house. This would be a more important and a more costly improvement than the other. They had the ground, however, and the enlargement might be got over without much difficulty. Although not so urgent nor so pressing as the two improvements he had alluded to, the question of increased holder accommodation would soon require to be considered. At present they were in the somewhat fortunate position that the demand for gas during the day was as great as during the night. But this might not always continue; and they would therefore require to consider soon the question of additional holder accommodation. Another question the Council would require not to lose sight of was the getting of a railway siding into the works. Reference was made to the step which the Corporation are taking, of paying £3000 to enable them to break an agreement with the British Electric Plant Company, and to work the Electricity Department themselves. Bailie Pearson stated his opinion to be that it would be much more economical to supply electric current from the gas-works than from the present sub-station. A great deal might be said in favour of having a joint gas and electricity department; and with a capable man like Mr. Napier as Manager, there should be no difficulty in making the new department a success. Ex-Bailie Duff proposed a vote of thanks to Mr. Napier for the excellent arrangements he had made for the afternoon's inspection; and Mr. Napier appropriately returned thanks.

The shareholders of the Kirkcaldy Gaslight Company, Limited, met in the Town Hall, Kirkcaldy, yesterday, to consider the notice to treat



# MAINTENANCE.

THE Steamless Radiator upholds the Maintenance traditions of Davis specialities.

UNIFORM HEAT DISTRIBUTION is secured without Steam and Water—and their attendant drawbacks.

There is NO FLAME CONTACT under any circumstances, and CONDENSATION AND DEPOSIT CANNOT TAKE PLACE.

Davis's "Steamless" represents the acme of SIMPLICITY in Radiator construction; no Water Receptacles to fill; no Gauge Glasses to break; no Valves; no array of Cleaning Brushes; no voluminous Instruction Charts.

Its field of action ranges between THE SMALLEST BATHROOM AND THE LARGEST SKATING RINK.

THE DAVIS GAS STOVE  
CO., LTD.,  
LUTON.



which had been received from the Corporation. Mr. G. Davidson, the Chairman of the Directors, presided, and moved two resolutions—the first to the effect that the Company consented to sell to the Corporation; and the second giving authority to the Directors, in the event of arbitration being resorted to, to appoint an arbiter and follow out the arbitration as they might consider necessary in the interests of the Company. The motion was seconded by Mr. Adam Macpherson, late Manager of the Company. Mr. T. Johnston, Solicitor, moved the rejection of the second resolution. He complained of the way in which the business was being rushed, and criticized statements issued by Mr. W. L. Macindoe, who is both Town Clerk and Secretary to the Gas Company. Mr. Macindoe's statements, it was contended, were contradictory. The Chairman's motion was carried by a large majority, and the meeting was declared to be ended, when Mr. Macindoe said he wished to point out how immensely successful the Company had been since he became Secretary. Possibly when the figures were examined by the accountants employed by the town, the Directors might find that the property of the Company was larger than appeared from a casual examination of the accounts. He had been trusted by the Directors and by the Company for sixteen years; and he believed that the Company had prospered very much during that period. He explained to the shareholders at their last meeting that he was the largest shareholder of the Company. His clients also were large shareholders; and he would suggest to the meeting whether it was likely that he was going to do any injustice to himself and his clients and the Company. He had no doubt the bulk of the shareholders were quite satisfied that no injustice was going to be done them. It had been said that it was impossible for him to assist both parties in coming to a fair and reasonable arrangement. He saw no difficulty in the matter whatever; and he was confident that it was only under his guidance that a fair and reasonable arrangement would ever be arrived at between the parties. His ambition was to lead both parties to arrive at a fair price.

The lectures which are being delivered in Glasgow at present, in the cause of air purification, were continued during this week. Mr. Alex. Wilson, the Gas Engineer to the Corporation, spoke on "Smoke-Producing *versus* Smokeless Fuel," in Langside Hall on Tuesday evening; Mr. Walter Grafton, the Assistant Gas Manager, on "Domestic Uses of Gas," in Springburn Hall, on Wednesday evening; \* Mr. A. Smith, the Manager of the Tradeston Gas-Works, on "Coal Gas and Some of Its Uses," in Dixon Hall, Govanhill, on Thursday evening; and Mr. S. B. Langlands, Inspector of Lighting, on "The Utility of Coal Gas for Cooking and Heating," in the Kingston Hall last night. The lectures have been very well attended.

The Kirkintilloch Town Council, who two years ago erected new gas-works, at a cost of £40,000, are now faced with the question of acquiring the mineral rights in the ground upon which the works are built. The Council obtained a report from a firm of civil engineers, as a result of which the Gas Committee on Monday reported that they had agreed to ask the Woodilee Coal and Coke Company to indicate the price they wanted for each seam of coal under the gas-works.

\* This lecture is noticed in another column.—ED. J.G.L.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Feb. 19.

### Sulphate of Ammonia.

The market opened on Monday at an advance of 2s. 6d. per ton on last week's closing prices, and it has continued to gain strength day by day; so that the values now are £11 18s. 9d. per ton f.o.b. Hull, £12 per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. The rapid rise has been mainly caused by the anxiety of dealers to cover their February requirements, but new direct orders from abroad have also helped to bring about the present position. Home consumption is still on a small scale, agricultural operations having no doubt been delayed this year. Some transactions are reported to have taken place for July-December delivery at £11 10s. to £11 12s. 6d. per ton f.o.b. at best ports; but makers have advanced quotations for this period to £11 15s. per ton, and buyers decline to go on at the higher figure.

### Nitrate of Soda.

This article is rather quiet, but holders refuse to accept less than 9s. 3d. per cwt. for 95 per cent. quality, and 9s. 6d. for refined.

### Tar Products.

LONDON, Feb. 21.

The markets for tar products remained steady throughout the past week. Pitch still maintains its price; but not quite so many sales have been reported. Creosote continues fairly firm and in fair demand, both in London and the country. In benzol, all qualities are in pretty good demand. Solvent naphtha is quiet. Crude carbolic acid is unsettled; and in some quarters makers will not offer even 1s. 1d. per gallon.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d. *ex* works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7½d.; North, 6¾d.; 50-90 per cent., casks included, London, 7¾d. to 8d.; North, 7¾d. to 7¾d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, 1s. 0½d. to 1s. 1d. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

### Sulphate of Ammonia.

This article has somewhat improved during the past week, and there has been an improvement in buying; the tender parcels fetching exceedingly good figures. To-day the principal London Gas Companies quote £11 18s. 9d. to £12; and ordinary makes upon Beckton terms are £11 10s. to £11 12s. 6d. In Hull, £11 15s. is asked; and in Liverpool, £11 17s. 6d. In Leith, £12 is quoted; and in Middlesbrough, £11 17s. 6d.

# THE "ST. NICHOLAS" GRATE FIRE

Is being put on Hire by many Gas Companies.

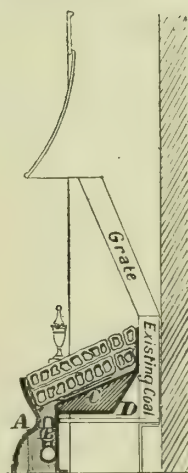


FRONT VIEW (Half).

## WHY?

### BECAUSE—

- It's Attractive.
- It's Economical.
- With Black Fuel it looks like a Coal Fire.
- Fits any Grate.
- Gas Flame does not come in contact with Ironwork.
- Therefore maintenance is practically Nil.



SECTION.

PUT ONE IN YOUR SHOW-ROOMS, LEAVE THE REST TO THE CONSUMER.

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GOthic WORKS, ANGEL ROAD, EDMONTON, LONDON, N.,  
GOthic IRON WORKS, FALKIRK, N.B.

Can be seen in Action at our Offices,

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## COAL TRADE REPORTS.

### Northern Coal Trade.

There is still some irregularity in the working of the Northern coal trade; but the output is now nearer normal, and prices for some qualities show ease. In the steam coal trade, the demand is moderate, as is usual at this season; so that the idleness of one or two collieries will have little effect should work continue at the rest. Best Northumbrian steam coals are about 10s. 9d. per ton f.o.b., second-class steams are 10s., and steam smalls from 5s. 6d. to 6s. 6d.—the latter being now in fuller output. In gas coals, the production is fair; and contracts are being better met than they were. Durham gas coals of the usual classes vary in price, according to quality, from 10s. 6d. to 11s. per ton f.o.b.; while for "Wear specials," something like 11s. 6d. to 11s. 9d. is the current quotation. Now that the deliveries on contracts are being overtaken, there is a little more likelihood of forward sales of coal being made; but the high freights to some of the Mediterranean ports make the quotations relatively high, though a few weeks may bring steamers back into their wonted trades. One or two small contracts for coal for the Baltic districts are under negotiation. Coke is firm. Gas coke is quoted 13s. 6d. to 13s. 9d. per ton f.o.b. the Tyne; and, as far as is known, supplies are not heavy at present.

### Scotch Coal Trade.

There is little change to report. Outputs are moving off fairly well, at former figures. For shipment, there is an easier feeling in prices. Small stuffs are in demand, owing largely to the activity in the iron and steel trades. The prices now quoted are: Ell, 10s. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 309,375 tons—an increase of 5621 tons upon the preceding week; and of 53,479 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,631,780 tons—an increase of 301,602 tons upon the corresponding period.

**Reductions in Price.**—The Scarborough Gas Company have decided to reduce the price of gas to ordinary consumers in the town by 2d. per 1000 cubic feet, and to those in Newby and Scalby by 3d. per 1000 cubic feet, after the end of the present quarter. The Directors of the Wisbech Lighting Company announce a reduction, as from the beginning of the year, of 2d. per 1000 cubic feet in the price of gas; making the net price 2s. 10d. for lighting, and 2s. 7d. for motive power.

**Gas Profits at Walsall.**—In presenting to the Walsall Town Council the annual report from the Gas Committee, showing a net profit of £8430, against £7476 for the previous year, Mr. Millerchip said the recent capital outlay on the gas-works was fully justified by the increased profit. Mr. Venables, in seconding, remarked that the profits from the undertaking during the last eight years had amounted to about £50,000, out of which the rates had benefited to the extent of some £35,000. The report was approved.

**Water Supply of Beverley.**—Mr. P. M. Crosthwaite last Thursday held an inquiry on behalf of the Local Government Board at Beverley into an application by the Corporation for power to borrow £1350 for the purchase of a new site for the water-works. The Town Clerk (Mr. J. W. Mills) stated that the site originally selected was found to be unsuitable; and as the result of expert advice, the Corporation decided to purchase a field on the Hull Bridge Road. It was for this that the loan was required. Mr. Baldwin Latham and Professor Kendall (of Leeds University) gave evidence as to the site being a favourable one.

**Shrewsbury and the Standard Burner Bill.**—At the quarterly meeting of the Shrewsbury Town Council on Monday of last week, Alderman Peele proposed that a petition be presented in opposition to the Gas Companies (Standard Burner) Bill, by which, he said, the Shrewsbury Gas Company, among others, were seeking to substitute a new burner for the one now in use for the official testing of the illuminating power of the gas supplied by them. The Committee had been advised that the effect of the proposal would be to reduce the quality of the gas; and they had in consequence sought to obtain from the Gas Company a promise to reduce the price. They had, however, received a reply that the Company were not prepared to give such an undertaking at present, as they did not anticipate any great financial advantage from the use of the new standard burner. Alderman Peele remarked that he did not think it was likely the gas companies would go to the expense and trouble of promoting a Bill in Parliament unless they had good grounds for expecting to derive considerable advantage. It was resolved to join with other local authorities in offering opposition to the Bill.

**Newport (Mon.) Gas-Works Benefit Society.**—There was a large attendance at the thirty-fourth annual dinner of the Society, which was held on Monday last week at the King's Head Hotel, Newport, under the presidency of Alderman Thomas Canning, the Engineer and Manager of the Newport Gas Company. Responding to the toast of "The Chairman and Directors of the Company," he said at present there were some thousands of pounds put aside by the members of the Society, many of whom were shareholders in the Company. He was a very strong believer in the policy of workmen becoming shareholders in the concern in which they were employed. The working man contributed very much to the revenue. His labour was to a certain extent capital; and capital and labour had to work together. This was so in actual fact to some extent in connection with their Company; and he hoped the day would come when it would be the rule in all works. He believed it was the intention of the Board to establish the system on a broader basis than it was at present. "Success to the Newport (Mon.) Gas-Works Benefit Society" was proposed by Alderman Greenland, and responded to by Mr. J. Whitefield and Mr. T. Donovan, who associated themselves with remarks which had been made during the evening with reference to the loss sustained by the Company by the death of the late Chairman (Mr. Richard Laybourne). Mr. Donovan also proposed the healths of Alderman Canning and Mr. T. H. Hazell (the Secretary of the Company), who responded.

# THE POSITIVE PREPAYMENT METER

## WET AND DRY.

### ANY SIZE FOR ANY COIN.



(With attachment detached.)

# SAWER AND PURVES,

MILES PLATTING,

Scotch Representative: JNO. D. GIBSON, 2, Causeyside St.,

RADFORD ROAD,

MANCHESTER.

PAISLEY.

NOTTINGHAM.



**Water Scheme for Penrith Western District.**—At the meeting of the Penrith Rural District Council last Tuesday, a scheme for the construction of two reservoirs in Greystoke Park, for the common benefit of a number of parishes in the western district of Penrith, was sanctioned; and it was decided to apply to the Local Government Board to authorize a loan to carry it out, at an estimated cost of £19,000.

**Failure of the Electric Light at Bristol.**—The sudden failure of the Bristol Corporation's electric lighting threw the central portion of the city into darkness last Friday night from seven to eight o'clock. Great inconvenience resulted in places of amusement; but performances were given—long disused gas appliances being brought into requisition, and audiences sitting in semi-darkness. Shops, clubs, hotels, the Post Office, and other places had to fall back on gas-brackets or on candles.

**Axbridge District Water Supply.**—Owing to difficulties experienced in providing water for certain parts of their district, the Axbridge Rural District Council requested the Local Government Board to hold an inquiry into the matter; and it was decided that the sanitary circumstances of the district generally should be investigated by one of the Board's Medical Inspectors. The duty was assigned to Dr. Reginald Farrar, who recommends the carrying out of a comprehensive scheme of water supply, estimated to cost about £30,000. The population of the district is 5799, and the assessable value £37,417.

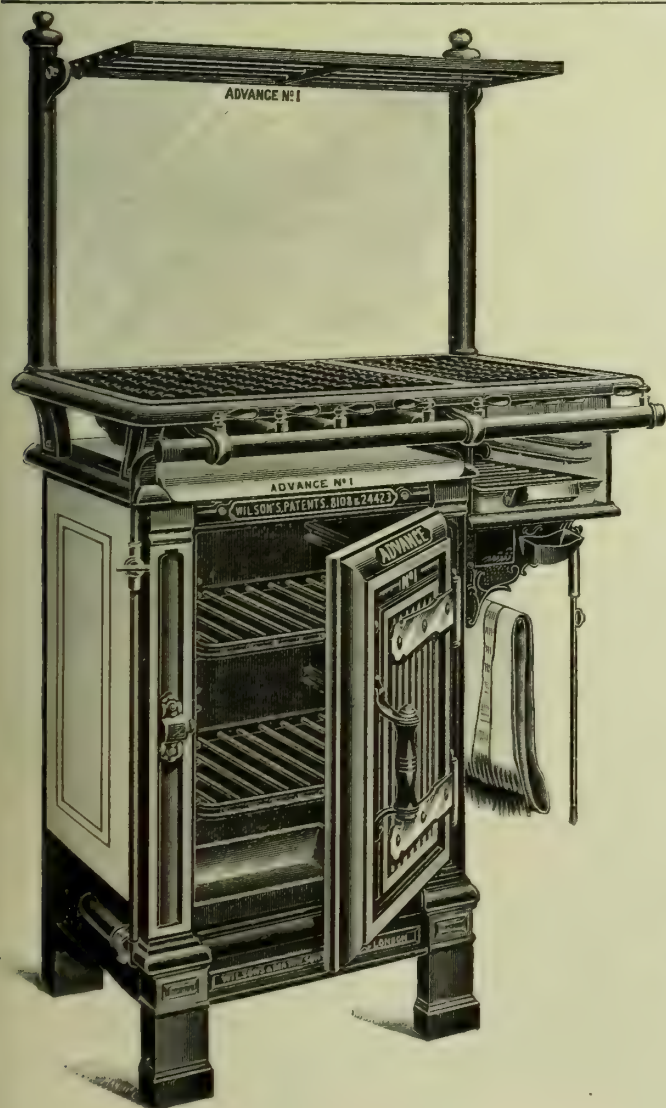
**Helping the Electric Light at Hastings.**—The following is from an article in a local paper on the estimates for the coming year, which have just been presented by the Hastings Borough Accountant to the Finance Committee of the Corporation: "The electric light undertaking has passed through a troublous year again. Very early it met with difficulties when the Gas Company opposed the making of the new rate for the conversion of the gas-lamps to electric light. This led to a change which necessitated what a member of the Council said could only be described as 'faking' the electricity accounts. In reality, the Electricity Committee are anticipating a larger income for the future, owing to the increase which was made in the price of current earlier in the year; but a deficit of £2000 has to be met—the estimated expenditure of £1625 for the previous year having, in actuality, doubled. Provision is therefore being made in the ensuing year for an expenditure of £4098, which necessitates £2000 being taken from the rates to give the undertaking a helping hand."

We are informed that Mr. S. Meunier, Engineer and Manager of the Stockport Corporation Gas-Works, has appointed Messrs. Robert Dempster and Sons, Limited, of Elland, Sole Agents for his patent No. 23,263, of 1908, which was recently described in the "JOURNAL" (*ante*, pp. 29 and 30). By the use of this arrangement, Mr. Meunier has obtained an increased make of 1223 cubic feet of gas per ton of coal, or 15 per cent., during his last financial year, as compared with the previous year, and without any trace of naphthalene on the district—the working conditions being the same.

## APPLICATIONS FOR LETTERS PATENT.

- 2822.—JONES, H., "Incandescent burners." Feb. 4.  
 2832.—WELCH, W. H. I., "Reflectors for gas-lamps." Feb. 4.  
 2881.—HESKETT, T. J., "Gas-producers." Feb. 5.  
 2887.—REULEAUX, J., "Gas-producers." Feb. 5.  
 3136.—VALENTINE, G., "Cheapening the production of illuminating and heating gas." Feb. 9.  
 3146.—COUSINS, V. S., and FIELD, W. J., "Gas-economizers." Feb. 9.  
 3154.—BROWN, H. W., "Temporarily closing burst pipes." Feb. 9.  
 3177.—DAVEY, A. E., "Ladders for spiral-guided gasholders." Feb. 9.  
 3203.—STILL, W. M., & SONS, LTD., and ADAMSON, A. G., "Lighting gas-lamps." Feb. 9.  
 3241.—RICHMOND GAS STOVE AND METER CO., LTD., and RANSOME, J. A., "Gas-cooker plate-racks." Feb. 10.  
 3255.—HARRISON, C. W., "Automatically controlling the supply of gas to burners." Feb. 10.  
 3258.—GROCOCK, E., "Supporting gas shades and reflectors." Feb. 10.  
 3260.—ELLIS, R. B. A., "Gasalier." Feb. 10.  
 3279.—EATON, E., "Treatment of tar." Feb. 10.  
 3289.—NICHOLLS, J. F., and FLETCHER, E. J., "Incandescent burners." Feb. 10.  
 3298.—STILL, W. M., & SONS, LTD., and STILL, E. H., "Incandescent gas-lamps." Feb. 10.  
 3304.—IONIDES, A. C., jun., "Carburetted air." Feb. 10.  
 3352.—LOWE, A., "Producer gas plants." Feb. 11.  
 3377.—YATES, H. J., "Gas-fires." Feb. 11.  
 3485.—KESSLER, M. C., "Gas-engines." Feb. 12.  
 3490.—HANSFORD, J., and WRIGHT, A. C., "Gas-meters." Feb. 12.  
 3491.—HANSFORD, J., and WRIGHT, A. C., "Diaphragm attachments for gas-meters." Feb. 12.  
 3492.—HANSFORD, J., and WRIGHT, A. C., "Prepayment meters." Feb. 12.  
 3493.—HANSFORD, J., and WRIGHT, A. C., "Water-meters." Feb. 12.  
 3517.—TEITGE, G., "Production of air-gas." Feb. 12.

Messrs. Hathorn, Davey, and Co., Limited, of Leeds, have sent a pamphlet they have just brought out containing illustrations and descriptions of their water or sewage pumping machinery, the manufacture of which has been specialized by them for the past sixty years. The pamphlet gives some typical examples of work which has been carried out; and they embody standard designs which have been developed after long experience. One of the illustrations is of the horizontal high-duty triple-expansion engine at the Widnes Water-Works; and it is accompanied by some observations by Mr. Isaac Carr, the Gas and Water Engineer to the Widnes Corporation, on the installation, and on the advantage of adopting boreholes instead of wells.



## THE GAS COOKER OF TO-DAY. THE WILSON "ADVANCE."

**THE "ADVANCE"** is the only Cooker that combines **all** the essentials of an up-to-date Gas Stove.

**THE "ADVANCE"** is the **most approved** Cooker from a Practical and Scientific Standpoint.

**THE "ADVANCE"** will appeal to your best Consumer. It has

**16 DISTINCT AND NOVEL DEVICES** which are all "Selling Points."

**Be Progressive and order a Sample now from the Manufacturers.**

**WILSONS & MATHIESONS,**  
LTD.,  
Carlton Works, ARMLEY, LEEDS.



Prompt measures on the part of the officials of the school and the Hanwell Fire Brigade prevented serious consequences resulting from a slight fire which occurred last Friday night at the Central London Schools, Hanwell, where nearly 900 children sleep on the premises. The gas-meter house was found to be on fire, as the result of a leak at the meter, and determined steps were at once taken to extinguish the flames.

The Little Hulton Urban District Council have decided to take a poll of the ratepayers on the question of whether their Bill shall be proceeded with. The Bill is to authorize the acquisition from the Salford Corporation by the Council of the Corporation's gas-mains in the district, and the entering into of an agreement with the Earl of Ellesmere to buy gas manufactured at the Brackley Coke-Ovens, Little Hulton. A meeting of the ratepayers has already decided against the Bill.

Owing to a curtain coming into contact with a gas-jet in the maids' quarters at the Parkhill Fever Hospital of the Liverpool Corporation early last Saturday morning, the building, which was composed mainly of wood, was destroyed, as were also the officers' quarters. A fire, caused by a swinging gas-bracket, resulted in a destructive outbreak of fire at 10, Huntley Street, W.C. (a large house of ten rooms), last Saturday night. There were five families resident in the building.

Mainly as a result of overtures made by the Ashford Chamber of Commerce, arrangements have been made for an interchange of commercial lectures between the Canterbury and Ashford Chambers. Last Wednesday evening, Mr. R. A. Turner, the Engineer and Manager of the Ashford Gas Company, gave an interesting illustrated lecture to the members of the Canterbury Chamber on "Gas, from Coal to the Consumer." At the close of the lecture questions were invited; and Mr. Turner was accorded a hearty vote of thanks.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations, &c., Vacant.

REPRESENTATIVE (OXIDE). No. 5180.  
SOLE AGENCY (ANTI-CORROSIVE WATERPROOF PAINT). No. 5181.  
TRAVELLER. No. 5191.  
WORKING FOREMAN FITTER. Winchester Water and Gas Company.  
CANVASSERS. No. 5188.  
FITTER. No. 5189.

### Situations Wanted.

ASSISTANT-MANAGER OR HEAD FOREMAN (COKE-OVENS). No. 5187.  
METER INSPECTOR. G. L., Aston Street, Birmingham.  
REPRESENTATIVE (SOUTHERN COUNTIES). No. 5192.

### Plant, &c. (Second Hand), for Disposal.

EXHAUSTERS AND STEAM ENGINES. Smethwick Gas Department.  
GAS-WORKS (TWO) COMPLETE. No. 5185.  
PURIFIERS, &c. Swansea Gas Works.

### Plant (Second-Hand) Wanted.

TOWER SCRUBBER. No. 5190.

### Processes for Disposal.

BURNING-OFF INVERTED MANTLES. Gesellschaft uer Verwertung Chemischer Produkte, Berlin.  
INCANDESCENT MANTLES. Alb. Baumgarten, Barmen.

### Stocks and Shares.

EAST HULL GAS COMPANY. March 1.  
HORNSEY GAS COMPANY. March 2.  
RIDDINGS DISTRICT GAS COMPANY. March 7.  
ROMFORD GAS AND COKE COMPANY. March 15.  
SOUTH ESSEX WATER COMPANY. March 1.  
TOTTENHAM AND EDMONTON GAS COMPANY. March 1.  
WANDSWORTH AND PUTNEY GAS COMPANY. March 15.

### TENDERS FOR

#### Benzol.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

#### Coal and Cannel.

MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
SALFORD GAS DEPARTMENT. Tenders by March 10.

#### Compressing Plant (High-Pressure Distribution).

DUNDEE GAS COMMISSIONERS. Tenders by Feb. 28.

#### Condensers.

STOURBRIDGE GAS DEPARTMENT. Tenders by March 8.

#### Cookers.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

#### Fire-Clay Goods.

BOLLINGTON GAS DEPARTMENT. Tenders by March 9.  
BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
ROCHDALE GAS DEPARTMENT. Tenders by March 2.

#### General Stores (Brass Fittings, Lead and Compo. Pipe, Barrows, Paints, Brushes, Oils, Tallow, Stoneware Pipes, Cement and Sand, Timber, Steel and Iron, Bolts and Nuts, Tools, Main Taps, Ironmongery, &c., &c.).

BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.  
DEVONPORT GAS DEPARTMENT. Tenders by March 5.  
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

#### Incandescent Goods, Gas Fittings, Lanterns, &c.

DEVONPORT GAS DEPARTMENT. Tenders by March 5.  
DUBLIN CORPORATION. Tenders by Feb. 23.  
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

### Meters.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.  
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

### Oil.

MIDDLETON GAS DEPARTMENT. Tenders by Feb. 28.

### Oxide of Iron (Spent).

ROCHDALE GAS DEPARTMENT. Tenders by March 2.

### Pipes, &c.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.  
CLACTON URBAN DISTRICT COUNCIL. Tenders by March 2.  
DEVONPORT GAS DEPARTMENT. Tenders by March 5.  
DUNDEE GAS COMMISSIONERS. Tenders by Feb. 28.  
MIDDLETON GAS DEPARTMENT. Tenders by Feb. 28.  
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by March 1.

### Retorts, Resetting (See also Fire-Clay Goods), &c.

BOLLINGTON GAS DEPARTMENT. Tenders by March 9.  
BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.

### Sulphuric Acid.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 1.  
MIDDLETON GAS DEPARTMENT. Tenders by Feb. 28.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

### Tar and Liquor.

BOLTON GAS DEPARTMENT. Tenders by Feb. 24 (see advertisement Feb. 15, p. 463).  
EXETER GASLIGHT COMPANY. Tenders by March 7.  
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 8.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.  
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### OXIDE OF IRON.

#### O'NEILL'S OXIDE

For GAS PURIFICATION.  
LARGEST SALE OF ANY OXIDE.

#### SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

#### WINKELMANN'S

#### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.  
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

#### BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.  
Correspondence invited.

**J. & J. BRADDOCK** (Branch of Meters Limited), Globe Meter Works, Oldham, and 54 & 47, Westminster Bridge Road, London, S.E.  
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.  
REPAIRS RECEIVE PROMPT ATTENTION.  
Telephones: 815 Oldham, and 2412 Hop, London.  
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

### OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

#### DONALD M'INTOSH,

110, CANNON STREET, LONDON.

### GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.  
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,  
Thornhill, DEWSBURY.

### OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

#### BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

### SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.

86, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.



**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
and ELEVATING and CONVEYING PLANT, ROSE  
MOUNT IRON-WORKS, ELLAND.

**BENZOL**

AND

**CARBURINE FOR GAS ENRICHING.**

ALSO

**THE MAXIM PATENT CARBURETTOR.**

For Prices, &amp;c., apply to

**THE GAS LIGHTING IMPROVEMENT CO., LTD.,**  
7, BISHOPSGATE STREET WITHOUT,  
LONDON, E.C.

Telegraphic Address: "Carburine, London."

W. EDGAR for:—

GAS HEATING APPARATUS—  
THE BLENHEIM FIRE, &c.  
BLENHEIM WORKS, HAMMERSMITH.

Telegrams: Telephone:  
"GASOLONDON." 14 HAMMERSMITH.

**AMMONIACAL Liquor wanted.**

CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."

**D. ANDERSON AND COMPANY,**  
GAS LIGHTING ENGINEERS AND  
CONTRACTORS,

18 &amp; 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams: Telephone:  
"DAGOLIGHT LONDON." 2336 HOLBORN.

**LUX'S GAS PURIFYING MASS.**

See Advertisement on p. 534.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**AMMONIACAL Liquor wanted.**

BROTHERTON AND CO., LTD., Ammonia Distillers.  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.

**KRAMERS AND AARTS WATER-  
GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.  
89, VICTORIA STREET, S.W.

**SULPHURIC ACID.**

**SPECIALLY prepared for Sulphate of**  
AMMONIA Makers by  
CHANCE AND HUNT, LIMITED,  
Works: OLDBURY, WEDNESBURY, AND STAFFORD.  
Address Correspondence and Inquiries to OLDBURY,  
WORCS.  
Telegrams: "CHEMICALS, OLDBURY."

**METER INDICES**

WITH AND WITHOUT DIALS.

**A. ROUX & CO., Limited,**

9, SOUTHAMPTON STREET, HOLBORN, W.C.

MOVEMENTS for CLOCKS, PHOTOMETERS AND  
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
WORKS, HANDSWORTH, BIRMINGHAM.

**ROBERT B. FITZMAURICE,**

4, EAST INDIA AVENUE,

LEADENHALL STREET, LONDON.

Telegraphic Address: Telephone:  
"FITZMAURICE, LONDON." No. 11,113 CENTRAL.

Established 1887.  
Advertiser, who is Shipping Agent to several Gas  
Companies, Municipalities, and Gas Material Makers,  
would be glad to undertake SHIPMENT OF GOODS  
ordered by Colonial Gas-Works or Others.

**SULPHURIC ACID for Sale, specially**

suitable for making Sulphate of Ammonia.  
BROTHERTON AND CO., LTD., Chemical Manufacturers,  
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-  
LAND.

**SULPHATE OF AMMONIA**

SATURATORS and all LEAD and TIMBER  
WORK in Connection with Sulphate Plants.  
We guarantee promptness, with efficiency for Re-  
pairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,  
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

**BRISTOL RECORDING GAUGES  
AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.

**AMMONIA.**

Consumers in any form are invited to correspond  
with CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.

**J. E. C. LORD, Ship Canal Tar Works,**

Waste, Manchester. Pitch, Creosote, Benzols,  
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,  
Carbolic Acid, Sulphate of Ammonia, &c.

**"GAZINE" (Registered in England and**

Abroad). A radical Solvent and Preventative  
of Naphthalene Deposits, and for the Automatic  
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.  
Manufactured and supplied by C. BOURNE, West  
Moor Chemical Works, KILLINGWORTH, or through his  
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-  
TYNE.

Telegrams: "Domio," Newcastle-on-Tyne. National  
Telephone No. 2497.

**TAR WANTED.**

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,  
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.

**SPENCER'S PATENT HURDLE GRIDS.****THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement, Feb. 1, p. 277.

**OXIDE OF IRON FOR GAS  
PURIFICATION.**

Please Address Inquiries for Analysis and Prices to the

**NEW WESTBURY IRON COMPANY, LTD.**

WESTBURY, WILTS.

**FIDDES-ALDRIDGE****SIMULTANEOUS Discharging-Charger.**

The one Machine which Discharges and Charges  
at One Stroke.

See Advertisement, Feb. 8, p. III. of Centre.

ALDRIDGE AND RANKEN,

89, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams: Telephone:

"MOTORPATRY, LONDON." 5118 WESTMINSTER.

**PATENTS AND TRADE MARKS**

PUBLICATIONS, "MERCHANDISE MARKS  
ACT, and Decisions thereunder," 1s.; "TRADE  
SECRETS v. PATENTS," 6d.; "DOCTRINE OF  
EQUIVALENTS, Mechanical and Chemical," 6d.;  
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent  
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-  
grams: "Patent London." Telephone: No. 243 Holborn.

**GAS-WORKS requiring Extensions**

should Communicate with FIRTH BLAKELEY,  
SONS, AND CO., LIMITED, Dewsbury, who make a  
Specialty of Catering for the Smaller Gas Concerns.  
Prices Reasonable; quality and results, the best. Satis-  
faction Guaranteed.

**"V.S.C." PAINT FOR GAS-  
WORKS PLANT.****JOHN E. WILLIAMS AND CO.,**

LOWER MOSS LANE,

MANCHESTER, S.W.

Telegrams: "ENAMEL." National Telephone 1759.

**GEO. NEWTON, Limited,**

Wires: "AUTOMATIC, MANCHESTER."

40 YEARS' REPUTATION.

WET, DRY, ORDINARY and PREPAYMENT,  
STATION METERS, &c.

Late of Oldham—Note new Address:—

39, RIVER STREET, HULME, MANCHESTER.

**HYDRATED OXIDE OF IRON.****PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**R. & G. HISLOP,**

GAS ENGINEERS, RETORT BUILDERS,  
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,  
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

**GAS TAR wanted.**

BROTHERTON AND CO., LTD., Tar Distillers.  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.

**GAS OILS.****MEADE-KING, ROBINSON, & CO.**

Represent the Strongest Independent Re-  
fineries in America; also Petroleum Spirit for Gas  
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and  
11, OLD HALL STREET, LIVERPOOL.

**APPLICATIONS FOR APPOINTMENTS.**

**DO** you appreciate how much success  
depends on well-considered and lucid present-  
ment of your qualifications? I make a Specialty of the  
Preparation of Applications, and am continually re-  
ceiving complimentary letters from clients. Write now  
for Particulars.

HERBERT GREATOROX, HACKNEY, MIDDLESEX.

**WANTED, a Situation by Meter**

Inspector. Practical Gas Fitter; Meters,  
Cookers, Gas-Fires, &c., and Maintenance.  
Address G. L., 36, ASTON STREET, BIRMINGHAM.

**ADVERTISER, well-known in the**

Southern Counties, wishes to REPRESENT two  
or three Firms. Will call personally on Gas, Water,  
Electricity and other Works. Terms to be arranged at  
interview.

Address No. 5192, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**BYE-PRODUCT COKE-OVENS.**

**WORKING** Manager is desirous of a  
SITUATION. Would accept place as ASSIS-  
TANT-MANAGER or HEAD FOREMAN. Good Re-  
ferences.

Address No. 5187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**EXPERIENCED Fitter required, accus-**

tomed to Acetylene and Lacquering.  
Apply, by letter, to No. 5189, care of Mr. King, 11,  
Bolt Court, FLEET STREET, E.C.

**GAS-STOVE TRADE.****THOROUGHLY Experienced and Re-**

liable Men required for Canvassing for Gas Stoves.  
Apply, by letter, stating Age, Experience, and Full  
Qualifications, to No. 5188, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.

**WANTED, at once, by the Winchester**

Water and Gas Company, a capable WORKING  
FOREMAN FITTER. Cyclist. Wages, 32s. 6d per  
week.

Applications to the General Manager, Staple Garden, WINCHESTER.

**TRAVELLER wanted by Firm of Gas**

and General Engineers in the North of England.  
One Conversant with Carbonizing and General Con-  
veying and Screening Plants, Steel Structure Work, &c.

All Applications will be treated in confidence.  
Apply, by letter, stating full Particulars of Ex-  
perience, Salary required, &c., to No. 5191, care of Mr.  
King, 11, Bolt Court, FLEET STREET, E.C.

**SOLE Agency to be given away, on**

Merchant Terms, of a Reliable ANTI-CORROSIVE  
WATERPROOF PAINT for Iron and Cement Sur-  
faces, for the United Kingdom and some of the Crown  
Colonies. The Paint could be partly Manufactured in  
England. First-Class Testimonials.

Address Applications, with Trade and Banker's Re-  
ferences, to No. 5184, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**A WELL-KNOWN Continental Firm,**

Established in 1885, wants a First-Class British  
Firm of Gas Engineers to REPRESENT them in the  
United Kingdom for the Sale of their High-Class  
OXIDE OF IRON for GAS PURIFICATION.

Address No. 5180, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**SCRUBBER.****WANTED by a Gas Company making**

13 Millions, a suitable Second-Hand TOWER  
SCRUBBER. Must be Cheap and in Fair Condition.  
Particulars to No. 5190, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.

**JAPAN-BRITISH EXHIBITION.****A FIRM Exhibiting a Bungalow at**

above is desirous of Co-operating with Firms for  
Lighting, Heating, and Furnishing.

Apply, with Offers, to Box No. 1474, JUDDS, 5, QUEEN  
VICTORIA STREET, E.C.



**TO BE SOLD, a Valuable Invention for the MANUFACTURE of WOVEN INCANDESCENT MANTLES**, the Patents of which have been Applied for.

For Particulars, please address 48,172 care of ALB. BAUMGARTEN, Advertising Agent, Barmen, GERMANY.

#### PURIFIERS.

**THE Swansea Gaslight Company have** for Immediate Sale—Four 20 feet Square by 5 feet deep PURIFIERS, with 24-inch Lutes, 18-inch Connections, and Centre Valve Complete. Immediate Removal.

Apply to the MANAGER, Gas-Works, SWANSEA.

**CAST-IRON Pipes. Spigot and Socket** or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet diameter and New STEEL TANK**, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

**TO BE SOLD, a process for Burning Inverted Mantles** on the Actual Burner, which consists in making apertures in one or several places in the wall of the fabric of the Mantle, the width of the said apertures being at least twice that of the meshes of the Mantle, while in the interior of the Mantle above the aperture an impregnated piece of fabric may be fitted like a flap valve, which automatically closes the aperture after igniting the flame.

For further Particulars, Apply to the GESELLSCHAFT FÜR VERWERTUNG CHEMISCHER PRODUKTE, BERLIN, S.W. EICHENSTR., 11.

#### COUNTY BOROUGH OF SMETHWICK.

(GAS DEPARTMENT.)

SECOND-HAND EXHAUSTERS AND STEAM-ENGINE.

**THE Gas Committee of the Corporation**

of Smethwick have FOR SALE—

Two Donkin EXHAUSTERS, with STEAM-ENGINES COMBINED, including Disc Valves. Nominal capacity, 40,000 and 60,000 Cubic Feet per Hour respectively; also a

HORIZONTAL HIGH-PRESSURE STEAM-ENGINE, 14-inch bore, 20-inch stroke, to work at 80 Steam Pressure.

The plant can be seen at work at the Gas-Works, Rabone Lane, during the next two or three weeks; and any further Particulars can be obtained on Application to Mr. Vincent Hughes, Engineer, at the Gas-Works.

Offers, endorsed "Second-Hand Plant," to be addressed to the Chairman of the Gas Committee, and sent to the undersigned.

W. J. STURGES,  
Secretary.

Gas Department, Council House,  
Smethwick, Feb. 15, 1910.

#### COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for** the Supply of COAL and CANNEL required at their works during a period of One Year.

Forms of Tender may be obtained on Application to Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Coal," to be delivered to me not later than Three p.m., on Thursday, the 10th of March, 1910.

L. C. EVANS,  
Town Clerk.

Town Hall, Salford,  
Feb. 17, 1910.

#### BOLLINGTON URBAN DISTRICT COUNCIL.

GAS-WORKS.

**THE Gas Committee of the above**

Council are prepared to receive TENDERS for the RECONSTRUCTION of TWO BENCHES of RETORTS and for the CONSTRUCTION of a SUBWAY.

Full Particulars may be obtained from Mr. William Rogerson, Gas Manager.

Sealed Tenders, endorsed "Retort Benches and Subway," to be forwarded so as to reach the undersigned not later than the 9th of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

SAMUEL KNIGHT,  
Clerk to the Council.

Council Offices, Bollington,  
Feb. 19, 1910.

#### DUNDEE GAS COMMISSIONERS.

(DUNDEE CORPORATION.)

**THE Dundee Gas Commissioners are** prepared to receive TENDERS for:—

GAS COMPRESSING PLANT FOR HIGH-PRESSURE DISTRIBUTION, SPIGOT AND FAUCET STEEL MAINS, 6-inch and 4-inch.

General Conditions, Specification, and Form of Tender may be obtained on Application to the Engineer, from whom all Particulars may be obtained.

Sealed endorsed Tenders to be lodged with Wm. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee, not later than Monday, Feb. 28.

The Commissioners do not bind themselves to accept the lowest or any of the Tenders.

ALEXANDER YUILL,  
Engineer and Manager.

Engineer's Office, Gas-Works,  
Dundee, February, 1910.

#### BOROUGH OF ROCHDALE.

TO FIRE-BRICK MAKERS AND OTHERS.

**THE Gas and Electricity Committee of** the above Corporation invite TENDERS for the Supply of such quantities of RETORTS and other FIRE-CLAY MATERIALS as they may require for ordinary repairs during the Current Year.

Forms of Tender, and any other Information may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.

Tenders, endorsed "Retorts," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than noon on Wednesday, March 2, 1910.

By order,  
WM. HENRY HICKSON,  
Town Clerk.

Town Hall, Rochdale,  
Feb. 17, 1910.

#### BOROUGH OF ROCHDALE.

TO VITRIOL MAKERS AND OTHERS.

**THE Gas and Electricity Committee of** the above Corporation invite TENDERS for the Purchase of about 500 Tons of SPENT OXIDE OF IRON, containing not less than 50 per cent. of Sulphur.

The Purchaser will be required to provide Railway Waggon or Boats for its Removal. The Corporation will deliver it free on Rafts at Rochdale Station or into Boats at the Canal Wharf, Rochdale, as may be required; but the Tender must state which mode of conveyance is selected.

Samples of the Material and any further Information may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.

Tenders, stating Price per Unit of Sulphur per Ton, must be sent in to me, endorsed "Spent Oxide," and addressed to the Chairman of the Gas and Electricity Committee, not later than Noon on Wednesday, March 2, 1910.

By order,  
WM. HENRY HICKSON,  
Town Clerk.

Town Hall, Rochdale,  
Feb. 16, 1910.

#### MOUNTAIN ASH URBAN DISTRICT COUNCIL.

TAR AND AMMONIACAL LIQUOR.

**THE Council invite Tenders for the**

taking of the Surplus TAR and the whole of the AMMONIACAL LIQUOR produced at the Gas-Works for One Year from the 1st day of April, 1910.

Further Information required may be obtained from Mr. W. G. Thomas, Surveyor, Town Hall, Mountain Ash.

Sealed Tenders, prepaid and endorsed "Tar or Ammoniacal Liquor" (as the case may be), to be sent to me so that they may be received not later than Ten o'clock in the forenoon of Tuesday, the 8th day of March, 1910.

The Council do not bind themselves to accept the highest or any Tender.

By order,  
H. P. LINTON,  
Clerk to the Council.

Town Hall, Mountain Ash,  
Feb. 15, 1910.

#### MOUNTAIN ASH URBAN DISTRICT COUNCIL.

TENDERS FOR STORES.

**THE Mountain Ash Urban District**

Council invite TENDERS for the following named STORES for One Year from the 1st day of April, 1910:—(1) GLASS. (2) PAINTS and BRUSHES. (3) OILS. (4) STONEWARE PIPES and SPECIALS. (5) CAST-IRON PIPES and SPECIALS. (6) CEMENT and SAND. (7) TIMBER. (8) WROUGHT-IRON TUBES and FITTINGS. (9) GAS-FITTINGS. (10) GAS-METERS. (11) STREET LANTERNS. (12) CASTINGS. (13) IRONMONGERY. (14) HOUSE and STEAM COALS. (15) INCANDESCENT GAS MANTLES.

Forms of Tender, with Conditions and Specification, may be obtained on Application to Mr. W. G. Thomas, Surveyor, Town Hall, Mountain Ash.

Sealed Tenders, prepaid and endorsed with words denoting what item is tendered for, to be sent to me so that they may be received not later than Ten o'clock in the forenoon of Tuesday, the 8th day of March, 1910.

Contractors will be required to pay their workmen the recognized Trades Union Rates of Wages.

The Council do not bind themselves to accept the lowest or any Tender.

By order,  
H. P. LINTON,  
Clerk to the Council.

Town Hall, Mountain Ash,  
Feb. 15, 1910.

#### BOROUGH OF BRIGHOUSE.

(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for** the Supply of the following REQUIREMENTS during the Twelve Months ending the 31st of March, 1911.

- 1—GAS METERS, Wets and Drys.
- 2—IRONMONGERY, including Lead Pipe, Cotton Waste, Shovels, Iron, Steel, and Brushes.
- 3—WROUGHT-IRON TUBES and FITTINGS including Malleable Fittings.
- 4—OILS, PAINTS, &c.
- 5—SULPHURIC ACID.
- 6—RE-SETTING RETORTS, REGENERATORS, and FURNACES.

Form of Tender for each item, together with Specification and Particulars, may be obtained on Application to Mr. Harold Davies, Engineer and Manager, Gas-Works, Brighouse.

Sealed Tenders, duly endorsed, must be sent to the undersigned not later than Tuesday, the 1st of March, 1910.

HERBERT G. ROBERTS,  
Acting Town Clerk.

Municipal Offices,  
Brighouse, Feb. 15, 1910.

#### URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for**

WATER-COOLED CONDENSERS.

Specification and all Particulars on Application to the undersigned.

The lowest or any Tender not necessarily accepted. Latest day for Tenders, March 8, 1910.

CHARLES H. WEBB,  
Engineer and Manager.

Gas-Works, Stourbridge,  
Feb. 19, 1910.

#### EXETER GASLIGHT COMPANY.

TENDERS FOR TAR.

**THE Directors of the Exeter Gaslight**

and Coke Company invite TENDERS for such TAR as they may not desire to dispose of to persons other than Distillers, for Twelve Months from the 25th of March next, at per Ton of 20 cwt., delivered into Contractors' Tanks at the Company's Works.

Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Monday, the 7th of March next; but the Directors do not bind themselves to accept the highest or any Tender.

By order,  
WM. N. WESTLAKE,  
Secretary and Manager.

Gaslight Offices, Exeter,  
Feb. 18, 1910.

#### CLACTON URBAN DISTRICT COUNCIL.

**THE above Council are prepared to re-**

ceive TENDERS for the Supply and Delivery of about 50 Tons of British CAST-IRON PIPES and CONNECTIONS.

Copy of Specification and Form of Tender may be obtained from the Council's Engineer, Mr. Sydney Francis, Assoc.M.Inst.M.E., Town Hall, Clacton-on-Sea.

Sealed Tenders, endorsed "Tender for Pipes," to be delivered to the undersigned not later than noon on Wednesday, the 2nd of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,  
Clerk to the Council.

Town Hall Buildings,  
Clacton-on-Sea, Feb. 19, 1910.

**THE Corporation of Middleton are pre-**

pared to receive TENDERS for the following ARTICLES and GOODS, SUNDRY STORES for the Gas-Works: VITRIOL, OIL, and TUBES and FITTINGS.

Further Particulars and Form of Tender, which will contain a Fair Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer, Gas-Works, Middleton.

Tenders, addressed to the Chairman of the Gas Committee, endorsed "Tender for Sundry Stores," are to be delivered at my office not later than Feb. 28, 1910.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,  
Town Clerk.

Town Hall, Middleton,  
Feb. 18, 1910.

#### PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

**THE above Council invite Tenders for**

the Purchase of the Surplus COAL-GAS TAR and WATER-GAS TAR produced at their Treforest Works during the Year ending March 31, 1911.

Tenders to state the Price per Ton, or per 200 Gallons for (a) Coal-Gas Tar; (b) Water-Gas Tar.

The Tar will be delivered into the Contractor's Railway Tank Waggon at the Treforest Gas-Works Siding, Alexandra Docks and Railway Company's line.

Tenders, sealed and endorsed "Surplus Tar," must be received by the undersigned, on or before Monday, March 7, 1910.

J. COLENSO JONES,  
Clerk to the Council.

Municipal Buildings,  
Pontypridd, Feb. 19, 1910.

#### PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

**THE above Council invite Tenders for**

the Supply of the following STORES and MATERIALS for the year ending March 31, 1911:—

- No. 1—Gas Cookers.
- No. 2—Sulphuric Acid.
- No. 5—Fire-Clay Goods, &c.
- No. 5A—Silica Fire-Clay Goods.
- No. 6—Wrought Iron Tubes and Fittings.
- No. 7—Lead and Compo. Tubing.
- No. 8—Barrows, Rake Heads, &c.
- No. 9—Oils and Benzol.
- No. 10—Brass Fittings and Sundries.
- No. 11—Slot Fittings.
- No. 12—Meters.
- No. 13—Main Taps and Locks.
- No. 15—Cast-Iron Mains and Specials.
- No. 16—Incanescent Materials.
- No. 18—Lamps and Copper.
- No. 19—Horse Feed.

Forms of Tender and Specification may be obtained, on Application, from Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd.

Tenders, on the prescribed Forms, sealed and endorsed "Tenders for Gas-Stores, No. —" (as the case may be), must be received by the undersigned on or before Monday, March 7, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,  
Clerk to the Council.

Municipal Buildings,  
Pontypridd, Feb. 19, 1910.



## CITY OF DUBLIN.

**THE Corporation of Dublin** are prepared to receive TENDERS for the Supply of MANTLES and 6-inch JENA CHIMNEYS for Street Lighting for the ensuing Year to the 31st of March, 1911.

Samples of at least Six of each to be forwarded to the Town Clerk, City Hall, Dublin (the Tenders to be enclosed in a sealed envelope), marked "Tender for Incandescent Goods," and addressed to the Chairman of the Supplies Committee, City Hall, Dublin, and forwarded on or before the 23rd inst.

By order,  
HENRY CAMPBELL,  
Town Clerk.

Town Clerk's Office, City Hall,  
Dublin, Feb. 14, 1910.

## COUNTY BOROUGH OF DEVONPORT.

(GAS DEPARTMENT.)

**TENDERS are invited for the Supply**

of:

- 1—WROUGHT-IRON TUBES and FITTINGS.
- 2—PAINTS, OILS, TALLOW, WASTE, &c.
- 3—STEEL and IRON, various sizes.
- 4—BOLTS and NUTS.
- 5—TOOLS, FITTERS' INDOOR and OUTDOOR REQUIREMENTS.
- 6—MANTLES, PROTECTORS, &c.
- 7—SUNDRIES.

Specification and Form of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for ———," and addressed to the Town Clerk, Municipal Offices, Devonport, must be delivered on or before Twelve o'clock noon on the 5th of March, 1910.

The Corporation do not bind themselves to accept the lowest or any Tender.

W. P. TERTVET,  
Engineer and Manager.

Gas-Works, Devonport,  
Feb. 15, 1910.

## SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

## Alteration in date of Sale.

By order of the Directors of the  
**HORNSEY GAS COMPANY.**

NEW ISSUE OF £5000 CONSOLIDATED STOCK,  
£6500 FIVE PER CENT. PREFERENCE STOCK,  
AND  
£3000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 22, at Two o'clock precisely, in Lots, instead of Tuesday, March 1, as previously announced.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**SOUTH ESSEX WATER-WORKS COMPANY.**

ISSUE OF £20,000 NEW CAPITAL, COMPRISING  
£5000 FIVE PER CENT. MAXIMUM ORDINARY  
STOCK,  
£10,000 FIVE PER CENT. PREFERENCE STOCK  
AND

£5000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**WANDSWORTH AND PUTNEY GASLIGHT  
AND COKE COMPANY.**

NEW ISSUE OF £12,500 THREE PER CENT.  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**ROMFORD GAS AND COKE COMPANY,  
LIMITED.**

NEW ISSUE OF 600 £5 "B" and £2000 FOUR  
PER CENT. DEBENTURE BONDS.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

## RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR PIPES.

**TENDERS are invited for the Supply of**  
6-inch CAST-IRON GAS MAINS, in 12 Feet  
Lengths.

Further Particulars may be obtained from the undersigned, by whom Tenders will be received until Tuesday, the 1st of March.

JAMES BRADDOCK,  
Manager and Secretary.

Gas-Works, Radcliffe,  
Feb. 16, 1910.

## RIDDINGS DISTRICT GAS COMPANY.

SALE BY TENDER OF  
400 FIVE PER CENT. PREFERENCE SHARES  
OF £10 EACH.

THE MINIMUM PRICE IS £10 PER £10 SHARE.

**THE Shares will be registered Free of**  
Expense to the Purchaser.

The last day for the reception of Tenders is Monday,  
the 7th of March, 1910.

Particulars and Conditions of Sale may be obtained at  
the Offices of the Company.

By order of the Board,  
ERNEST W. DREW,  
Secretary.

Offices: 6 and 7, Queen Street,  
Cheapside, London, Feb. 1, 1910.

## TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

**NOTICE is Hereby Given, that it is the**  
intention of the Directors of this Company to  
SELL BY TENDER, under the Authority of the  
Tottenham and Edmonton Gas Act, 1906

£30,000 "B" Consolidated Stock.

Minimum price, £111 per £100 Stock.

Tenders will be received up to Five o'clock p.m. on  
Tuesday, March 1, 1910.

The progressive character of the Company's Business  
will be seen from the following statement:—

Year ended Dec. 31.	Registered Consumers.	Price of Gas.	Dividend on "B" Stock.
			Per Cent.
1901	19,040	3s. 4d.	4
1902	22,505	3s. 0d.	4½
1903	27,070	3s. 0d.	4½
1904	32,072	2s. 10d.	4½
1905	37,363	2s. 10d.	4½
1906	41,733	2s. 8d.	5
1907	45,691	2s. 6d.	5½
1908	49,982	2s. 6d.	5½
1909	53,785	2s. 5d.	5½

The full statutory Dividends have been paid for many  
years.

The price of Gas is now 2s. 4d. per 1000 Cubic Feet,  
and a Dividend of £5 10s. Per Cent. per Annum may  
therefore be paid.

Particulars of Sale, with Form of Tender attached,  
may be obtained at the Head Office of the LONDON AND  
PROVINCIAL BANK, LOTHBURY, E.C., or at any of their  
Branches, or will be forwarded on Application to me.

By order of the Directors,  
E. TOPLEY,  
Secretary.

Chief Offices of the Company,  
High Road, Tottenham.  
Feb. 4, 1910.

## EAST HULL GAS COMPANY.

SALE BY TENDER OF £5000 NEW FIVE PER  
CENT. ORDINARY STOCK.

**THE Directors Offer for Sale, by Tender,**  
the above Amount of STOCK, to be issued under  
the Provisions of the East Hull Gas Act, 1906, and the  
various Acts incorporated therewith.

Since the year 1867, the Company has paid without  
intermission the Maximum Dividend allowed by Parlia-  
ment.

The Dividend is Cumulative—i.e., should the Profits  
of the Company in any one year be insufficient to pay  
the Maximum Dividend, the same may be made up out  
of the Reserve Fund or out of Surplus Profits in any  
future Year.

Any amount of Stock being a multiple of £5 but not  
less than £20 may be applied for.

The Stock will be allotted to the Highest Tenders.  
A deposit of £10 per Cent. on the nominal amount of  
the Stock applied for must accompany each Tender,  
and the Allottees must pay the remainder of the  
Purchase Money on or before the 31st day of March, 1910.

LAST DAY FOR RECEIPT OF TENDERS, TUES-  
DAY, the 1st DAY OF MARCH, 1910.

Forms of Tender and Particulars of Sale can be ob-  
tained at the Local Branches of Messrs. Barclay and  
Co., Limited, Bankers; or from the Offices of the Com-  
pany.

By order of the Board of Directors,  
DAVID WOOD,  
Secretary.

Offices: Saint Mark Street,  
Hull, Feb. 7, 1910.

Price 5s. 6d. Post Free.

REPORTS OF DISTRICT  
GAS ASSOCIATIONS FOR 1909.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

Just Published. Demy 8vo. 168 pages. 103 Illustrations.  
8s. 6d. net.

## MODERN COKING PRACTICE,

Including the Analysis of Materials and Products.

A Handbook for those engaged in Coke Manufac-  
ture and the Recovery of Bye-Products.

By T. H. BYROM, F.I.C., F.C.S., Mem. Soc. Chem. Indus.,  
Chief Chemist to the Wigan Coal and Iron Company,  
And J. E. CHRISTOPHER, Memb. Soc. Chem. Indus.,  
Lecturer on Coke Manufacture at the Wigan Technical  
College.

LONDON: CROSBY LOCKWOOD & SON,

7, Stationers' Hall Court, E.C., & 121A, Victoria St., S.W.

## NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

## THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

## NEWTONGRANGE, MIDLOTHIAN.

## NEW EARTH BORERS.

15 Patents. Highest Awards.

Work easily and quickly. Reliable.

For Earth-Working, Boring, Soil-  
Testing, Planting, Sinking Fences,  
Posts, and various other uses.

Borers from 60 to 400 mm. (2½ in.  
to 16 in.) diameter.

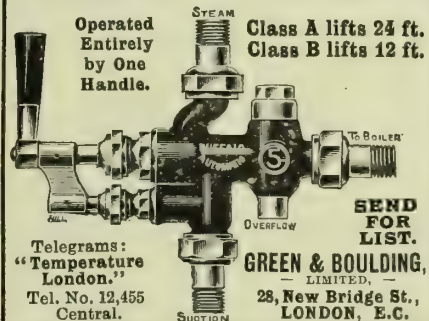
Great Saving of Labour. Low Prices.

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E. JASMIN,

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## \* BRASS AND STEEL

\* PINION WIRE  
any lengths.

\* John Rigby & Sons, Ltd.

Rawfolds Wire Mills,  
CLECKHEATON.

Head Office & Works:  
Adelphi Wire Mills,  
Salford, MANCHESTER.

Also IRON and STEEL WIRE of all descriptions.

## HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,  
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.  
Above the Average in Weight and Quality  
of Coke.

Maintains a High Standard in Residuals.



**TROTTER, HAINES, & CORBETT,**  
BRETTELL'S ESTATE, LIMITED,  
**FIRE-CLAY & BRICK WORKS,**  
**STOURBRIDGE.**

Manufacturers of GAS RETORTS, GLASSHOUSE  
FURNACE & BLAST-FURNACE BRICKS, LUMPS,  
TILES, and every description of FIRE-BRICKS.  
Special Lumps, Tiles, and Bricks for Regenerative  
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,  
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

**THOMAS DUXBURY & CO.,**  
**16, DEANS GATE, MANCHESTER.**  
Best Gas Coal and Cannel, giving High Illu-  
minating Power, Large Yield per ton, and  
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1806.

**JOHN HALL & CO. OF STOURBRIDGE,**  
LIMITED,  
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Manufacturers of

**FIRE-BRICKS, LUMPS, TILES,**  
**GAS RETORTS,**

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED  
FOR SHIPMENT.

**MIRFIELD GAS COAL.**

**UNEQUALLED.**

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

**MIRFIELD COLLIERY COMPANY,**  
**RAVENSTHORPE, NEAR DEWSBURY.**

LONDON: 16, Park Village East, N.W.

**LUX'S**  
**Gas Purifying Material**

is now used in many Gas-  
Works throughout Scotland  
with gratifying success.

**FRIEDRICH LUX**  
Ludwigshafen-am-Rhein

Sole Agent for Scotland:

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1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

**JAMES OAKES & CO.,**

ALFRETON IRON-WORKS, DERBYSHIRE

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road  
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches  
in diameter, and make and erect to order  
RETORTS, PURIFIERS, and TANKS, with  
or without planed joints, COLUMNS  
GIRDERS, SPECIAL CASTINGS, &c., re-  
quired by Gas, Water, Railway, Telegraph  
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.  
These are cast in one piece, without Chap-  
lets; doing away with Bolts, Nuts, and Covers,  
and rendering Leakage impossible.

**THOMAS TURTON**  
**AND SONS, LIMITED,**

**SHEAF WORKS, SHEFFIELD,**

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**FILES OF BEST QUALITY**  
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**STEEL OF ALL DESCRIPTIONS.**

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**CASES FOR BINDING**  
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**ADDITIONAL REVENUE FOR GAS-WORKS.**

**COKE SELLING . . AT 11/6 A TON**  
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**IN THE SAME TOWN.**



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Gas, Steam, and other Fuel for Home and Export.

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**S. S. STOTT & CO.,**  
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**LIME & OXIDE ELEVATORS & CONVEYORS.**  
COAL AND COKE STORAGE PLANTS.

**Coal and Coke Elevators and Conveyors.**  
STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

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**ARTESIAN BORED TUBE WELLS,**

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Deep Well Pumps and Patent Air Lift Pumps.

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Artesian Well and Waterworks Engineers,

MAGDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.

**OUR DISCOUNT SYSTEM GAINS**  
**GROUND DAY BY DAY.**

Greatly increases Sale of Gas.

Particulars and fullest description on  
application.

**T. G. MARSH,**  
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**IN**  
**PAINTING**

THE GAS HOLDERS AND OTHER OUT-  
SIDE PLANT IT IS FALSE ECONOMY  
TO USE A CHEAP PAINT WHICH LOSES  
COLOUR AND DOES NOT PROTECT THE  
IRON FROM CHEMICAL FUMES.

**"SHELL BRAND" (Pure) PAINTS**

POSSESS ALL THE PROPERTIES  
WHICH CHEAP PAINTS LACK.  
Prices and particulars on application.

**A. H. HAMILTON & CO.,**  
Possilpark, Glasgow.





# GRAETZIN LIGHT

## Important Improvements.



### BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

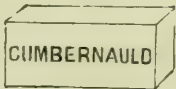
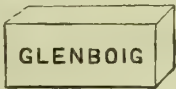
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

# THE GLENBOIG UNION FIRE-CLAY CO., LTD.

## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE  
MARKS.

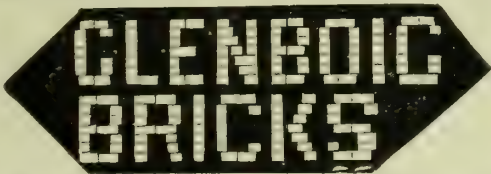


The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

### GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



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56 Prize Medals and Diplomas  
of Honour.

Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,  
LONDON, E.C., September 21st, 1909.

DEAR SIR,  
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

#### CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free .. .. .	3.03	3.49
Silica, combined .. .. .	43.20	49.77
Alumina .. .. .	36.55	42.10
Ferric oxide .. .. .	1.80	2.08
Titanic oxide .. .. .	1.30	1.50
Lime .. .. .	trace	trace
Magnesia .. .. .	trace	trace
Alkaline oxides .. .. .	trace	trace
Sulphates as trioxides .. .. .	0.92	1.06
Loss on Ignition .. .. .	13.20	—
	100.00	100.00

#### PHYSICAL RESULTS.

Density .. .. .	2.65
Volume weight .. .. .	1.90
Porosity .. .. .	15.4 %
Linear shrinkage at 100° C. .. .. .	3.70 %
" " " 1050° C. .. .. .	4.76 %
" " " Total .. .. .	8.46 %
Volume shrinkage at 100° C. .. .. .	10.7 %
" " " 1050° C. .. .. .	12.6 %
" " " Total .. .. .	23.3 %
Plasticity .. .. .	20.0 %
Fire Stability .. .. .	1850° C. equiv. to 3362° F.

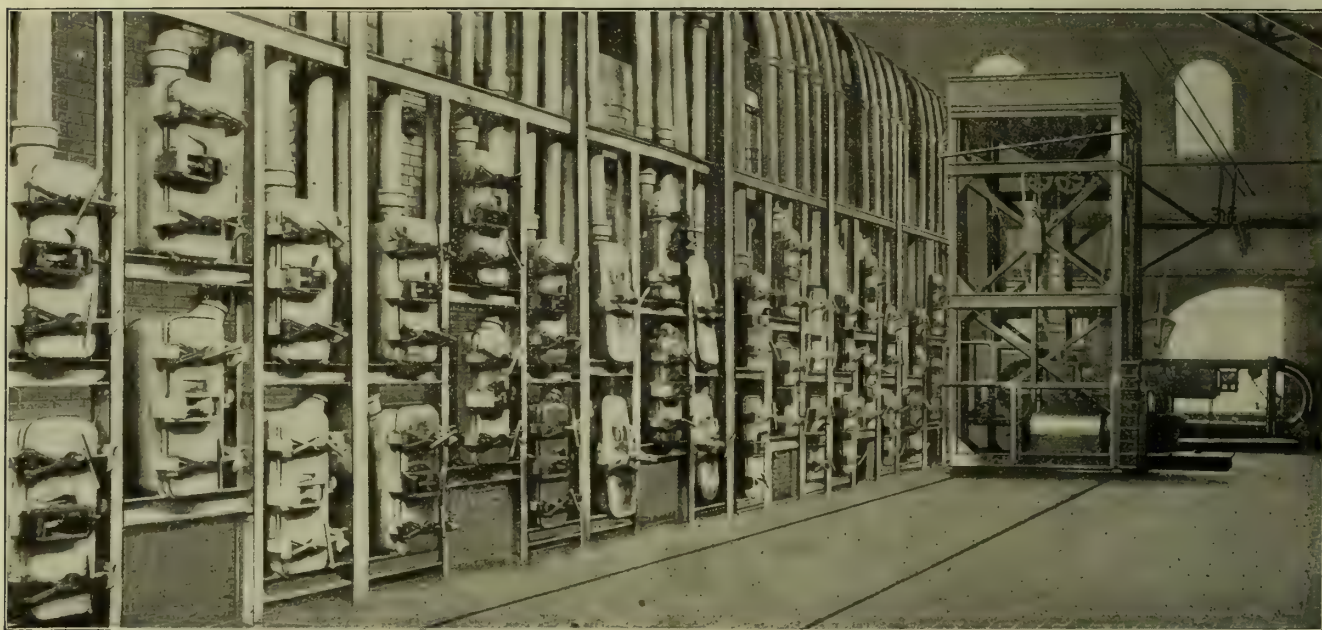
(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.



# GLOVER'S PATENT NORWICH CHAMBER RETORT SETTINGS.



## SPECIAL ADVANTAGES:—

**21 CWT. CHARGES** or larger if required.

**GAS RESULTS,** 13,600 cub. ft. of 14·5 c.p. gas per Ton of coal carbonized.

**COKE,** GREY, DENSE, and MASSIVE, suitable for many metallurgical purposes and for malting.

**OPERATING COSTS** considerably lowered owing to greatly reduced number of operations.

**ADAPTABLE TO EXISTING REGENERATORS.**

The work of **CHARGING AND DISCHARGING** these Chamber Retorts is performed by the **"D.B." STOKING MACHINES** with the same **SMOOTHNESS** and **RELIABILITY** that characterizes the working of the **"D.B. MACHINES"** with ordinary Retorts.

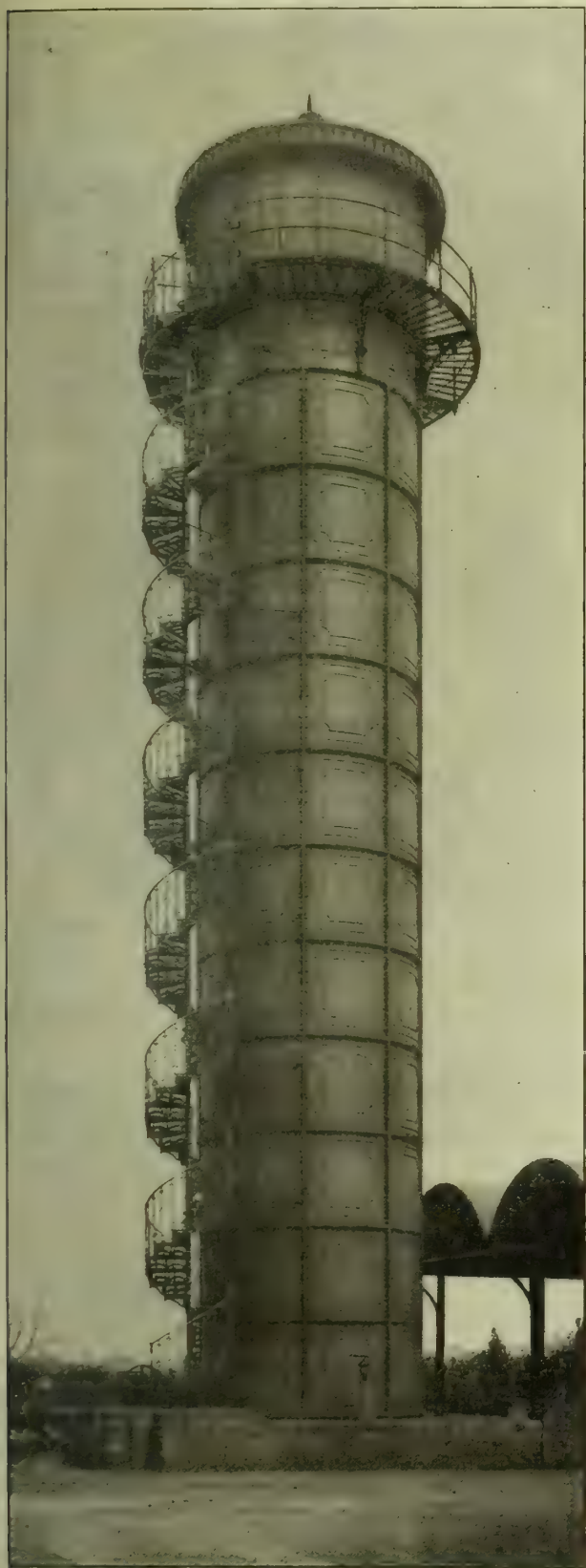
**THE ONLY MACHINES THAT WILL COMPLETELY FILL CHAMBERS OR RETORTS.**

Write for full Particulars to

# W. J. JENKINS & CO., LTD.,

## Engineers, RETFORD, NOTTS.





**SCRUBBERS.  
PURIFIERS.  
GASHOLDERS.**

Every Description of Gas-Works Plant Made and Erected.

**C. & W. WALKER, LTD.**

**DONNINGTON, NEWPORT, SALOP.**

London Office: 110, CANNON STREET, LONDON, E.C.

**THOMAS PIGGOTT & CO., L<sup>D</sup>.,**  
**BIRMINGHAM.**



**LAPWELDED AND RIVETED STEEL PIPES.**

**HUMPHREYS & GLASGOW'S  
CARBURETTED WATER-GAS PLANTS.**

Aggregate Capacity of Plants supplied  
**228,600,000** cubic feet Daily.

**Why Have  
BROKEN MAINS,  
SERVICES, OR  
LAMP POSTS?**

**MANNESMANN**

**WELDLESS STEEL SPIGOT AND FAUCET  
TUBES, FLANGED TUBES, SCREWED AND  
SOCKETTED TUBES, TUBULAR LAMP POSTS,  
&c., are Unbreakable, cost Nothing to Maintain,  
and are altogether more reliable and Durable than Iron.**

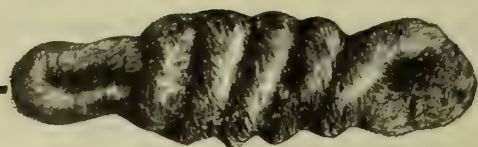
They are FAR cheaper and more economical in the  
long run, and a source of great satisfaction to all users.

**THE  
BRITISH MANNESMANN TUBE CO.,  
LTD.,**

**Salisbury House,  
LONDON WALL, LONDON, E.C.**

Telegrams: "TUBULOUS, LONDON." Telephone: 4610, LONDON WALL (2 lines).  
Works: LANDORE, S. WALES. Branch Offices at MANCHESTER and NEWCASTLE.  
Agents for New South Wales, Queensland, and Victoria:  
Messrs. NOYES BROS., SYDNEY.





## LEAD WOOL

Is sent out in Skeins all ready for use.  
Every Skein of equal weight and length.  
The Lead Wool Joint is built up evenly all the way through.  
Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33½ per cent. less.

**THE LEAD WOOL CO., LTD., SNODLAND, KENT.**

Telegrams: "STRENGTH, SNODLAND." Telephone 199 SNODLAND.

## EVERITT'S Patent TAR-FOG EXTRACTOR AND NAPHTHALENE REMOVER.

SOLE MAKERS:

**ROBERT DEMPSTER & SONS,**

ROSE MOUNT IRON-WORKS, LTD.,

**ELLAND, Yorks.**



# R. LAIDLAW & SON (EDINBURGH), LTD.

## GAS METER MAKERS.

## STATION METERS

IN

**Ornamental  
Square & Round  
Cast-Iron Cases.**

**ALL SIZES.**

*Drawings, Specifications, and  
Prices on Application.*

SIMON SQUARE WORKS  
**EDINBURGH,**  
AND  
6, LITTLE BUSH LANE,  
**LONDON, E.C.**



LATEST DESIGN.



# Welsbach

## LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

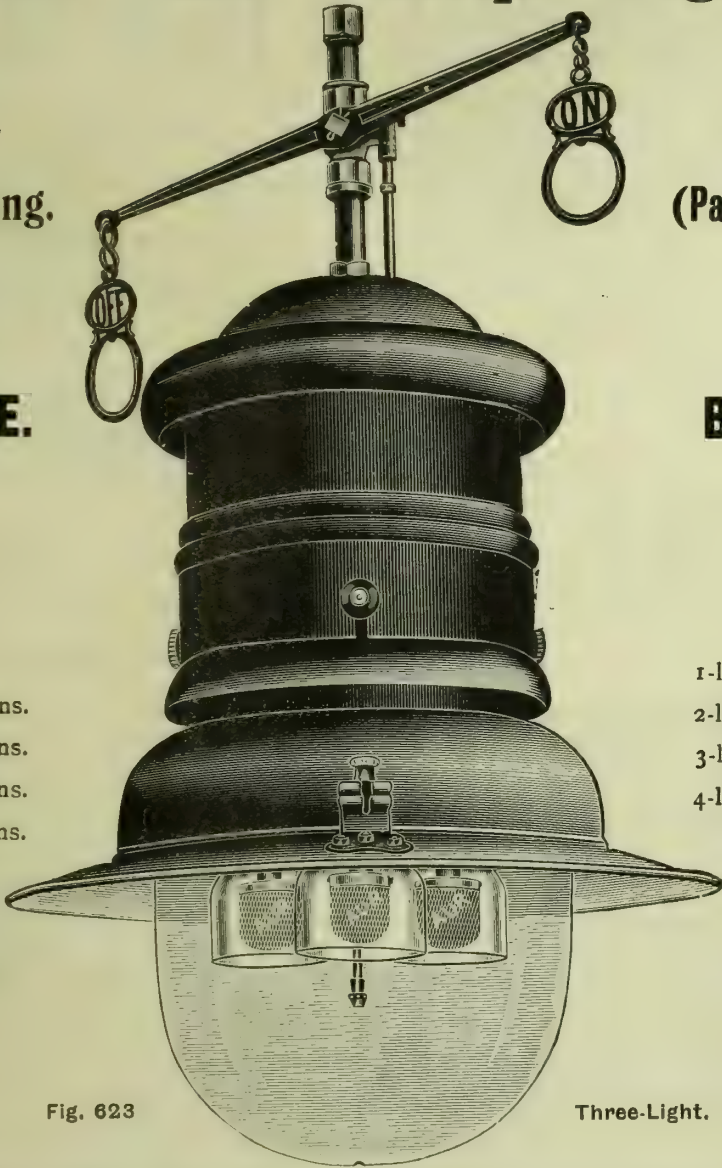


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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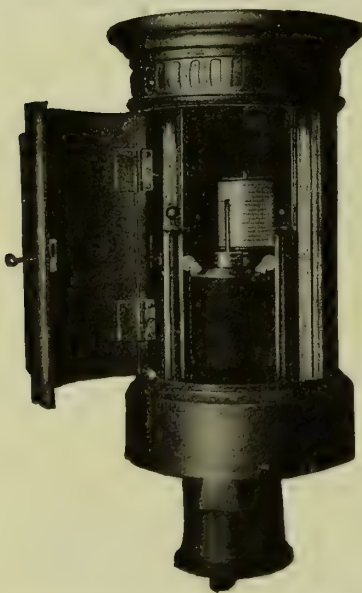
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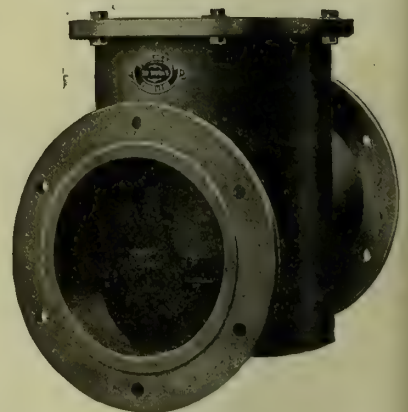


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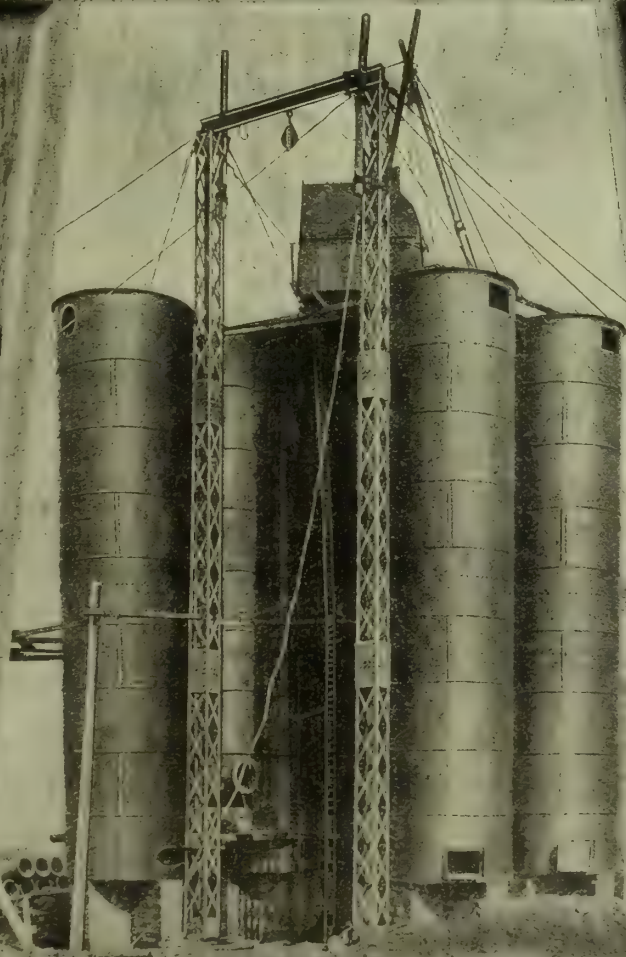
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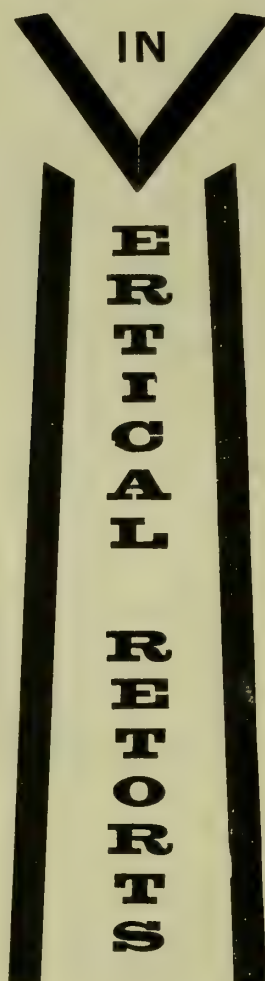


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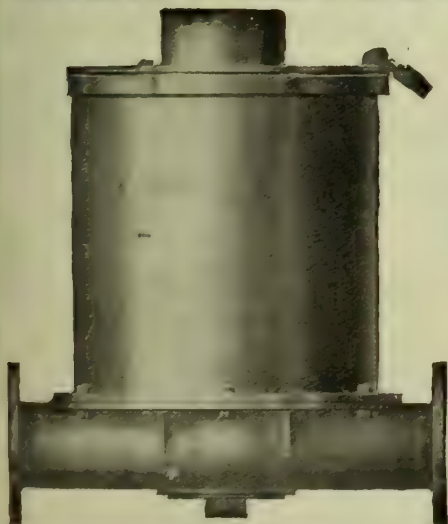
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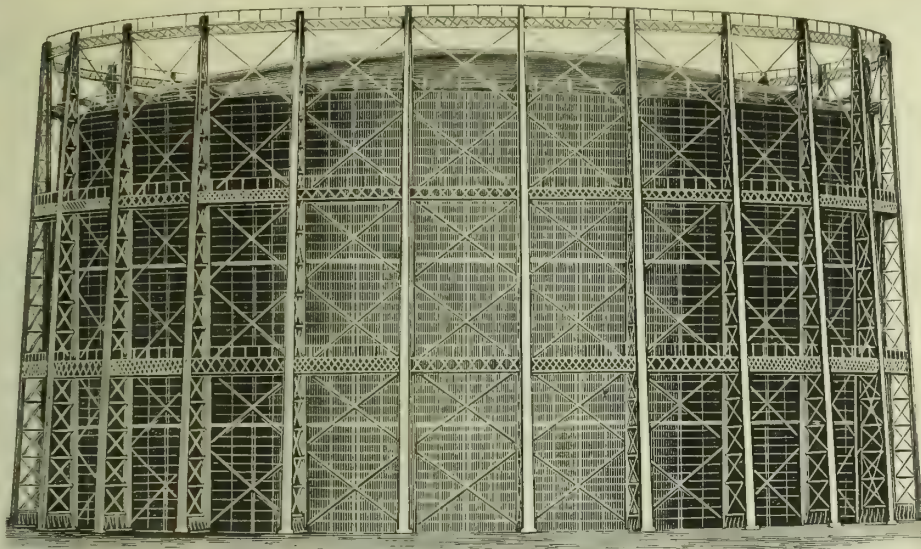
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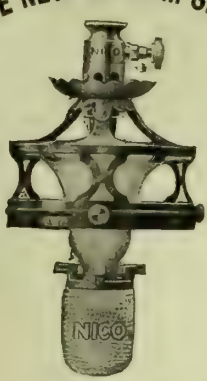


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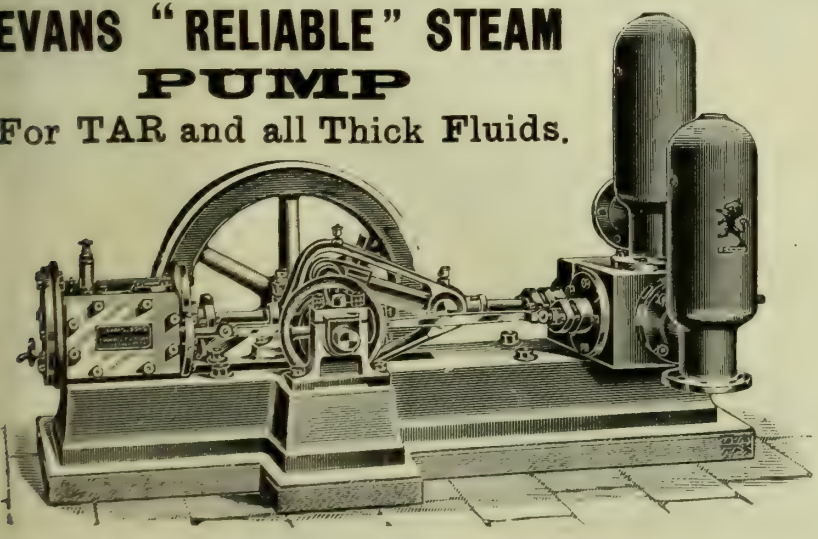
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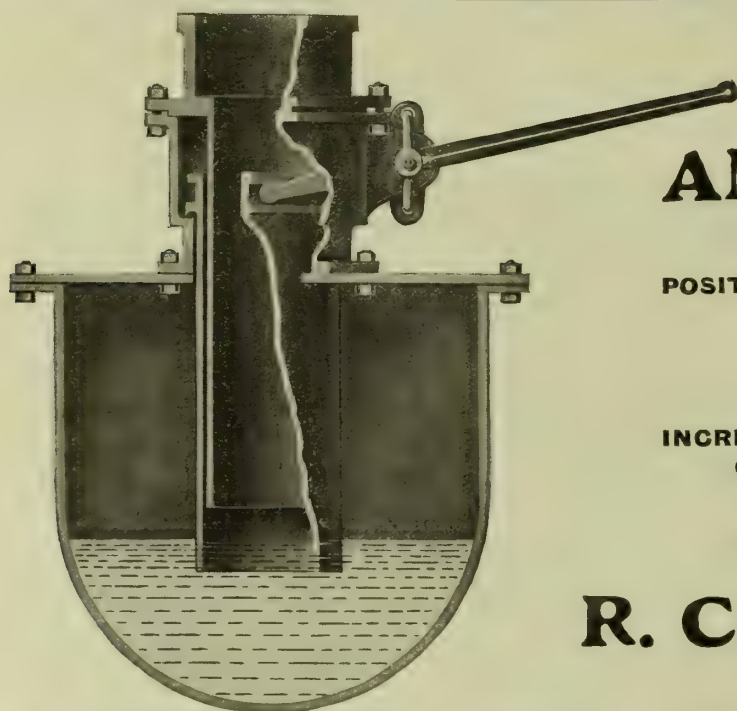
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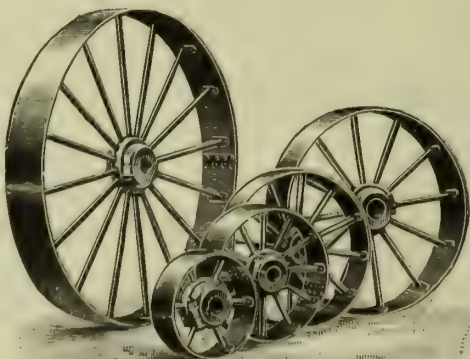
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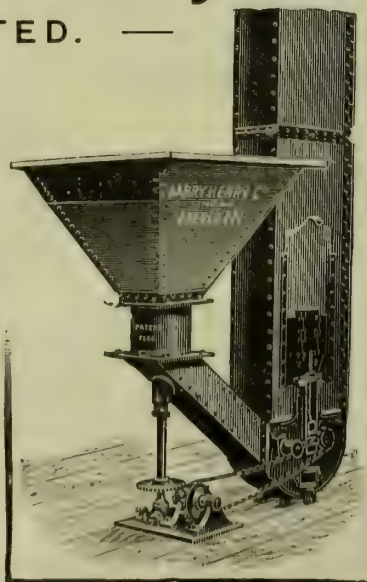
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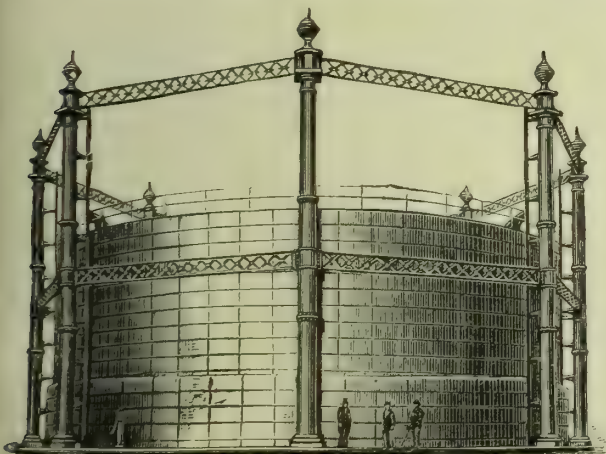
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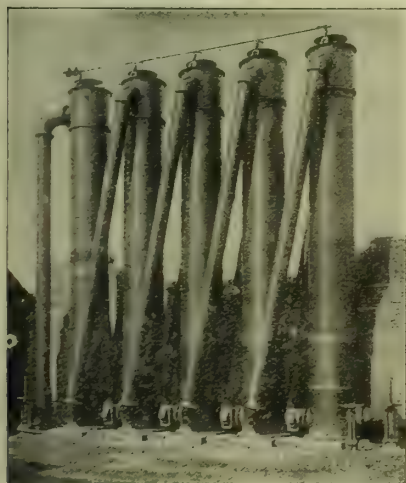
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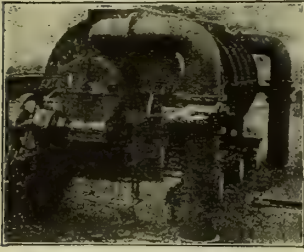
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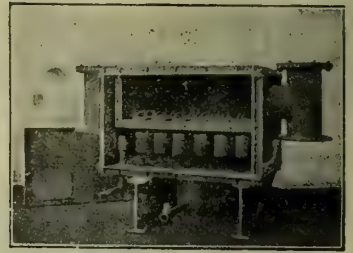
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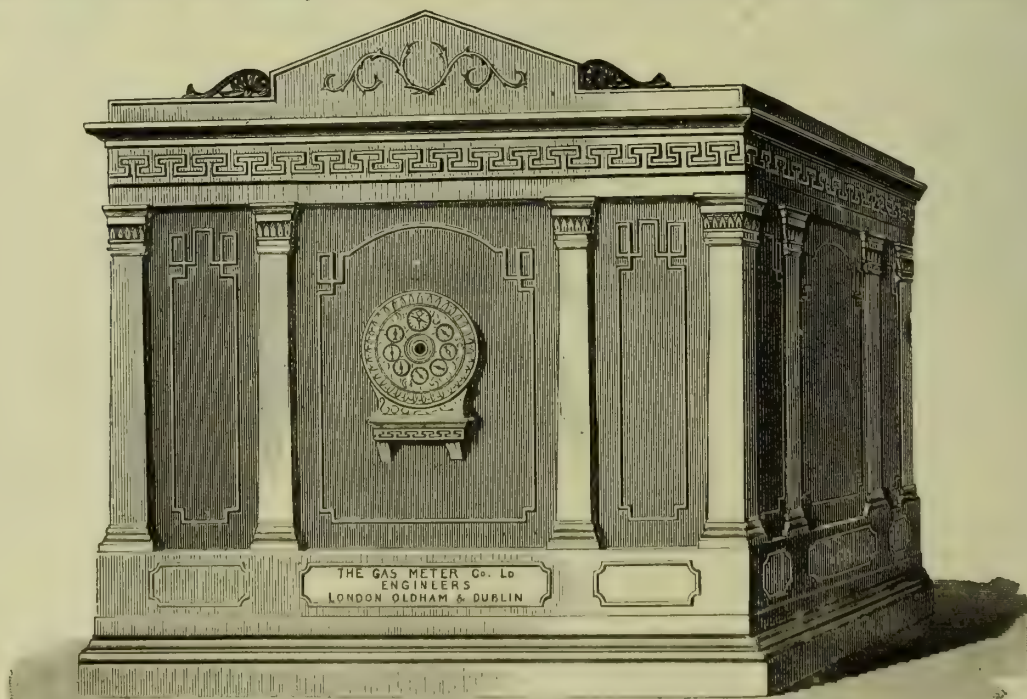
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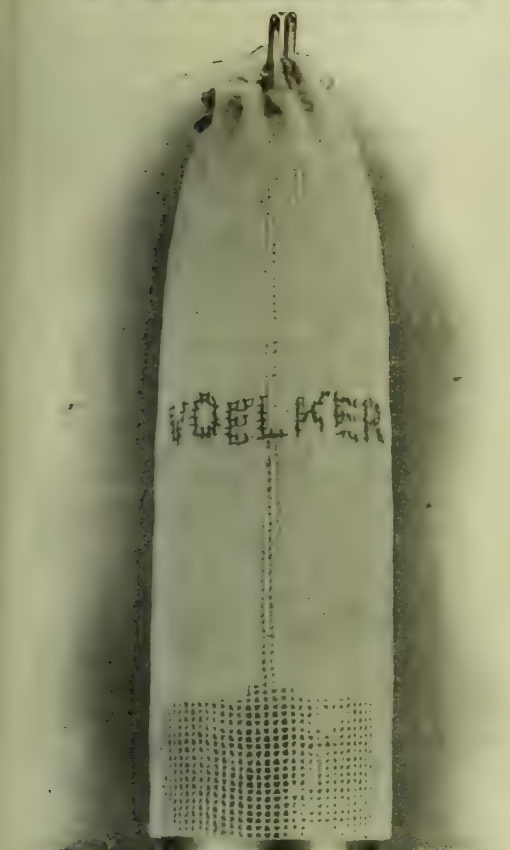
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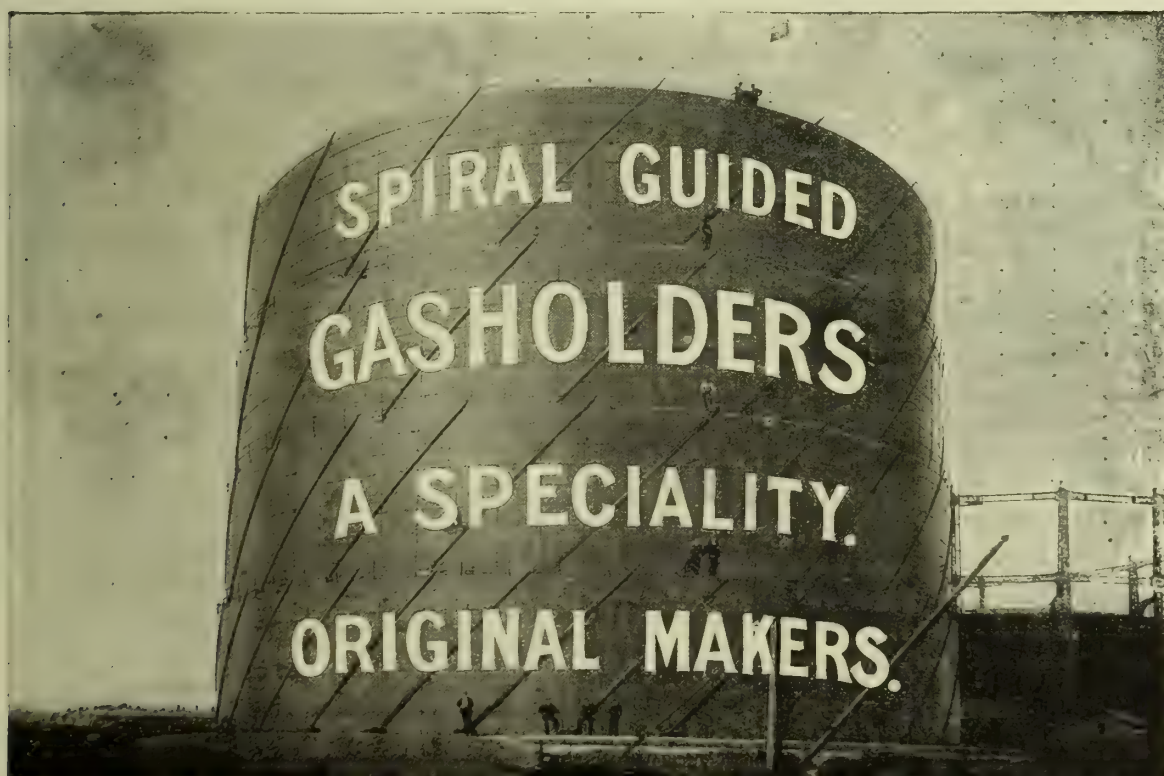
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Brentford (2nd) . . .	850,000	Innsbruck, Austria . . .	200,000	Southampton . . .	800,000
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Bridlington . . .	150,000	Kampen, Holland . . .	350,000	Southampton (3rd) . . .	600,000
Bridlington (2nd) . . .	200,000	Kiel, Sleswig . . .	1,000,000	Southgate . . .	400,000
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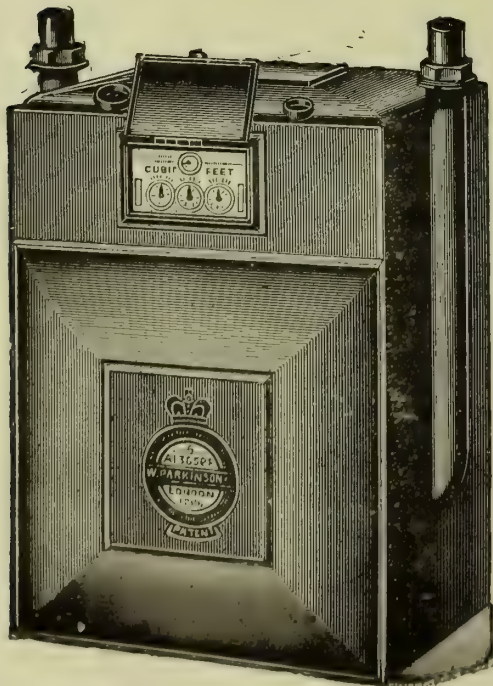
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EDITOR & PUBLISHER: WALTER KING,

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2442.—TUESDAY, MARCH 1, 1910.

## EDITORIAL NOTES—GAS, &c.

### Trade and Legislation.

THE Society of British Gas Industries have been fortunate in their Presidents; never more so than in the current year, for they have secured the services in that capacity of the eminent leader at the Parliamentary Bar, Mr. J. H. Balfour Browne, K.C. The Society are not in a position to add lustre to the honour that clusters around the name and work of their new President; but his tenancy of the presidential chair adds lustre and distinction to the Society. The members appreciate deeply the sacrifice that is made by one whose time is already so amply occupied in larger affairs, by his carving out of it a part to devote to the interests of this young organization. In the act, however, we trace the sensibility of a personal identity with an industry in the fortunes of which, legislatively, there has been a great and valued connection, and anything but regret that opportunity enables a tightening of the bond with at least one side of that industry. Moreover, there was the personal friendship, embracing many years, and created and cemented by frequent contact, between Mr. Balfour Browne and his predecessors in the chair of the Society—in order of succession, Mr. Dugald Clerk, Sir George Livesey, and Mr. Thomas Newbigging.

As an industrial and parliamentary lawyer, no one can speak more authoritatively, and with long and unique experience at the base, than Mr. Balfour Browne as to the conjunction existing between trade and legislation, and as to the wise and the defective legislation that is respectively constructive or destructive of trade interests. His professional life has been spent in fighting for the requirements of industry, in its defence, and in lightening the evil effects of mistaken and repugnant enactment. It was therefore peculiarly apposite that he should have taken as the subject for his Inaugural Address "Trade and Legislation." But it is, on the other hand, singular that a careful perusal of the address does not disclose anything that may be in Mr. Balfour Browne's mind favourable to our present legislative machinery in its relations to industry. It does, however, show (and pointedly) that he knows and appreciates to the full the defects that combine to produce enactment ineffective for good to the trade and industry of the country. But high though the standing of a man at the Parliamentary Bar is, he is not in any way responsible for this. He is not allowed to interfere with the machinery. He is not permitted to have the last word regarding the quality of the product. He can only use his gifts in counselling as to its character; and there perforce he must leave it. But reform is in the air; and this fact supplied the text for the address. Most people have long agreed that the House of Lords requires reforming; but few agree with the idea that it shall be either completely abolished or rendered so absolutely impotent that non-existence would be as good as continued existence. A Second Chamber there must be. Quite apart from imperial and national affairs, the value of the Second Chamber has frequently been found in connection with gas legislation. Mr. Balfour Browne would have the Second Chamber reconstructed; and its representative elements should include trade and industry—there by absolute right, and not by favour, or through (as now) the mere rewarding or honouring of an individual who has, through industrial and commercial pursuits of any kind, raised himself high in the estimation of his fellows and his country generally. Such a reformed Second Chamber as that mirrored in the address would meet with general approbation, excepting, of course, from the ranks of the extremists. The functions of the Second Chamber as it now exists are of a protective order that must, whatever else happens, be in chief maintained, though possibly improved. Mr. Asquith himself in 1894 well set out the nature of these functions; and they are

incorporated in the address under review. The described functions are as applicable to a reformed Second Chamber as to the present House of Lords. One of these functions is found in this: "It must be keen to watch, and careful to follow, the steady set, as distinguished from the transient trend, of national sentiment; and it must always be ready to defer to the manifestation of the popular will." By paraphrasing part of this, it is easy to make clear where our legislative machinery has so often failed in relation to industry, by producing repressive rather than helpful enactment. The Legislature "must be keen to watch, and careful to follow, the steady set of industrial changes in condition and requirement."

It is because the Legislature has not the assistance of technical competents to watch and follow the steady set of industrial change and requirements, that they have been unappreciative, and so have committed much legislative blunder. It is because of the want of technical capacity and incompetence in our Legislature in the various branches of industry and trade, that it has been unable to adapt itself readily to contemporary needs, and has hung as a clog far in the rear of the progressive strides that industry essays to make. We have found this very much of late years in the gas industry. The uses of gas have changed; and the character of the gas meet for the new circumstances is quite different from that required aforesaid when its bulk was required only for lighting. The industry knows the gas that is essential to the day and its purposes. But public sentiment is largely against change, merely because the public does not understand. Whose voice carries most weight in such a case—that of a public that does not understand, or that of an industry that does do so? Select Committees are good enough in their way in a judicial sense upon matters of ordinary character. But they are rarely capable of appreciating a technical necessity; and they find safety in keeping to the time-deepened grooves, in which largely survives the "popular will." Reform of the House of Lords is not the only improvement in legislative machinery that is required in the name of industry. Reform of Select Committee procedure is another, by introducing technical advisers, who have specialized in particular industries, and have their fingers on the pulses of those industries. It is admitted that, in the case of release from high standards of illuminating power, the gas industry has to a point—and to a point only—been successful. But the partial release did not come about until persistent agitation issued in technical inquiry; and Select Committees are now glad enough to have the backing in their decisions of the recommendations that Lord Rayleigh's Committee made. This shows plainly that they would not be hostile to technical guidance from an independent and conscientious adviser. Because of the absence of that advice, the tendency frequently is now, in matters of innovation and change, to accept the popular view as more or less faultily represented by the local authority, and to let matters remain as they are rather than make concessions helpful to industrial progress.

In another way, legislation is repulsive, and not helpful, to industrial progress. Legislation should offer inducement to industry to bring itself under its protection and control. But in the case of small non-statutory gas undertakings, it invites them to come under protection and control, but makes the coming as unattractive as possible. No one can compel a non-statutory gas company to go to Parliament unless it be a local authority who makes itself so obnoxious that life for the company becomes a burden; and then the only way to obtain any measure of protection from designed persecution is to apply for parliamentary authority. With what result, apart from the heaviness of fees? The applicants have no assurance of security on any matter; and they have no idea as to whether their applications will put upon them a limit to further existence. No non-statutory company cares for voluntary immolation, or to be made the victim of the petty jealousies and ambitions of the local



authorities. But that is what it comes to, and so there we have another direction in which reform is required. What chance, however, is there of such reform when current politics and legislation are so largely branded "Communism," and through which politics and legislation there is the open declaration of enmity to all private enterprise and individualism? Then, further, there is the difficulty that industry has of getting antiquated and other legislation that is obnoxious to its progress abrogated. The scope of necessary reform has, indeed, been considerably broadened and widened compared with what it was only a few years ago. Would that the final words of Mr. Balfour Browne's address were deeply planted, and would germinate, and bear fruit among our legislators. They are: "It is, after all, upon wise 'politics that our trade depends; and it is due to unwise 'legislation that this great business of industry and commerce has not made the progress in the past which the 'ability of our manufacturers and the industry of our 'workers entitled us to."

### A Comprehensive Address.

Who will say, after the presidential address delivered by Mr. H. Kendrick, of Stretford, at the meeting of the Manchester District Institution of Gas Engineers last Saturday, that there is any dearth of material in the gas industry's affairs from which such deliverances may be constructed? Those who complain of any paucity of matter have in this address the negation direct. Never in the extensive history of the gas industry has there been a period when so many questions of first technical and commercial importance have claimed consideration, and consideration of the most critical kind. Development can only come from work; and, on every hand, there has of late years been in the gas industry development in the technical and commercial lines, opening up to those holding the dual capacities of engineer and manager, or only the one or the other, a broad field of view, and numerous matters for examination in detail. Development as well as progress emanates from such work. The point of actual achievement, great as the achievement has been, is only the starting-point for some fresh effort; and the vista before the gas industry fortunately reveals and promises very much more work, which should yield great intrinsic value. Therefore no one in the gas industry associates any part of his work with finality. All men, however, cannot engage—some have not the opportunity, some have not the capacity—in the prosecution of original work that has for its immediate object a common advance; but there are really few who cannot, having the inclination, engage in work that puts to proof new ideas and fresh invention, and extract from the investigation much instruction and interest. It is in this latter light that Mr. Kendrick's address is regarded. It is a record of painstaking work, submitting to proof, under his own conditions, new propositions with the set purpose of ascertaining what, if any, advantage would, by application, accrue to the interests for which he is responsible. Long as the address is, there is not a single part that we would have omitted. There is value in the results of the investigations not only to the Stretford Gas Company, but to the President's colleagues; and, in those parts where there is only personal opinion expressed, and not hard facts the resultants of research, that opinion invites more than superficial consideration from the very fact that the remainder of the composition shows the writer himself to be something more than a superficial observer.

Carbonization questions have a front place in the address; and the President is perfectly frank in declaring his views in connection with vertical retorts. He is not prepared to accept any one of the systems without further information. He has much respect, no one more so, for the work that has been done; but he asserts that the systems have not been tried in sufficiently small units in the medium size and small gas-works, and hints that there has been rather a significant economy observable in the intelligence as to capital, wear and tear, and renewals. We have been under the impression that Oberspre, Dessau, Bournemouth, Nine Elms, and St. Helens had yielded a fairly large amount of information as to the working of vertical retorts in small units; but perhaps our interpretation of the expression "small units" does not coincide with Mr. Kendrick's meaning. It is quite true that, in respect of capital cost, there has been reticence on the part of those interested financially in the systems; and it can hardly be expected, while any manner of proprietary right exists, that they will publish such figures broadcast, though

at the same time it is not likely that confidentially submitted prices will for long be successfully maintained in secret. Concerning wear and tear, Herr Körting has given information in our columns (for example, on Nov. 9 last) that indicates his view that there is nothing to complain about in this regard—that, as a matter of fact, the conditions are so much more regular through ease of control and inspection in a Dessau vertical retort-setting, that wear and tear and renewals are items that should be found to be tangibly modified in contrast with horizontal and inclined retorts. With the Woodall-Duckham retort-settings, there has been little opportunity, by long continuous runs under ordinary working conditions, for ascertaining, save approximately, how these items will stand; and the same has to be said respecting the Glover-West plant at St. Helens. But on the experience, one can fairly presume; and there appears to be no reason for apprehension as to the items showing any alarming increase—if any increase—over older types of settings, particularly when, with horizontal retort-beds, the wear and tear of power charging and discharging machinery has to be incorporated in the account.

Owing to the limitation of his conditions, Mr. Kendrick has not been able to put to proof for any considerable period, carbonization of heavier charges and for longer duration periods; but so far as he has experimented, he seems very much to doubt whether, under the circumstances of the Stretford plant, taking capital, fuel, renewals, labour, and enrichment into calculation, there is for him much in the new method—the saving being small and the calorific value of the gas produced somewhat lower, but only to the extent of some 8 per cent. The smallness of Mr. Kendrick's financial advantage is apparently altogether due to his peculiar conditions; and he himself is not satisfied yet that he has realized all that may be gained, as is patent by the fact that he is going to revive the experiments in the coming spring with improved apparatus since installed. That Mr. Kendrick's experience cannot be taken as being any guide excepting to himself and others whose conditions may be of corresponding order, is proved by the remarkably fine showings in the manufacturing returns—productive and financial—that have been coming before us from all quarters during the past few weeks. They are of a character that cannot be treated as immaterial in the workings of any gas undertaking. But the President proceeds to show in his address that the heavier and the longer duration charge does not stand alone as the means of improving the working results of ordinary retort-benches. And here, for the first time, we have published independent of Stockport working experiences in the use of Mr. Meunier's arrangement for preventing undue oscillations of the liquor in hydraulic mains, and maintaining more equable conditions therein than formerly. The figures tabled by the President of his working at Stretford, show that, by the application of the arrangement, there is an improved make of gas, no loss in illuminating power, no loss in heating value, and a diminution of naphthalene stoppages. This is on six-hour working, and presumably the  $6\frac{7}{8}$  cwt. charges. But as the whole of Mr. Kendrick's hydraulics were not, during the period embraced by the figures, fitted with Mr. Meunier's invention, it may be taken that, when there is conversion of the remainder, the results will be even better than those presented in the table. It is almost a pity, too, that while these records were being made, retort-house governors should have been introduced, though there was at least a prior couple of months' working with the Meunier arrangement in use, and the results, subsequent to the intervention of the governors, do not appear to have been appreciably affected for the better. To the employment of the new arrangement, Mr. Kendrick also ascribes the saving he is now effecting in the use of naphthalene solvent—the quantity being less than one-third of that required during December, 1908. The reduction and prevention of naphthalene constitutes one of the claims made by Mr. Meunier for his invention; and so there will be interest in this independent certification of value in this respect. Though the invention has been only partially applied, the testimony as to its particular and general utility is gratifying.

The subject-matter of the address is so extensive that comment upon the whole of it is out of the question. In passing, it is noticed that there is recommendation as to both the "Coalexld" and "Charco" processes being worth trying by gas undertakings desiring to produce coke of improved value for domestic purposes. Regarding "Charco," it would be of advantage to ascertain experience where its produc-



tion—under the system of dry quenching by the aid of breeze—has been tried. One trial of which we wot, carried out strictly on the lines laid down, resulted in combustion continuing for a time after the incandescent coke had been buried beneath the prescribed depth of breeze; and, after relieving the coke of the breeze, it was found that the "Charco" was of less weight than a like quantity of coke would have been if treated in the ordinary manner. At the bottom of the sections of the address dealing with enrichment costs, the value of pyrometers in connection with the fixing chambers of carburetted water-gas plants, and coal testing, is pointed out. If any manager wants awakening to a sense of the importance of making a survey, and rendering consumers assistance in connection with their gas-fires, he may obtain what is necessary from the results of active work at Stretford. The gas-fire is going to play a large part in the future business development of the gas industry; and inefficient and defective gas-fires ought not to be allowed by the responsible administrators and officials of gas undertakings to obtrude themselves on, and so hinder progress along, a path that is destined to lead to greater things for the industry in the future than in the past. So we pass on in the address from interesting subject to interesting subject until we come to the warning regarding the subterranean work of the General Post Office in relation to telegraphs and telephones. The Government Department under their Acts appear to have plenary and arbitrary powers so far as other occupants of the subsoil are concerned, while these have only a modicum of protection accorded them. So far as Warrington is concerned, as we showed in reviewing the Bills for the coming session, the Corporation are proposing to trim the Postmaster-General's powers in connection with gas-pipes, mains, and other apparatus. There is certainly ground here for some useful action and representation on the part of the Institution of Gas Engineers and the Gas Companies' Protection Association.

### Petitions against the Standard Burner Bill.

THE Gas Companies uniting in the promotion of the Standard Burner Bills have now, through the petitions presented, full knowledge of the amount of opposition, and the nature of the allegations and requirements that they will have to meet. In the first place, readers may be reminded that there are 47 Companies concerned in the promotion of the Bills, and that these refer to 49 undertakings. Of the 47 Companies, there are only 33 that are opposed; so that there are 14 companies who have local authorities in their area who are not in sympathy with the organized movement against the Bills, and who appreciate the unwisdom of entering into a contest over a matter that has been so thoroughly endorsed in succeeding sessions by Parliament and by the Board of Trade. The number of petitions lodged is 42, which is an average upon the Companies opposed of less than 1.3. This again is significant. Looking down the list of Companies, it is recognized that there are few of them that have not each to deal in their supply districts with a plurality of local authorities, so that there is not unanimity of opinion on this particular subject among the latter in the areas in which the Companies are opposed. This is the more surprising having regard to the way in which the opposition has been worked up, and the easy terms on which the local authorities have been given an opportunity of making an attempt to "squeeze" the Companies in which they happen to be interested.

There is great similarity in the allegations and requirements in the petitions presented. Parliament cannot fail to note this, and will regard the fact, together with the number of petitions presented, as an effect of the organization of opposition. Had there been no organization, it is fair to assume the opposition would have been considerably less than it is. In favour of the promoters, too, there will also be noted by Parliament the want of unanimity among the local authorities in districts served by the Companies. Many of the allegations and requirements in the petitions are absolutely frivolous; and most of them are foreign to the simple and single object of the Bills, which object has a long line of parliamentary endorsement in its favour. The allegations are not new, nor are the requirements; and they have been ruled out by Parliament when preferred or submitted on previous occasions. History and experience are against the petitioners. When it is contended that the provisions of the Bill are special to the London Gas Companies, there is the whole history of gas-testing to show that the generally applied statutory methods of testing have always had

their inception and first application in London, and that the particular proposition of the present Bills has been applied to gas undertakings—company and local authority—in all quarters of the country. Experience of consumers' gas accounts in large areas of London and elsewhere prior to and since the adoption of the "Metropolitan" No. 2 burner is the practical proof of the puerility of the petitioners' submission that the Bill will enable the promoting Companies to supply gas of lower illuminating and heating values, to the financial injury of the consumers; and, moreover, as most of the Companies are working under the sliding-scale, any financial advantage (if any) that may be derived from the use of the burner will go, with the exception of an almost negligible fraction, to the consumers. When it is suggested that the new burner is either "unsuitable" or by no means "practicable for use by the consumer," in accordance with the terms of the Act of 1868, it rests with the petitioners to show that any testing-burner giving a luminous flame is, in these days of incandescent gas lighting, "practicable for use" by consumers other than prodigals and fools.

Some of the petitioners are submitting that a calorific test should be applied. This is a matter that has been fully dealt with in recent articles in the "JOURNAL" on "The Case for the Standard Burner Bill"—a series of articles which, we are pleased to know, has received widespread approval in the gas industry—and we should be merely repeating the arguments adduced in those articles did we criticize here the suggestion of the petitioners that there should be a dual test applied to the gas of the promoters. The petitioners have to choose between modern illuminating power testing conditions or the calorific power test, and the latter only after a period of local information testing in order to arrive at a just standard. Most of the other submissions by the petitioners have been treated upon in the series of articles referred to; and there are a few others with such a limited backing from petitioners that they will certainly be completely ignored by any Parliamentary Committee. It is also observable that the more important of the petitioners—excepting the London County Council, whose interest in the matter is of a rather modest character—are suppliers of electricity; and therefore in active competition with the promoters of the Bills. It is to the interest of these municipal competitors to make the conditions of gas supply as onerous as possible, because they of all people realize that—notwithstanding the allegations in the petitions as to the evil effects (drawn from imagination) of the use of the "Metropolitan" No. 2 burner upon the consumers—the gas companies, in face of well-sustained electrical competition, are not so idiotic as to adopt and apply any power that will inure to their own destruction.

### Value of Gas Stocks.

A REPORT and financial statement that establish records in progress and prosperity are much to the liking of both a Board of Directors and the shareholders. With such a report and financial statement it was the happy lot of Mr. W. G. Bradshaw to have to deal when presiding over the meeting of the Commercial Gas Company last Thursday; and therefore, as may be supposed, there was most hearty congratulation, in which that excellent trinity in commercial partnership—Directors, ordinary proprietors, and official and employee co-partners—shared. We will not pass in review the causes that contributed to the good results of the half year. They have a strong resemblance to those that have been dealt with of late in treating of the same period's accounts and proceedings of other companies. A striking point in Mr. Bradshaw's address was his reference to the enhanced value of gas stocks and their continued stability, while other trustee securities have so considerably depreciated. Mr. Bradshaw explained—and no one is in a better position to judge of and explain—the reasons for the depreciation of the latter. Sufficient for this reference are the facts that there has been this depreciation, and that gas stocks have proved so perfectly stable during the period when market prices in other directions have been falling to pieces. "Public confidence," and "internal prosperity" are the tags to be affixed to the statement as to gas stocks. As a trustee, Mr. Bradshaw has in possession some Commercial gas stock that was purchased about 1840 by his grandfather. In that stock there has been an enormous increase in value. Again, as trustee under his father's will, he holds stock purchased between 1865 and 1875. The bulk of the stock that he holds in his own right was bought about 1888, and that, too, has increased in



value. Looking back over the "JOURNAL" Money Market records, in our first number published on Feb. 10, 1849, it is seen that at that date the Commercial Company's £25 shares, paying  $5\frac{1}{2}$  per cent. dividend, were only selling at 25-26; and the £10 new shares, paying  $5\frac{1}{2}$  per cent., were merely realizing par to  $\frac{1}{2}$  premium. Some 53 years later—1902—the Act was passed providing for the conversion of the Company's stocks on 4 and  $3\frac{1}{2}$  per cent. bases. On Dec. 30 of that year, the market price of the old stock was standing at 250-260, and it was paying a dividend at the rate of  $12\frac{1}{2}$  per cent. per annum; while the new stock stood at 200-205, and was paying  $9\frac{1}{2}$  per cent. In the following year, the first quotations in our pages, after the conversion, put a market value on the 4 per cent. stock of 106-109, with a dividend of 5 per cent., while the market value of the  $3\frac{1}{2}$  per cent. stock was 101-104, with a dividend of  $4\frac{3}{4}$  per cent. Last week the respective quotations were 109-111 and 105-107, with dividends of  $5\frac{1}{10}$  and 5 per cent. But in these days, when Chancellors of the Exchequer keep so sharp a look-out for fresh victims, it is well not to boast too loudly of these matters; for one never knows what may be labelled "unearned increment."

### Conviction and Recommendation.

If any justification were needed beyond already established facts for the caustic criticism of the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) of the conduct of certain local authorities owning electricity undertakings in the matter of the maladministration of the street lighting, it is to be found in the report of the Finance Committee of the London County Council on the application of the Marylebone Borough Council for a loan of £24,000 for extending the electricity cables and converting the public lamps from incandescent gas-burners to electric metallic filament lamps. The sum asked for has been reduced to £20,900—the difference between this and the sum applied for representing the additional cost of part of the work being carried out by the unemployed, instead of in the ordinary way. In other words, the Borough Council are, in contravention of all economic doctrine, going to pay more for the work being done by the unemployed, and obviously less efficiently than if executed in the customary manner. Inefficiency always costs more than efficiency. Better by far scatter the extra money among the unemployed, and have the work done at lower cost and properly. But what will not be understood by anyone interested in this question of the Marylebone loan is, by what irrational process the Finance Committee of the County Council came to their resolve to "reluctantly" recommend the granting of such a large unnecessary loan when all their convictions are opposed to the proposition being a sound one, and the expenditure an economic proceeding either from the point of view of the ratepayers or the electricity undertaking. The Committee are advised that the streets are sufficiently well lighted by the existing incandescent gas-lamps; and, as the Governor of the Gaslight and Coke Company showed recently (*ante*, p. 368), the Company are prepared to continue the lighting at a lower price than the Borough Council electricity undertaking, and give more efficient illumination.

Moreover, the Finance Committee regard the scheme as speculative, inasmuch as, apart from the receipts from street lighting, the revenue the electricity undertaking will derive from this large expenditure on cables is not likely to yield a substantial sum. It is from this purely unknown quantity—the adventitious private business—that the thousands of pounds of capital expenditure on this big extension of the cable system is to be vindicated; for the street lamp business cannot yield anything towards the means for discharging the capital obligation. The chance of vindication coming along in the shape of a large accession of private business from the new cables is very remote. The best part of the area—the "best" for electricity business—is already cabled; and the streets through which it is now proposed to run cables will, the prospects are, be of very minor productiveness. So think the Finance Committee of the London County Council; and they are also of opinion, and give their reasons for it, that, having regard to the present position of the Marylebone undertaking, the Borough Council should not incur this heavy capital outlay. But pious expressions of opinion of this kind and inferrible counsel do not go far towards putting a stop to municipal prodigality. Nothing short of an impregnable firmness is necessary; and with such a strong sense of the unwisdom of the scheme upon

them, it is regrettable that the Finance Committee of the County Council should have so far violated the principles of the municipal reformers as to have, by their action, connived at a proposition that, however considered, must be regarded by any independent mind as financially vicious. The suggestion of Mr. Woodall that this new phase in the administration of local affairs—introduced by electricity trading and speculation, and repugnant to legitimate and economic local government—should be the subject of inquiry by a parliamentarily appointed Committee or Commission, is one that should receive not only the consideration but the active support of all intelligent men. Mere passive concurrence will not do. Though a business be run by a municipal body, it should not be run so as to be a charge on the rates; and in respect of any business offering by the various municipal services, it should be subject to competitive laws and not preferential favour. Until these conditions are legally assured, there will, it may be taken, be repetitions of this Marylebone scandal.

### Relief from Naphthalene Troubles at Tynemouth.

The efforts of gas managers to relieve themselves of the troubles attendant upon the deposition of naphthalene in the mains and services are so often unattended by success, that it is pleasant to be able to record an instance to the contrary; and it will be found in another part of the "JOURNAL." For some years, Mr. William Hardie, the Engineer of the Tynemouth Gas Company, tried various expedients for getting rid of the nuisance; and at the annual meeting of the Company last week, the Chairman was able to communicate to the shareholders the gratifying information, contained in a letter received from Mr. Hardie, that naphthalene troubles no longer exist. Evidence of this was afforded by a recent inspection of the mains, both on the works and in the district. Much benefit was derived from mechanical treatment of the gas; but a great deal more from the use of a special oil prepared in the laboratory of the works, which has brought total relief at a very trifling cost. When it is mentioned that by means of this solvent the stoppages due to naphthalene have been brought down from about 4000 to 30 per annum, some of our readers will doubtless be desirous of testing its efficacy in their districts.

### Cause of Improvement in Gas Lighting Efficiency.

In a popularly written article on the lighting engineer in the "Daily Telegraph" on Monday last week, the "Engineering Correspondent" of our contemporary falls into a common, but perhaps pardonable, error in asserting that "there is little doubt that the many improvements in lighting by coal gas owe their origin to the competition of electricity." Welsbach himself would be the last to admit that electricity had anything whatever to do with his rare-earth researches, and the discovery which culminated in the development of the incandescent mantle. The tale of Welsbach's revolutionizing discovery in 1883 in the laboratory of Bunsen at Heidelberg is almost romantic, and is well known to all students of gas affairs. The improvements that have been made in gas lighting have followed as a natural consequence from the new line of investigation and invention that the mantle opened up. It brought into being and has developed quite new fields of industry; and, apart from external scientific investigation, the occupants of that field have, in the struggle for supremacy, bestirred themselves, and brought about a large measure of improvement. This, however, may be admitted, that electrical competition has been a stimulus to improvement in the commercial methods of the gas industry; and so well in many districts has the gas industry looked after the organization of this particular department, that what has been done is at once the admiration and the envy of their competitors.

### The Piping of Houses.

The same writer makes a charge of lack of application of scientific rule in the gas-piping of houses. He says that it is probable gas-fitters generally do their work with little consideration for engineering rules. The important question of length of pipes, and the resulting friction of gas, he asserts, is frequently neglected by those installing gas, with the result that a considerable falling off of the illuminating power of lights is noticeable when a few extra ones are turned on in other parts of



the building. He calls to mind an instance where this is always observed to happen in an otherwise well-appointed house. After all, such instances—they are not general—are usually found in old houses, and not in modern piped ones, unless they be of the jerry-built class, where the builder practises a blind economy which goes to make his houses unattractive. But when one thinks of the hundreds of thousands of existing houses that were piped before cooking-stoves and gas-fires were so largely installed and supplied by means of branches from old fittings, the marvel is that the percentage of complaints of deficient supply is not larger than it is. In a measure, that the percentage is not larger must be ascribed to the consumption economy of incandescent gas-burners, which make, light for light, an infinitesimal draft on the pipes contrasted with their flat-flame predecessors. But nowadays gas undertakings exercise a greater supervision over internal fittings than they did in times past, when there was a rigorous cessation of all responsibility at the meter. The writer also complains that rules for the correct size of pipe vary considerably—indeed, in the case of two formulæ given in the same work, the quantity of gas flowing is given in one as proportional to the square root of the diameter, and in the other as proportional to the square root of the fifth power of the diameter. Both cannot be correct, though the fact that the diameter is in inches, and generally in the neighbourhood of 1, causes the formulæ to give fairly consistent values for small sizes, such as are used in houses. However, if the engineering critic of our morning contemporary will read Mr. Chandler's article in the "JOURNAL" for Feb. 8, and Mr. F. S. Cripps's article in last week's issue, he will see that this particular aspect of his subject has been receiving the attention of competent investigators.

### The Cheapest Gas in London.

It was with pardonable pride that the Chairman of the Wandsworth and Putney Gas Company (Mr. H. E. Jones) referred, at the meeting of the proprietors the other day, to the fact that the Company had now reached, for ordinary purposes, the lowest price—1s. 10d.—charged for gas in London or the suburbs. In fact, one has to go a good journey from London to find the equal in lowness to the Wandsworth price. The 1s. 10d. is not the Company's minimum. One-twentieth part of the gas sent out by them is used for power and trade purposes; and on this a discount of 15 per cent. is allowed, which brings the price down to 1s. 6<sup>7</sup>/<sub>8</sub>d. per 1000 cubic feet. Apart from the gas used for ordinary trade purposes, the Company have within their territory large gas-mantle factories; and these take a considerable quantity of gas, and no doubt glad enough are the managements to get their requirements met at so moderate a figure. Mr. Jones bestowed honour where honour is due for the notable low charges of to-day. It was those who laid the foundations of the gas supply in the district who made possible the existing proud position of the present administrators and officers of the Company in supplying gas at such low rates. Names mentioned in the Chairman's speech of men who took part in the direction and work of the Company in times past, and to whom all associated with the Company in these times are indebted, were those of Dr. T. S. Howell, Mr. Robert Jones (father of the present Chairman), and Mr. Harry Freeman, erstwhile the Engineer, now a Director of the Company. Dr. Howell and Mr. Robert Jones rest from their labours; their works live. Prudent and economical administration and control of the capital account in their time has worked wonders. Their policy in this respect and in active enterprise is the policy of Directors and officers to-day. Gratification with the positions they hold in connection with a Company that has made this record, and in the making of which record they have taken part, is naturally indulged in by the Engineer (Mr. H. O. Carr) and the Secretary (Mr. Chas. W. Braine).

### "Gas Companies' Misfortunes."

It is not often the "Financial News" makes such a slip in alluding to gas stocks as it did the other day by inferentially roping in the whole number of British gas companies with the wretched little concerns that have come to grief through the exploits on the fringe of the industry of a number of queer company promoters. Our financial contemporary quoted the East Sussex, Ticehurst, Rawcliffe, and Robertsbridge Gas Companies which have proved disastrous "investments" for the shareholders, and then added: "It is not often that so persistent a

'run' of ill-luck attends one class of enterprise. Doubtless these misfortunes explain the reluctance of investors to subscribe for gas shares at the present time. They can hardly be blamed for their hesitancy." This ill-considered statement was quickly fastened on by correspondents, who pointed out to our contemporary what is a well-known fact, that all gas companies, large or small, that are well established, and have good reputation, find no difficulty whatever in the placing of new issues—many of substantial amount. The gas industry was never in sounder position than at the present time, nor were its prospects ever brighter, having in view the large expansion of the uses of gas. The current prices of gas stocks, and the amount of capital raised in the last few years, offer an abundant refutation of any hesitancy on the part of investors to place as hitherto their confidence in gas stocks. But numerous investors have been taught by experience to discriminate between good and bad. It is, unfortunately, the investors who have been hitherto misled, and fortunately the promoters of these risky (we were nearly writing fraudulent) concerns, who are feeling the run of ill-luck—and not the "one class of enterprise" as represented by the gas industry generally.

### The Uncollodionized Mantle.

Attention may be briefly drawn here to the paper which was read by Mr. Percy G. Somerville before the London and Southern District Junior Gas Association last week. The author is a member of the staff of the Chief Inspector's Department of the Gaslight and Coke Company; and he was able to give his hearers some highly interesting information with regard to the adoption by the Company of the system of using non-collodionized mantles. He explained that the method was introduced into this country about six years ago by Mr. Corbet Woodall. The limp mantles are purchased; and they are then modelled, burnt-off, and seasoned by the Company's employees. When these operations are completed, the mantles are placed in glass cylinders, and taken to the street-lamps or consumers' premises. It is found that not more than 2 per cent. of the mantles so carried are broken in transit; while there is a saving of about 3s. per gross by using the uncollodionized type instead of the usual collodionized form. This is well worth considering, on the half million or so mantles the Company are now annually burning-off. There were many other points of interest in the paper which cannot be alluded to here; but a report of the proceedings will be found in another column.

### Negotiations Suspended.

Last Saturday, the South Wales coalowners and the miners' representatives resumed negotiations at Cardiff for a revision of the coalfield agreement which expires at the end of March. But once more the conference proved ineffectual; and in view of the shortening of the time left in which to come to a settlement, each abortive meeting adds to the seriousness of the situation. On the latest occasion, the conference sat for about seven hours; but even at the end of this period neither side would submit modified proposals. It is stated that the discussion was chiefly upon the questions relating to a fixed rate of wages for work done in abnormal places, the fixing of an equivalent selling price of coal to the minimum wage-rate, and the demand of the workmen for payment for small coal. In holding out as they are doing on the wage-rate question, the men are supported by the Miners' Federation of Great Britain; but on all other points, it seems, they are given a free hand. A suggestion by the owners that certain points should be submitted to arbitration was declined by the men's representatives. After the break-up of the conference, an executive meeting of the Miners' Federation was held, when Mr. Tom Richards, M.P., was instructed to communicate with the General Secretary of the Miners' Federation of Great Britain, asking that a national conference be immediately called to consider the whole of the matters in dispute in South Wales. The best that can be said of the present position of the coalfields dispute is that there is still opportunity for a settlement to be arrived at, if both sides are anxious to do so.

At the meeting of the Metropolitan Water Board last Friday, on the recommendation of the General Purposes Committee, the salary of Dr. A. C. Houston, the director of water examination, was increased from £1000 to £1100 a year—the advance to take effect as from April 1 next.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 613.)

BUSINESS in the Stock Exchange last week might almost be summed up in two words—Rubber and Oil. Here speculation was rampant (especially in the former line), serenely indifferent to the political tempest which dominated the chief markets. In these, business was at very low pressure; the prevailing disposition being to await developments. The opening day was quite quiet; business being arrested by various factors, from political puzzles to broken telegraphs. Most lines were rather weaker if they moved at all; but Consols had a small rise. Tuesday was inactive, and things were dull. Railways lost ground, but recovered partially. The Foreign Market was uneasy about the Near East. Wednesday was more active with a better tone, mainly by the cheapness of money. Consols, however, were an exception to the upward tendency. Things became dull and heavy again on Thursday. Consols receded  $\frac{1}{4}$ ; Railways were idle and uncertain; and even in the speculative markets there was a check. Friday was almost equally quiet, but not weak. The gilt-edged division was mostly firm; and the other leading departments were very fair. Saturday was much the same; but Consols rose  $\frac{1}{4}$  for the account. Movements elsewhere were rather irregular. In the Money Market, there was a good demand for the Stock Exchange settlement, and discount rates hardened; but at the close there was a tendency to greater ease. Business in the Gas Market was a good deal quieter than the previous week for all classes of undertakings; and there was hardly any change in quotations, except for variations *ex div.* Of these, there were a large number—as usual in the final February account. In Gaslight and Coke issues, the ordinary was only moderately active, but firm and steady. With the exception of one special bargain done at 104 $\frac{3}{4}$ , all transactions ranged from 104 $\frac{3}{4}$  to 105 $\frac{1}{2}$ . The secured issues were only lightly touched; the maximum marking 88 $\frac{1}{2}$  and 89, the preference 104 $\frac{1}{4}$  and 105, and the debenture 81 $\frac{1}{2}$  to 82 $\frac{1}{4}$ . South Metropolitan was not active, but was stronger, changing hands at from 120 to 121 $\frac{1}{2}$ —a rise of 1. The debenture realized 82 $\frac{1}{2}$  and 82 $\frac{3}{4}$ . Commercially were hardly noticed; one deal in the 4 per cent. at 110 $\frac{1}{4}$  *cum div.*, and one in the debenture at 81, being all that was done. Among the Suburban and Provincial group, business was at its lowest ebb. One transaction in Alliance and Dublin at 86 $\frac{1}{2}$ , and one in South Suburban at 123 $\frac{3}{4}$  *cum div.*, being the total. The Continental companies were almost correspondingly inactive. Imperial was done a few times at from 175 to 176 $\frac{1}{2}$ , ditto debenture at 92 and 92 $\frac{1}{2}$ , and Tuscan at 9 $\frac{1}{2}$ . Among the undertakings of the remoter world, Bombay fully-paid changed hands at from 6 to 6 $\frac{3}{4}$ , and ditto part-paid at 4 $\frac{1}{2}$  and 4 $\frac{1}{4}$ . The Argentine Companies were still pretty busy, though Buenos Ayres was not dealt in. Primitiva marked from 7 $\frac{3}{4}$  to 7 $\frac{1}{2}$ , ditto preference from 5 $\frac{1}{4}$  to 5 $\frac{3}{4}$ , ditto debenture 99 to 99 $\frac{1}{2}$ , River Plate 17 $\frac{1}{2}$  to 18 (a rise of  $\frac{1}{4}$ ), ditto debenture 99 $\frac{1}{2}$  and 100 $\frac{1}{2}$ , and San Paulo 14 $\frac{1}{2}$ .

## ELECTRICITY SUPPLY MEMORANDA.

**Intrinsic Brilliancy of Metallic Filaments—Shaded or Concealed Lamps Necessary—Metallic Filament Prices—Controversy Among the Juniors—Contractors and Municipal Trading.**

ELECTRIC light and eye strain has been the subject of correspondence in the "Pall Mall Gazette." The public are finding out by experience that the metallic filament lamp is the cause of discomfort and even injury to the eyes; and that the only remedy is to properly screen the lamps, or to hide them away and use the reflected light. The incandescent gas mantle has an intrinsic brilliancy by no means low; and it ought to be kept at such an angle and distance as to prevent any direct influence upon the eyes. But the intrinsic brilliancy of the fine filaments of the metallic electric lamp is so immense that the most thoughtful electricians are convinced that it will be to the interest of the electrical industry to advocate, and set the example of having, the incandescent filaments completely obscured. What the public are finding out, recognized leaders of the electrical industry are now admitting, both by their teachings and actions. If the Illuminating Engineering Society has yet served no other good purpose, its existence has been useful by giving a platform (in the discussion on "Glare" published last week) to Mr. A. P. Trotter, Mr. W. M. Mordey, Mr. J. H. A. Baugh, Mr. Cooper, and others—electricians to the backbone—for stating their opinions and experiences in regard to the detrimental effect of metallic filament lamps. Mr. Trotter, who is Electrical Adviser to the Board of Trade, pointed to the necessity for screening such lamps. Mr. Mordey (who is the ex-President of the Institution of Electrical Engineers) referred to the "terrible whip-lash" of the lamps on the eyes. Mr. Baugh confessed that to him the metallic filament lamp was "positively painful," while Mr. Cooper agreed that at night time it was a "distinctly unpleasant thing to look at." There is no question among these electrical experts on this point; and it will be to the interest of the public eyesight that the public be made acquainted with the views, expressed with such perfect candour by these electricians.

The evil being admitted, the cure is the next matter for consideration, and there was a consensus of opinion, among those

who took part in the discussion, that to use the lights without proper shades or ensconcing them in some other way—say, in the cornice—is a huge mistake. The conviction on this point is so strong that, for the new lecture-theatre of the Institution of Electrical Engineers, the Council have decided, cost what it may, to avoid the "terrible whip-lash" of the metallic filament lamps upon the eyes of the electricians who will assemble there, and to utilize the light of the lamps by reflection. Mr. Trotter, Mr. Baugh, and others referred to the prohibitive expensiveness for ordinary purposes of the ceiling-reflected light of concealed lamps; but it is this costly system of illumination, and only this system, that the Institution of Electrical Engineers think good enough and proper for their new theatre. It may illustrate an ideal system of illuminating the interior of such a building; but it will also illustrate a method of illumination which the pockets of few consumers will allow them to adopt. It is, however, significant that the Electrical Engineers felt it incumbent upon them to cast their decision in favour of such an expensive system of illumination; and, by so doing, they have emphasized the injury-dealing effects of the new lamps. If ordinary consumers cannot go in for this costly method of illumination, then the next best thing for them, for the protection of their visual organs, is to use obscured globes. Obscuration means loss of light; and the loss of light has to be made up by the adoption of a greater number of sources of illumination. This represents increased expense; and therefore the comparative statements of central station engineers and sales managers as to the cost of inverted gas-lamps and electric metallic filament lamps must be revised in favour of the former—seeing that the useful efficiency of the latter will not be that obtainable from clear-glass lamps, but that realized through an obscured globe, or by reflection from the ceiling.

There has been quite a flutter in the electric lamp trade in this country over the reports from Germany as to the breaking down of the prices of metallic filament lamps there owing to competition—a matter that was referred to in the "Memoranda" last week. It is thought, however, that what is happening in Germany will not affect the wholesale and retail prices here. The Osram lamp is supposed to be in such a strong position in the matter of contracts, that the makers—the General Electric Company—will be able to maintain present prices for at least twelve months. We are not at all so sure of that, so far as current business, apart from contracts, is concerned. The feeling of the consumer (mistaken or otherwise) is that, whatever the quality of the Osram lamps, the prices are all too high; and there is no doubt there will be, with the lowering of German prices, a considerable influx of the cheaper and perhaps inferior types from that country. It is feared that, if this happens, and discontented users result, the difficulty of the contest with modern incandescent gas lighting will be much increased. For the Osram lamp to come down to the level of the German prices, would mean a reduction of at least 15 to 20 per cent.; and it is hinted that the makers of the Osram variety could not stand this, and still give lamps of quality equal to those at present on the market. The Allgemeine Elektrizitäts-Gesellschaft are the prime movers in producing the break of prices in Germany; and their action is regarded as a direct blow at the Deutsche Gasglühlicht Gesellschaft, the makers of the Osram lamps in Germany, whose activity in the gas mantle and metallic filament lamp businesses was the subject of remark last week. There appears to be, as a result of the existing position in Germany, a desire on the part of some of the makers to form a sort of combine, with the view of acting in concert in the matter of regulating prices; but without the largest makers, such a working body would be absolutely ineffectual.

There must be congratulation to both the Manchester District Junior Gas Association and the Manchester Electrical Engineering Students on the high level in tone and matter of the debate published in our columns last week, on the relative aspects—cost, efficiency, constancy, and so forth—of the applications of gas and electricity to cooking, heating, and power. There is a mass of information in the debate that the commercial men of the gas industry will with advantage be able to add to their present accumulations of points useful in the carrying on of their work. The junior gas engineers were exceedingly well prepared for the oral and mental fray; and the electrical students were better equipped on this occasion than they were when the two bodies previously met in friendly debate. But though we may not be so classified ourselves, we think any disinterested person reading our report of the discussion (which included both the gas and the electrical speeches) will say that, in weight of hard facts and sound reasoning, the junior champions of the gas industry gave a better account of themselves and the interests of their adopted industry than did their opponents. We must, however, say this for the electrical side, that 1s. per 1000 cubic feet of gas for heating and cooking was hardly a fair current price to take. Whether it will generally come to that in the future is not a matter upon which we need exercise ourselves just for the present. But, on the other hand, the 1d. per unit that was taken for electricity for the same purposes set at naught all the principles that were at one time piously advocated for observance in the arranging of tariffs by electricity purveyors. Though both prices were low, however, they made little difference to the argument, financial or otherwise, because in cost of cooking and heating appliances, running expense, maintenance costs, and efficiency, all along the line it was shown (as there was no difficulty in doing) that the excelling point of gas was so far in advance of electricity that a considerably higher



price for gas could have been taken, with economy still on its side. Practically all that the electrical students could submit was the piece of weakness and nonsense—the forced parrot-like reiteration of which lays claim to our sympathy—that electricity can compete with gas so far as utility, cleanliness, and healthiness are concerned. The attitude taken up by the electrical students was that the least said by them on the question of cost, the better; and they skipped with the agility of youth from all explanation as to the foundation for their belief regarding the superiority of electricity in the matter of usefulness, cleanliness, and healthiness. One speaker, in spite of the millions of people (and electricians among the number) who live daily on gas-cooked food, spoke of its being “tainted” by the gas. It is a great pity the students of the electrical industry should have been schooled so well in the failing of their seniors in respect of postulatory statement. They have, or they profess to have, the earnest faith of their predecessors in the assumed pre-eminent virtues of electricity—albeit the want of economy—ousting gas for cooking and heating. Let us hope the faith will be sufficient to sustain them in the hours of their disappointment. As with heating and cooking, the junior gas engineers got the better of their opponents over the power question on the points of cost, reliability, and efficiency. But there was no denying on the part of the junior gas engineers that there are situations where, and purposes for which, electric motors are more convenient than gas-engines; even so, the gas-engine is a cheap way of obtaining the electrical energy. There is no purpose to be served by denying what is obvious and what is proved. The 20 per cent. dividend paying gas-engine companies will smile hugely over the statement of one youthful aspirant to electrical fame, that “the only reason why gas-engines are sold is that there happen to be places at the present time where electricity is not procurable.” Really a greater sense of responsibility should be inculcated in the electrical seminaries, for statements of this kind only provoke the mirth of those on the other side of the way.

The officers of municipal electrical fittings departments see future happiness in one direction in which there has been much unrest. The Electrical Contractors' Association have been, in the protection of the interests of their members, a veritable thorn in the sides of these sections of municipal enterprise; and the organization has met with a large measure of success in keeping municipalities within the sphere of legitimate operation, as defined by their parliamentary powers. There is, of course, much to be said on both sides; and to say it all would require more space than can be devoted to it here. It has, however, been thought that the Association objected, without any qualification whatever, to the trading in wiring and fittings. All who so believed have evidently been labouring under a mistake, as is seen in the official organ of the Association. There we now read: “To the electrical contractor, the maintenance of a fair selling price is everything in the world. What care we who engages in the sale of electrical goods, so long as the transaction is on a fair commercial basis? Surely we have no grievance here! In the past, our complaint against supply authority sales departments has been (once more, most emphatically) that prices have been cut—aye! shamefully cut. And upon this point, and this point alone, is based our objection to the rate-aided competition.” Indeed, electrical contractors, it is understood, would not oppose the establishment of such trading departments in every town in the kingdom, did they feel sure that those responsible for their management would observe the condition as to prices being on a fair commercial basis. The expression put into the statement points to deliberate, and not hasty, consideration; and those in favour of municipal trading in electrical wiring and fittings have certainly not been slow to take the “Electrical Contractor” seriously.

### Management of Gas-Engine Plants.

Gas-engine plants, particularly those operating with suction producer gas, have suffered so much in the past by improper management, that it is gratifying to learn from a recent report by Mr. R. H. Fernald, issued by the United States Geological Survey, that operators are generally more proficient now than they were formerly. We learn from “Engineering Record” that Mr. Fernald and an assistant have personally investigated the conditions at a number of such plants, and have arrived at the conclusion that difficulties with producer-gas engine installations are more often due to this single cause than to any other. The report referred to proves definitely, however, that well-built plants properly managed give excellent satisfaction, even with poor grades of fuel. Producer-gas power plants have advantages for certain uses that cannot be gainsaid; but their introduction will be more rapid if manufacturers will co-operate with engineers to a greater extent than they do now. Plants of this sort are still such a novelty that exceptional attention should be paid to them by manufacturers of their equipment, even after the installation is completed. It should not be forgotten that the best salesman is a satisfied purchaser; and the best way to make a satisfied purchaser is to help him to utilize in a successful way the equipment he has bought.

Mr. G. H. Raddin, of Lincoln, has been appointed Assistant Water-Works Engineer to the Bolton Corporation.

### NATURAL GAS AGAIN.

GENERALLY speaking, it is a pleasure to come unexpectedly across an old acquaintance; but there are exceptions to this rule, as to others—and one of the exceptions has just occurred at the “JOURNAL” office. We have had brought to our notice a prospectus, dated Feb. 21, 1910, of the South of England Natural Gas and Petroleum Company, Limited. This date is the newest thing about the matter; the “undertaking” which it is sought to acquire is old enough to have achieved notoriety years ago. Indeed, the whole thing long since became a “great bore,” though not in the sense in which the words are used in the fearful and wonderful example of the company promoter's art which now lies before us. The document is, it is true, marked “For Private Circulation;” but as we have been favoured with copies from at least half-a-dozen correspondents, it may fairly be assumed that the widest publicity is desired for the proposals—a desire which it would be a pity to discourage.

Natural gas, as has been announced on occasions too numerous to mention, was discovered some years since at Heathfield, in Sussex, when the London, Brighton, and South Coast Railway Company were boring for water, and since that time the station premises and a neighbouring hotel have been lighted by this means. Surely, if he was aware of this circumstance, the writer of the prospectus must have been struck by the humour of the thing when he was penning the following somewhat loosely constructed statement: “It is believed that a large supply of water will be found when sinking the borehole, and which the Directors believe can be disposed of to the local Water Company, if that Company consider the water suitable for drinking purposes. The Directors believe that this will also prove to be a good source of income.” When water is sought, gas comes up; and when gas is to be sought, water may be found. It sounds almost like a conjuring trick. But the first part of the operation, at any rate, was true enough. Gas came when water was sought; and it is estimated that the Railway Company now use some 100,000 cubic feet per annum. “Not much to go upon here,” the reader will say. No; but it seems to be the only tangible proof of the existence of that natural gas in Sussex, which is to make “a possible Pittsburg in the South of England.” Companies have been formed on even more slender bases than the emanation from the bowels of the earth of a supply of gas that would perhaps be sufficient to meet the requirements of one or two medium-sized private residences; and sure enough a Company was started to exploit this grand discovery. Much talk followed, in the usual course of things; but the last we heard of the venture was that the effects were to be sold at auction. An inglorious end to the exploitation of natural gas, people thought at the time; but they were mistaken—not as the “ingloriousness,” but as to its being the “end.”

Here is the revival! A share capital of £20,000 (one-half in 8 per cent. preference shares), and debentures. “Applications for shares and debentures at par will be entertained by the Directors not later than Monday, the 28th February, after which date the balance (if any) unallotted will probably be advertised for public subscription at a premium.” With this money—should anyone be found to supply it—steps are to be taken to sink the borehole to a much greater depth; and “in the event of the proposed boring providing a satisfactory quantity of natural gas or commercial petroleum shale, it is the intention of the Directors to propose the formation of a new Company with a larger capital for the purpose of taking over the works and furthering the objects of this Company, paying cash and allotting shares to shareholders in the present Company on the following lines: For each £1 share of the present capital issued, £1 10s. in cash, and a £1 fully-paid share.” It is evident that, though years have elapsed since the natural gas first made its appearance, there is now great anxiety to proceed with the work; for intending applicants are invited to send on their deposits to the Natural Gas Office, Heathfield, which will avoid any possibility of delay on the part of the bankers if the money was sent through them. In fact, they are not only “invited,” but would be compelled to do so; for though a banker's receipt accompanies the form of application, no statement is made on the front page of the prospectus as to who are the Company's bankers. There is, however, something useful in another direction to be found in the document—that is, an indication of the “stable” from which the promotion comes. One of the Directors is Captain F. Jenkins. Was he connected with the unfortunate East Sussex Gas Company? And among the subscribers to the Memorandum of Association is to be found Sir Charles B. H. Soame, Bart., whose name has a familiar ring about it.

The years which have passed since this “discovery of natural importance” was made while boring for water, have borne fruit in one direction. They have given time for the evolution of a “Natural Gas Expert,” who has joined the Board, and prepared calculations as to possible profits and so forth which are of a truly amazing character. The figure finally reached is a net revenue of £45,659 19s. 4d. We admire that “19s. 4d.” It is so much more convincing than would be £45,660. It is also stated, presumably so that it may be a guide to the would-be investor, that the Scotch shale oil companies have made a profit of over £1,000,000 sterling up to the present time. As a further bait, it is stated in a footnote to the prospectus that: “The £1 shares of the Kent Coal Concessions, Limited (a Company which has found coal and shale in boring about 60 miles from the Sussex gas fields), are



quoted, the Directors are informed, at about £2 17s. 6d., or nearly 200 per cent. premium." May we suggest that, if further copies of the prospectus are printed, a second note should be added, to the effect that, after years of work and the expenditure of many thousands of pounds, the Kent Collieries Company—whose works were the first started to prove the existence of coal in payable quantities in Kent—has for a long time been in a moribund condition, with its shares practically unsaleable? And "Coal in Kent" has been as convincingly preached by geologists as can be "Natural Gas in Sussex."

In conclusion, one word of explanation of—or apology for, if such be thought necessary—the vein in which this has been written. We have declined to take the prospectus really seriously, for the simple reason that it seems to us impossible that any of the readers of the "JOURNAL" with money to invest should regard it as a desirable commercial proposition. The temptation is strong to deal further with its fantastic features; but already more space has been devoted to the subject than it deserves. The "Natural Gas Expert" strongly recommends the project; we do not—at any rate, under its present auspices.

## EXPERIMENTAL HIGH-PRESSURE GAS-LAMPS IN THE CITY OF LONDON.

### With Raising and Lowering Gear.

A SMALL installation of high-pressure gas lighting, on the lines of the report of the Streets Committee of the Corporation of London dealing with lighting in Continental cities, is being carried out on the widened approach to Blackfriars Bridge. It will be remembered that the second "conclusion" in the report was to the effect that "open spaces should be lighted by means of lamps upon standards, fitted with lowering gear." The bridge approach, as now improved, is evidently an "open space" within the meaning of the Committee's conclusions; and as the lighting of the new refuges has only been of a temporary character, since the opening of the bridge, and was about to be made permanent, the South Metropolitan Gas Company, who are responsible for the lighting of the bridge, were called upon by the Streets Committee to carry out the new work in such a manner as would entirely meet their requirements.

The Gas Company, entering fully into the spirit of the Committee's report, have caused to be erected upon the three island refuges north of the bridge very handsome standards of the City pattern; the two on the larger islands between the tramlines and the statue of Queen Victoria carrying two high-power lamps each, on handsomely decorated arms, while the standard on the small rest in the centre of the roadway at the bridge-foot carries one lamp on a swan-neck bracket hanging so as to face the north. Thus the area will be lighted by five high-power lamps each of 1500-candle power, giving 7500 candles duty (actual) at this spot. The standards and lamps are by the Keith and Blackman Company, Limited; the lamps being similar to those erected by them for Fleet Street (the successful superheater of the firm being a special feature in the make-up of the lamp), except that they are what is known as the "1909 pattern," and carry some slight improvement on the firm's original 1500-candle lamp. As with the well-known Fleet Street lamps, the consumption of gas is 25 cubic feet per hour; giving a duty of 60 candles per cubic foot of gas consumed. The lamp services are connected to the new compressor-house of the Gaslight and Coke Company close by, in Tudor Street, where the gas is sent out at a pressure of 60 inches (water gauge).

The lamp-standards are about 20 feet in height over all, and the height of the light about 17 feet from the ground. The lowering gear is out of sight; being self-contained in the column. Two doors, bearing the City Arms upon them, fixed in the base of the column, give access to the winding gear, which is actuated by a small ratchet and drum; the lowering wire running up the inside of the column, and through the arms supporting the globe-shaped lanterns, so that there are no unsightly wires or other appliances to offend the eye. The lamps are held in position by means of a pin with a cone-shaped head and two steel balls; and they can be automatically released for lowering or cleaning by the insertion of a small thimble, which comes into action and dislodges the steel balls by the first turn of the handle of the lowering gear. The lamps are not fitted with any bye-passes, but are lighted by a flash torch similar to the lamps in Fleet Street.

The improvement in the lighting of this busy part of the City, which is known as "the most dangerous crossing in Europe," intensified as it is by the coming of the trams, fully justifies the Streets Committee in selecting this as one of the "open areas" for the purpose of experiment.

Mr. Richard Laybourne, of The Firs, Malpas, Monmouth, who died on the 25th of October last, aged 84, as noticed in the "JOURNAL" shortly afterwards, left estate valued at £103,022 gross, with net personality £93,387. The testator left £1000 ordinary stock of the Newport (Mon.) Gas Company, of which he was Chairman, to the Newport and Monmouthshire Hospital, for the endowment of a bed.

## PRESSURE-RAISING PLANT AT TYNEMOUTH.

By WILLIAM HARDIE, Assoc.M.Inst.C.E.,

Engineer of the Tynemouth Gas Company.

As the subject of high-pressure distribution may now be said to occupy a prominent position in the gas industry, and as there is every indication that it will become a matter of increasing importance in the near future, a short description of the plant recently installed at our works may be of interest to some of your readers, and perhaps helpful to those experiencing difficulties similar to those we encountered at Tynemouth. With this object in view, I have pleasure in offering the following for publication.

It will be necessary, in the first place, to briefly describe our conditions of supply, and mention the particular problem placed before us a short time ago. The area supplied by the Tynemouth Gas Company is divided, to all intents and purposes, into two districts: (1) The town of North Shields, in the immediate neighbourhood of the works; (2), the distant district, including the well-known seaside resorts of Tynemouth, Cullercoats, Whitley Bay, and Monkseaton. The former district is supplied direct through a 24-inch main, and the latter through an 18-inch main. The gas consumption in each district is at the present time approximately equal. The second or distant district has in recent years grown at a very rapid rate, and conditions of supply amply sufficient in the past have become quite inadequate in recent years.

The 18-inch trunk main referred to above is about 1800 yards in length; and up to a recent date it formed the connecting-link between the works gasholders and a two-lift station holder having a capacity of 200,000 cubic feet. From this holder the gas was supplied to the district through a 24-inch main about 3500 yards in length. This holder was filled daily during the periods of light consumption, and during the periods of heavy consumption it gradually emptied—thus augmenting the supply through the 18-inch main, and thereby maintaining the pressure required. The scheme had served a useful purpose for many years; but, owing to the rapidly increasing consumption, the holder emptied at an increasing rate, and, except at times when the works holders were quite full, we had at peak-load a drop in pressure which was far from satisfactory.

In addition to the trouble regarding pressures, we were faced with the question of immediate repair to the station holder. This holder was erected in 1864 by Messrs. Thomas Piggott and Sons, of Birmingham—having been in constant use for forty-five years without having been re-sheeted or repaired, except a few small crown patches which had been put on in recent years. The indications of failure in this old servant were not, under the circumstances, entirely unexpected.

Three schemes were considered.

- 1.—Rebuilding the gasholder.
- 2.—Enlarging or supplementing the 18-inch trunk main.
- 3.—Mechanically raising the pressure at the works end of the 18-inch trunk main, and thereby increasing its delivering capacity.

*Scheme No. 1.*—The difficulty of carrying out this scheme was great. It was a costly one; and even if a three-lift holder had been erected, the old trouble regarding pressures would have reappeared in a comparatively short period.

*Scheme No. 2.*—This scheme could not be favourably considered, owing to the whole pipe-track passing through the main street of the town—a narrow congested thoroughfare, with tram lines, sewers, water-pipes, electric cables, and two 18-inch gas-mains already laid.

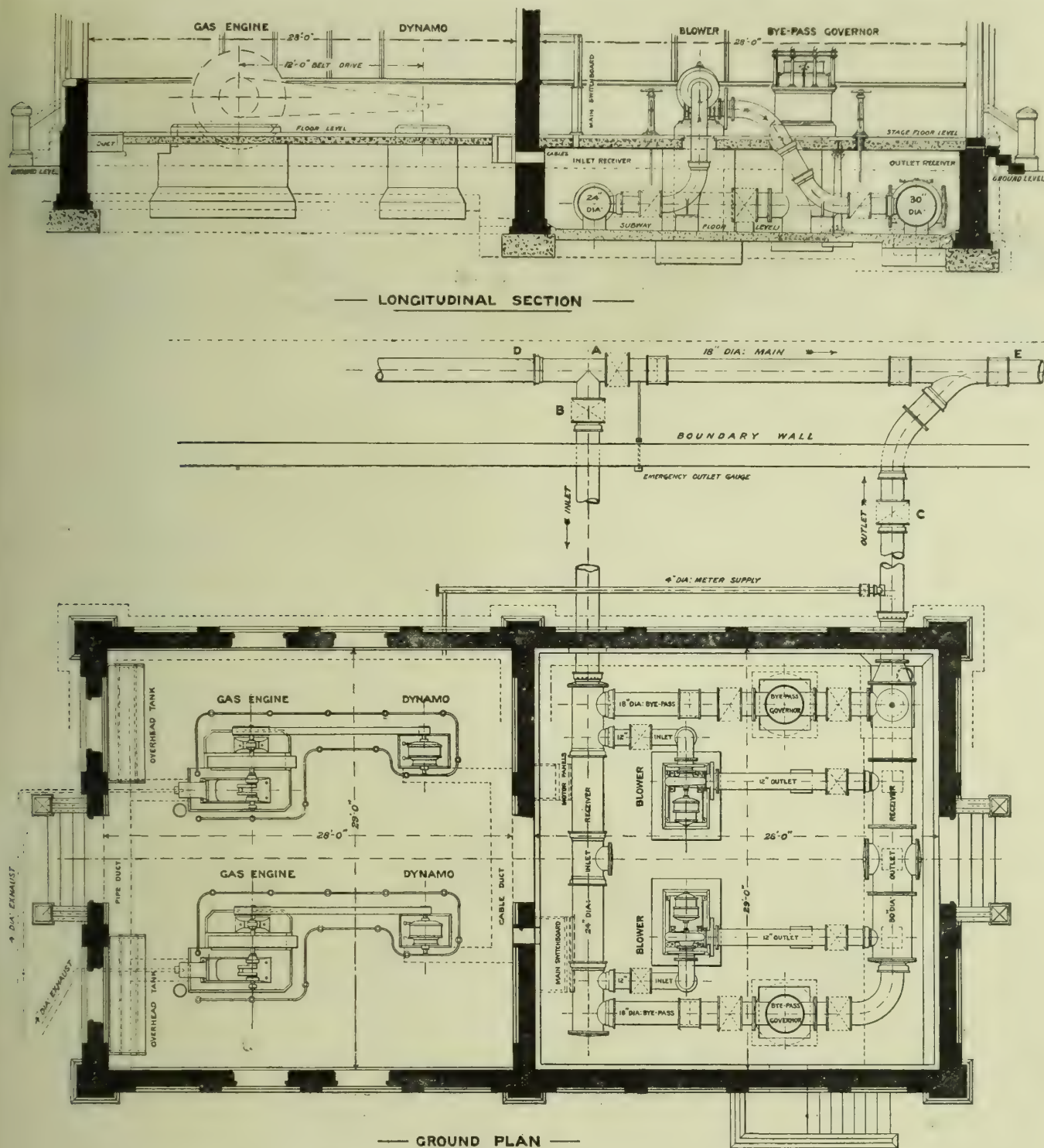
*Scheme No. 3.*—We therefore decided to adopt this scheme as being the most convenient, economical, and permanent method of overcoming the difficulties regarding pressure and consumption of gas in the district already referred to. The station holder is now abandoned, and the pressure-raising plant has been in regular use during the past three months; and the working results in the heaviest period of the year have been most satisfactory.

The plant is fixed in the north-east corner of the works, and is connected to the existing 18-inch trunk main—on the outlet side of the holders. The method of connecting-up with the existing main is shown on the accompanying diagrams. The portion of the 18-inch main between D and E is retained as an emergency bye-pass, with a bye-pass valve at A and main inlet and outlet valves fixed at B and C. Having regard to the fact that the plant is on the direct line of supply to one-half the Company's consumers, special care has been taken to ensure against possible failure or accident, both in the duplicating of plant and the arrangements for bye-passing it.

Each unit consists of a gas-engine and dynamo connected by belt drive, switchboard, motor starting-panel, direct-coupled blower and motor, all necessary cabling, and a safety bye-pass governor. The pipe connections are arranged as shown with cast-iron inlet and outlet receivers; and each blower and governor has an inlet and outlet valve of the vertical type, controlled by indicator columns and handwheels from the stage floor. The connections are arranged with bends of large radius, to offer a minimum of resistance to the flow of gas; and to take up any vibration at the blowers when running at high speed, there are steel expansion joints fixed at the inlets and outlets as shown.

The gas-engines used are each 19 B.H.P., of the "National"





Arrangement of Pressure-Raising Plant at the Tynemouth Gas-Works.

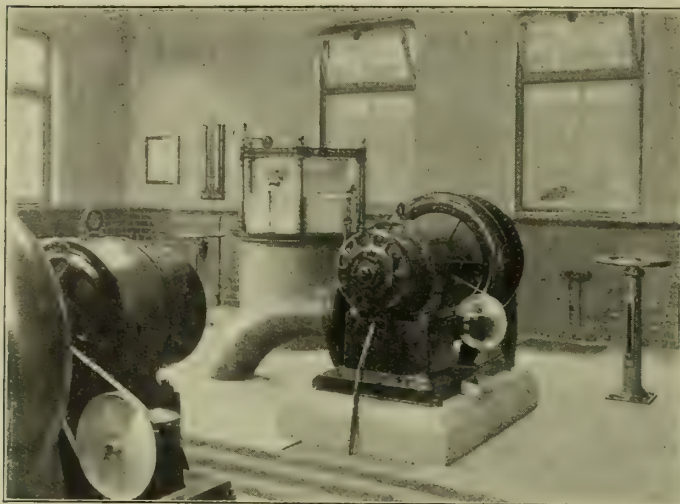
Gas-Engine Company's "Improved Otto" type, each having one heavy fly-wheel, balanced crank, and self-starter. The dynamos are compound-wound, of the "protected" type, and each will generate 11 kilowatts at 250 volts when running at 920 revolutions per minute. The main switchboard, which is duplicated, is fitted with 50-ampere double-pole main switches, single-pole cut-outs, maximum-current circuit-breakers, shunt regulators, voltmeters, and ammeters. There are also 50-ampere double-pole change-over switches, for connecting up to motor panels, and one 25-ampere switch for charging accumulator hand lamps. The motor-starting panels are fitted with 50-ampere double-pole main switches, 50-ampere single-pole cut-outs, and Brook-Hirst panels, having starting switches fitted with no-voltage and overload releases, and shunt-wound regulating switches attached. The main switchboard is designed to allow of the fullest possible use of plant, thus: Either engine and dynamo will drive either blower; one engine and dynamo will drive both blowers simultaneously; each engine and dynamo will drive one blower, the units working together. It will thus be seen that in an emergency there is considerable latitude of control. Each blower is driven by a direct-coupled motor of 12 B.H.P. maximum. The motors are of the shunt-wound semi-enclosed end-poled type; all ventilating openings being protected by wire gauze dust-screens.

The blowers are of the James Keith and Blackman Company's manufacture, and are known as their No. 5 "Narrow Type" blower, having a fan or impeller secured to the main shaft, and working in a cast-iron outer casing. The impeller consists of a circular disc of sheet steel secured to a shaped cast-iron

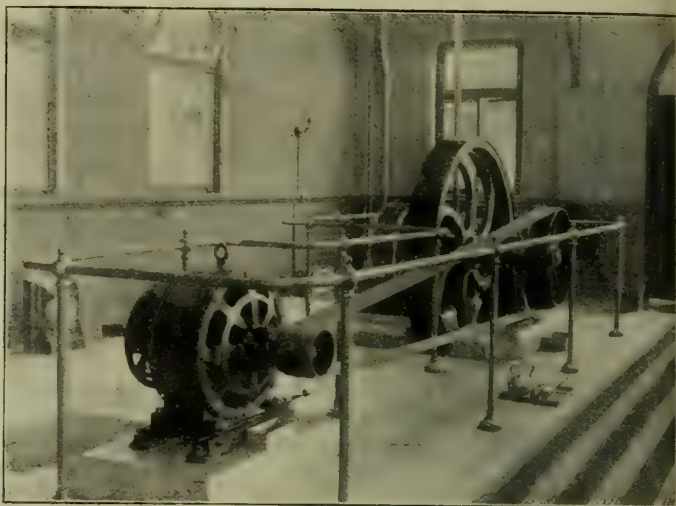
centre core, which is keyed to the main shaft. On this circular disc, and electrically welded to it, there are 48 sheet-steel blades specially curved to direct the flow of gas forward through the blower casing. For the purpose of stiffening these blades, there is an annular disc of sheet steel electrically welded to the side opposite the circular disc which closes in the ends of the blades. The moving part of the blower which imparts the necessary motive force to the gas is thus formed of a series of curved blades closely pitched and secured between two circular flanges with the one nearest the suction side open in the centre to allow a free passage to the incoming gas. For the purpose of reducing friction to a minimum, and also to take any thrust on the motor shaft to which the impeller is secured, there are ball-bearings fitted at each side of the motor, and also in the blower casing, and the impeller is overhung. The stuffing-box on the casing is packed with lead wool, causing little friction, and preventing the escape of gas.

Though the blowers are designed to allow the gas free passage through the casing while they are not in use, and though this is most advantageous under certain conditions, we decided that, in the event of a sudden failure of the plant, it would not be advisable to rely entirely on the comparatively small passage through the blower. The area through the blowers is equal to about 30 per cent. of the area of the trunk main; and with the fan outlet valve partially closed, as in ordinary working conditions, this would be further reduced. It was therefore decided to fix a form of automatic bye-pass which could be entirely relied upon, and two 18-inch safety bye-pass governors, manufactured by Messrs





Interior of the Blower and Governor Room.



The Gas-Engine and Dynamo Room.

Parkinson and W. & B. Cowan, Limited, were fixed as shown. Subsequent working conditions have proved these governors to be highly efficient; and it would be difficult to find a more reliable form of automatic bye-pass. The pressure-raising plant is fixed in a brick building specially erected for it, and having a white brick finish inside. There is a centre division with an open archway separating the gas-engines and dynamos from the switchboards, blowers, and governors. The two rooms are shown in the photographs. The pressure-room has a subway floor in which every portion of the valves, governors, and pipe connections, gauge-pipes, cables, &c., are easily accessible in case of repair. The stage-floor is composed of steel joists with expanded steel embedded in concrete between same; and the floors in both rooms are covered with wood block flooring embedded in mastic.

The whole of the contract, including gas-engines, dynamos, switchboards, blowers, and motors, also the bye-pass governors and cables, was carried out by the James Keith and Blackman Company, Limited, who, though they had not previously supplied an exactly similar plant, gave most satisfactory guarantees as to the efficiency of their blowers; and, as the working results have shown, our confidence has not been misplaced. During the last three months, the plant has been in more or less regular use; being only laid off when the works holders were full. During this period, we have been able to work with our holders much lower than would have been possible under the old conditions; and in this way we have utilized the top lifts—those portions of the holders which are so generally looked upon as of little value, so far as pressure is concerned—maintaining at the same time excellent pressures by means of the pressure-raising plant.

Under the new conditions, the governor at our distant station, which was previously connected to the outlet of the abandoned holder, is now coupled up to the 18-inch main, and converted into a constant pressure governor, thereby keeping the pressure developed by the blowers at the maximum for which it is loaded. The new safety bye-pass governors at the pressure-house, which are alternately in action, are used as station governors through the whole period the blowers are not in use—usually from mid-night to about one hour before sunset the following day.

The blower to be run is started with the outlet-valve closed a short time before it is required, and regulated to a speed which would be sufficient to pass more gas than is wanted. At the time scheduled, the governor is loaded by means of a special water-loading arrangement until it is fully open. The blower outlet-valve is then gradually opened, the governor automatically raised and put out of action, and the outlet pressure slowly raised to the amount required by means of the blower outlet-valve. When the fan is on the town, the governor is thus standing loaded, ready to come into action at any time if needed. At the time scheduled for reducing the pressure, the blower outlet-valve is gradually closed, and the governor automatically comes into action again, the plant is stopped, and the excess of water is slowly run out of the governor tank until the normal night pressure is indicated on the register. During periods of light consumption, the constant-pressure governor is out of action (being fully open); and when the evening pressure is put on at the pressure-house, it automatically rises and comes into action, governing the pressure developed by the blower down to the amount required on the town. The outlet pressure at the works is kept sufficiently high to allow of a margin of pressure of about 1 inch at the inlet of the constant-pressure governor at the maximum consumption; and in this way the inconvenience of a constantly varying drag, or pressure difference, on the 18-inch trunk main is overcome.

The blowers were each specified to be capable of passing 200,000 cubic feet of gas per hour, and develop a maximum pressure of 13 inches water-gauge—i.e., with an inlet of 5 inches, the outlet to be 18 inches water-gauge.

I give below a few of the results of tests taken by us for delivery, while the fans were being put through a series of official tests extending over fourteen days. They furnish useful information as regards deliveries and pressures. It was not convenient, for certain reasons, for us to raise the blower outlet pressure to

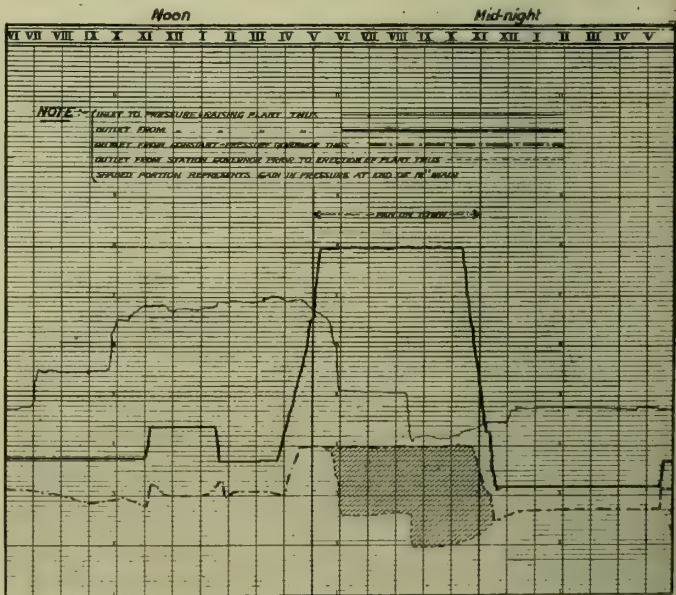
the maximum specified; but, from the actual figures obtained, there is every reason to conclude that the maximum of 200,000 cubic feet per hour will be obtainable.

TABLE showing Fan Speeds, Pressures, Volumes, Etc.

Fan Speed in Revs. per Min.	B.H.P. Required by Motor.	Pressure in Inches.		Pressure Developed by Fan.	Pressure at End of 18-in. Main.	Terminal Pressure Difference.	Rate of Delivery in Cub. Ft. Per Hour.
		Inlet.	Outlet.				
1700	3.3	4.6	9.4	4.8	3.6	5.8	125,500
2400	10.4	4.4	14.2	9.8	5.8	8.4	148,700
2600	12.0	3.9	15.2	11.3	5.2	10.0	177,200
2800	14.2	3.7	16.7	13.0	6.0	10.7	190,760

Note.—Loss of pressure due to altitude = 0.5 inch.

The regulating switches enable the motors and blowers to be run at speeds varying between 1400 and 2800 revolutions per minute—thus affording a wide margin of control. At all speeds there is no oscillation on either inlet or outlet pressures. The blowers have each a margin of 90 per cent. above our present requirements when running at their maximum speed, so that there is an ample reserve for future development. The accompanying pressure register, taken from an actual set, shows clearly the advantages derived from the plant.



Diagrams Taken from Actual Charts.

The blowers have not given the smallest trouble since starting, and have fulfilled in every way the guarantee of the James Keith and Blackman Company, Limited.

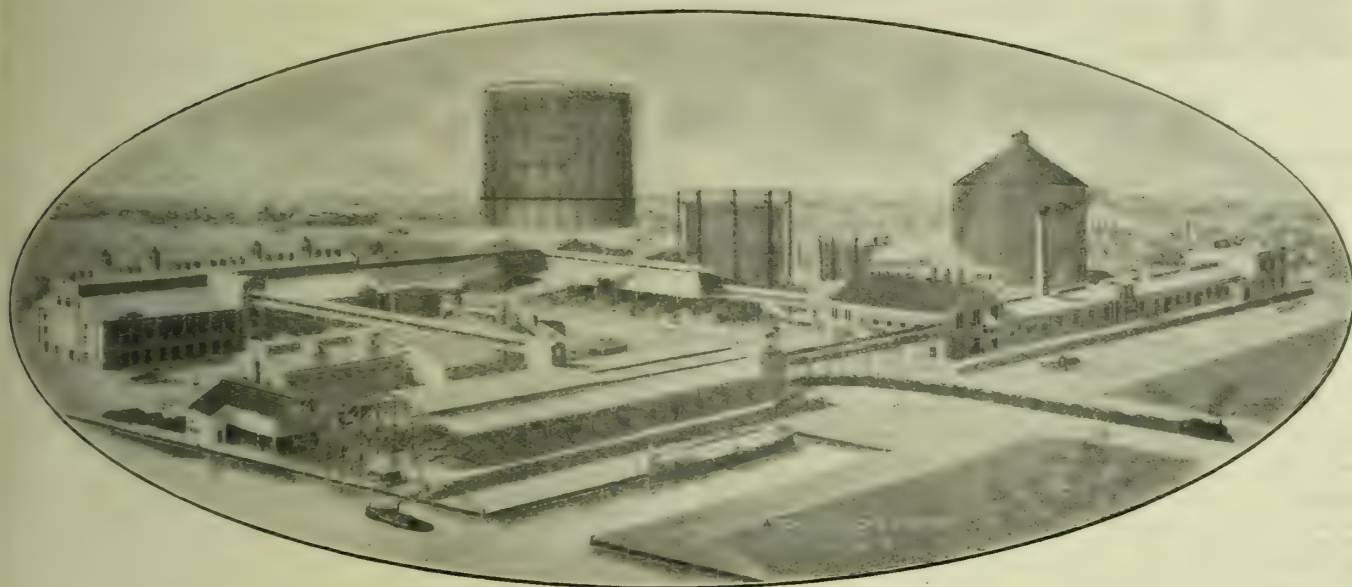
The Manchester and District Junior Gas Association will next Saturday visit the Wigan Gas-Works and the Kirkless works of the Wigan Coal and Iron Company, through the kindness of Mr. J. Timmins, M.Inst.C.E., and Mr. W. Hewlett. The coke-ovens at the Kirkless works will be first inspected; and here light refreshments will be partaken of. After this, the members will re-join the special cars to be provided by the Tramways Committee, and proceed to the Wigan Gas-Works. Subsequently the Gas Committee will entertain the members at high tea.



## DETROIT CITY GAS UNDERTAKING.

By JACQUES ABADY.

[It may be in the recollection of some of our readers that shortly after Mr. Jacques Abady read his paper, on "Light—and Some Reflections," before the London and Southern District Junior Gas Association, in December last, he left England for America on important business connected with the firm in the direction of which he is associated with Mr. Simmance. Early last month Mr. Abady was in Detroit, and made an inspection of the works of the City Gas Company, of which Mr. Irvin Butterworth is Vice-President and General Manager. The result of that inspection and of his interviews with Mr. Butterworth is embodied in the following article, which we are pleased to publish. Mr. Abady has been having a very enjoyable time. He left Detroit on the 9th ult. for Niagara, with the object of seeing the celebrated Falls and inspecting the power-houses. He will subsequently go to Toronto and Montreal (possibly to Quebec), and then to Syracuse and New York. We cordially wish him a safe completion of what appears to have been up to now a very successful trip.]



DETROIT CITY GAS COMPANY'S "A" STATION.

Of the making of gas-works there is no end, nor is there any lack of ability, enthusiasm, and energy on the part of those charged with the direction of gas undertakings; so that these qualities cannot be assigned particularly to any special or single concern. In Detroit, however, not only are these qualities apparent to a very high degree, but their exercise is continually called for by the fact that in Detroit, as the city is always growing, gas-works are always being made. It is on account of the almost unique conditions which surround the growth of this city that I send you a few particulars of the gas undertaking here.

Here, then, is the phenomenon of rapid growth, abundant prosperity, and an apparently unlimited future; and it is shown by a population of now nearly half-a-million, which is practically double what it was ten or twelve years ago. The daily planning of new factories, huge works continually being increased, an unceasing inflow of population, and labour hardly to be obtained for love or money, are features which, to a mind accustomed to the slow-moving Old World, are something to be wondered at. So great are the advantages presented by the geographical situation

of the town (it is in practically the centre of the Lake system, and one can throw a stone into Canada), and so conspicuous the energy of its citizens, that, although it is one of the oldest cities in the Middle-West—having celebrated its two hundredth anniversary in 1901, and having until then grown slowly—it is now the ninth largest city in the United States; and I am informed that it leads all other cities in the production of motor-cars, stoves, brass goods, drugs, and medicines. Here, for instance, are the works of Parke, Davis, and Co., Frederick Stearns and Co., Detroit Jewel Stove Company, American Radiator Company, Packard, Ford, E. M. F. Company, and other motor works innumerable, and many other large factories employing thousands of men, with a huge output of manufactured goods.

Harking back to the beginning of things, it is interesting to note that Detroit was the last city to haul down the British flag, which it did some ten years after the Declaration of Independence, and of which fact the wayfarer is reminded by a memorial brass on the fine building of the General Post Office.

From the rapid growth which I have endeavoured to indicate,



DETROIT CITY GAS COMPANY'S "B" STATION.





Building Embracing the Gas Company's Offices, Corner of Washington Avenue, Denver City.

it will be seen that it has been no easy matter to cope with the increased demand for gas, and it must have taxed to the utmost the energy of Mr. Irvin Butterworth and his staff to deal with it. That these efforts have been successful may be seen from two figures—firstly, an increase of from about 1800 million cubic feet in 1904 to just on 3000 millions in 1909, or an increase in five years of about 70 per cent.; and, secondly, that 63 per cent. of the houses are lighted exclusively with gas, while 90 per cent. use gas for cooking.

Before placing before your readers further statistics, and some particulars of the chief gas-making station, and in looking for an explanation as to how this increase has been dealt with so successfully, I am reminded of the doleful jockey in the "Arcadians," who, being a melancholy mummer, exclaims: "I've gotter motter, always merry and bright." This is the keynote which strikes one upon entering the offices (to which the photographs reproduced hardly do justice)—merriness, brightness, and accessibility. The offices of the chief officials are not made on the sanctum sanctorum principle, where one must wait and wait and wait, but so that, if you see your man—be it Mr. Butterworth, Mr. V. F. Dewey, the Engineer, his Assistant, Mr. F. L. Cross, or Mr. Chas. S. Ritter, the Secretary—you go straight into him; and I am able

to state, from personal observation, that no business is deemed too unimportant for personal attention. The weary bagman, selling lubricating oils, receives the same brisk, concise, and cheerful treatment as the big contractor; and it is, I think, a very blessing that the American system of accessibility in business has not been left outside the doors of gas offices. It results, I think, in a keenness of perception, an adaptability of mind, and a receptivity for new ideas, which must be beneficial to any undertaking. Without making any comparison, I can only say that the good, keen spirit of *camaraderie* which appears to prevail, is something which is too often lacking in the conduct of business undertakings in the Old Country.

There are two gas stations—the "A" and "B;" and both the works are on the river and about three miles from the centre of the city, and six miles apart. The high-pressure pipe line not only connects the two stations, but circumvents the city. The high-pressure main is 16 inches diameter, and is fed off through about fifty district regulators, which govern the pressure—reducing it to that called for by the requirements of each low-pressure district.

It should be noted that the total gasholder capacity of all the stations is  $5\frac{1}{2}$  million cubic feet; whereas the maximum demand per day is  $11\frac{1}{2}$  millions. One of the holders is somewhat of a curiosity, being of the enclosed type. This was constructed twenty years ago.

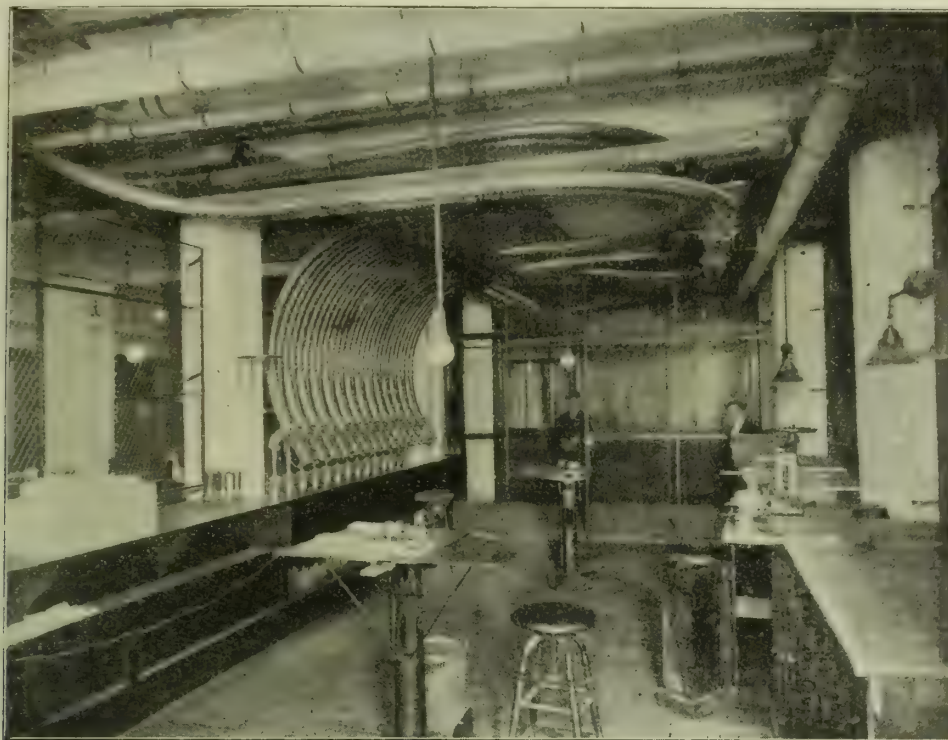
The boosting is effected by three Roots blowers, coupled direct to horizontal steam-engines, each of 225 I.H.P., and the capacity of the pumping chamber of each blower is 52 cubic feet per revolution. The total pressure on the outlet of the blowers, which runs to a maximum of 88 oz., is controlled from the gauge-board by a flexible shaft connecting to the throttle of each engine, which is operated by a lever at the side of the recording gauge, which shows the pressure at the moment. Each of the three engines can be separately controlled by an independent striking gear; and it will be seen that the pressure can be controlled absolutely from the gauge-board by the means described. The details of the type of automatic district governors, which have had much of the personal attention of the engineering staff devoted to their design, show considerable ingenuity, and are well worth studying by any engineer interested in distribution. The exigencies of patents prevent any detailed description for the moment.

The coal used in manufacture comes from the Pittsburg and the West Virginia fields; being conveyed by the railway, which runs right through the works (I am now speaking of Station A, which is the one visited by me; but I understand this is so at both stations). The trucks are run into a coal-shed, which is roughly at right angles to the track of the railway; and there is provision in the shape of a spare coal-store of about 10,000 tons (American). Each truck load is dumped into crushers, and then elevated by a bucket elevator to an overhead coal-store, and carried by a scraper conveyor to the retort-house, which is distant about 100 feet. Work will shortly be commenced on a new retort-house; but the existing one consists of twenty beds of eight horizontal retorts, 28 in. by 17 in. by 10 ft. The beds are back to back; so that on each side of the retort-house there are ten beds of eight. The method of charging and discharging is that of the Bronder mechanical stoker, which is operated by a steam-propelled trolley; the steam pipe-line having flexible joints. Each machine works four scoops at once; and the retort-house opera-



The Vice-President's, Engineer's, &c., Offices on Second Floor.





Basement of Offices—Showing the Tube System to the Several Departments.

tions employ two charging and two drawing machines, and during each twelve-hour shift eleven men are on the retort-house floor. The capacity per mouthpiece is about 11,000 feet per twenty-four hours; and the retorts are charged five times in this period, taking about 415 lbs. each per charge.

The coke is dropped through the retort-house floor into a stationary quenching shelf, which is enclosed and kept free by means of a draught created by a fan. The coke, after being quenched, is raked down into hand-propelled skips, whence it is taken up and screened and dropped into coke-bins in an overhead coke-store. It is then ready for the market. The coke can be dropped directly into carts that back underneath the storage floor, where railway trucks can also run for the direct transmission of the coke to the railroad.

Naturally, the exigencies of seasonal demand make it necessary to store unscreened coke during the summer in a shed, which is a light, steel structure with a timbered roof, and holds about 15,000 tons. A swivelling steam dipping shovel conveys this stored coke into skips when it is desired to draw from the store; and these skips take the coke to be screened in the same way as that which is taken direct from the retort-house.

There is nothing which calls for particular comment in the condensers, washers, or scrubbers; but a very particular control is kept on the hydraulic main pressure by a new form of retort-house control, the invention of Mr. Cross, which, it has been demonstrated to me, controls to 2-100ths of an inch of water. The simplicity and sensitiveness of this control was a matter of considerable astonishment to myself.

There are one or two details in connection with the purifying plant which may be of some interest. The plant is under cover, and consists of eight boxes arranged in two rows. Only oxide is used, and the spent material is conveyed from the purifier-house and shot upon a grid top, which is directly over a cellar. This cellar is heated by steam, which naturally causes an ascension of air, which finds its way through the mass of spent oxide, and so revivifies it without the necessity of employing manual labour to continually turn the material over; this process being only occasionally necessary. After the oxide is sufficiently revivified, the grids are drawn away, and the oxide is dropped below into the cellar, where it is dumped into an elevator, which conveys it to a large fixed bin. This bin is in the centre of four boxes, and has a flexible exit pipe; so that, by opening the damper, the oxide can be distributed down this flexible pipe into one of four boxes at will. The other boxes are filled from this fixed bin, but through the medium of a separate elevated trolley, which carries skips into which the oxide is shot.

At these works no sulphate manufacture is attempted; but the liquor is concentrated up to 15 per cent. of ammonia. It is concentrated by steam distillation, which is automatically regulated according to the temperature of the gases of distillation by a thermostatic control, which shuts off or opens the steam supply.

There is a water-gas plant in operation, consisting of four generators, having a total capacity of about 4,500,000 cubic feet per day. The coke used in the generators is conveyed from the elevator above the retort-house by means of hand-propelled trucks and dropped into fixed hoppers, whence it is shot into the generators. There is in operation in connection with this water-gas plant an automatic steam and air control, or proportioning device, of which probably more will be heard in England at a later date. The power used in the works is obtained from four Stirling boilers with automatic stokers; gas-coal screenings and coke breeze being

the fuel used. An interesting feature in connection with the works is the incorporation therein of a Pintsch gas plant, in which oil gas is made in fire-clay retorts, compressed up to 200 lbs., and conveyed by 2½-inch pipes to the dépôt, about 2 miles distant. It is then taken off by various railways—such as the Pere Marquette, Wabash, Michigan Central, Grand Trunk, &c.

The tar produced in the works is sold locally, and worked up by a firm of tar distillers.

These, briefly, are the particulars which I was able to gather in the course of a brief visit to the works; and I trust the details therein may be of interest to "JOURNAL" readers. From a personal point of view, I think they cannot fail to be of interest, seeing that the Gas Company have for their Vice-President and General Manager a man who bears a name so well known in the gas profession as Mr. Irvin Butterworth. The Detroit City Gas Company are, by-the-by, one of ten in the United States, owned by the American Light and Traction Company; and the following statistics may not be without interest to those to whom figures are not anathema.

The sales (as I have said) in 1909 were about 3000 million cubic feet; being 37,034 feet per consumer, and 7617 feet per capita. The average monthly gas bill of all consumers was \$2.43 (about 10s.). The biggest day's output was 11,496,700 cubic feet, on the shortest day (Dec. 21), and the smallest was 5,541,200 cubic feet on July 5. The gas is distributed through 536 miles of street mains to 80,204 consumers. The price varies according to the quantity consumed per month, and is subject, in addition, to a discount of 10 cents (5d.) per 1000 cubic feet if paid within one month from the date of the account. The net price per 1000 cubic feet thus varies considerably; but from the figures given above, it will be seen that the average rate per 1000 cubic feet is just under 80 cents, or 3s. 4d.

Of the total gas sold, there was used—

For cooking in homes . . . . .	about 50 per cent.
„ „ hotels, restaurants, cafés, &c. . . . .	2½ „
„ „ lighting homes . . . . .	14 „
„ „ stores . . . . .	8 „
„ „ factories, shops, &c. . . . .	4½ „
„ „ heating water in homes, &c. . . . .	7 „
„ „ rooms, stores, offices, &c. . . . .	½ „
„ „ industrial fuel in factories, &c. . . . .	8 „
„ „ gas-engines . . . . .	2 „
„ „ other purposes . . . . .	3½ „

A house-to-house canvass of 18,500 representative homes shows that in Detroit about 63 per cent. of the houses are lighted exclusively with gas, 5 per cent. exclusively with electricity, and 12 per cent. exclusively with oil; while 90 per cent. use gas for cooking, and 32 per cent. use coke for heating.

About 18,500 so-called "gas arc" lamps are now in use in Detroit.

The unaccounted-for gas last year was 5 per cent. of the total delivered to mains.

The Company do not handle or deal in gas-ranges, water-heaters, room-heaters, gas-fixtures, or gas-engines; these goods being sold by hardware and fixture dealers, plumbers, &c., in the city. Neither do the Company do gas-piping. Gas arc lamps, Welsbach burners and mantles, portable lamps, and industrial fuel appliances, are, however, sold by the Company.

The Company lay services free of charge to the lot-line of the street; the property owner paying for the service thence to the meter, at the rate of 15 per cent. per lineal foot. No services less than 2½ inches in diameter are laid throughout the district. The



Company repair their own meters; the meter-repairers being paid on a detailed piece-price plan.

The city is divided into three districts to facilitate the payment of bills by consumers; the discount periods expiring on the 10th, 20th, and last day of the months respectively.

The Company buy the surplus gas of the Solvay Process Company's bye-product coke-ovens, located within the city limits, and make in their own coal and water gas plants the balance needed to supply their consumers. About 25 per cent. of the finished gas is water gas. The quality of the gas is 19.50 candles tested in a No. 2 "Metropolitan" argand, and 625 B.Th.U.

## WATER LEGISLATION FOR 1910.

IN the last number of the "JOURNAL," the Bills promoted by Water Companies for the present session were noticed. We deal to-day with some of the measures introduced by Local Authorities containing proposals in reference to water supply.

By the Abertillery and District Water Board Bill, authority is sought for the constitution and incorporation of a Joint Water Board, consisting of representatives from the Councils of the urban districts of Abertillery, Abercarn, and Risca, in the county of Monmouth, with power to construct water-works, and purchase those belonging to the Councils named. The Board is to consist of seventeen members; nine to be elected by the Abertillery Council, and four each by the Abercarn and Risca Councils. It is proposed to construct an impounding reservoir in the parish of Llanelieu, in the rural district of Hay, in the county of Brecknock; a catchwater drain in the same parish; a service reservoir in the parish of Abertillery; another in the parish of Abercarn; two aqueducts; and various road and railway works. The Board require authority to collect, impound, and appropriate for the purpose of their works the waters of the River Grwyne Fawr, and all the streams and springs intercepted. After the Grwyne reservoir is completed, the Board propose to discharge into the river not less than 750,000 gallons of water in a continuous flow every 24 hours. Ten years are asked for the completion of the works. As soon as any of the water authorized to be taken is available for supply within the limits of the Act, the separate undertakings of the Councils represented are to be transferred to and carried on by the Board. The limits of supply are to be the respective districts of the Councils, and a portion of the urban district of Mynyddislwyn; and the rates are to be 8s. 8d. where the annual value of the premises supplied does not exceed £5, and 9 per cent. when it is above this, with an additional charge for a fixed bath capable of containing more than 50 gallons. Where the supply is by measure, the price is not to exceed 1s. 6d. per 1000 gallons. Borrowing powers are required to the amount of £240,000 for the purchase of lands and easements and the construction of works, £7000 for a trunk main, £2000 for working capital, and such sum as the Local Government Board may sanction for new mains, extension of service-pipes, &c. For the two largest amounts sixty years, and for the working capital ten years, are required for repayment. Surplus revenue is to be apportioned among the Councils, who, of course, are to make good any deficiency in the water fund. Authority is sought by the Board to provide dwelling-houses for persons in their employ. [Parliamentary Agents: Messrs. Lees and Co.]

A General Bill promoted by the Bradford Corporation contains a few clauses relating to water supply. The Corporation wish to be empowered to hold lands for the protection of their water and water-works, to require not less than 24 hours' notice before the connection or disconnection of a meter, and to impose penalties for injuring meters, &c. The words "domestic purposes" are not to apply to water supplied for use elsewhere than in, or in connection with, a dwelling-house. The Corporation also wish to be authorized to lay water-pipes in streets not dedicated to the public use. [Parliamentary Agents: Messrs. Dyson and Co.]

Authority is sought by the Urban District Council of Clevedon to purchase the undertaking of the Clevedon Water Company, and to supply water within their district and the neighbourhood. The limits are the urban district of Clevedon, and the parishes of Tickenham and Kenn and part of the parish of Walton-in-Gordano, in the county of Somerset. Notice of the intention to purchase is to be given within six months after the passing of the Act; and the transfer of the undertaking is to take place on payment by the Council to the Company or to the Bank of England of a sum equal to the amount of all moneys payable under the provisions of section 83 of the Company's Act of last session and of the Act now being applied for. The necessary borrowing powers are required, and the modes of raising the money and paying it back are specified. Any deficiency in the revenue is to be made good out of the reserve, or out of the district rate if the reserve is inadequate; and separate accounts of the water undertaking are to be kept. [Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.]

The Exmouth Urban District Council wish for authority to construct a well and pumping-station in the parish of Colaton Raleigh, an aqueduct, conduit, or one or more pipe-lines connecting it with the River Otter, and others commencing at the pumping-station and terminating in the parish of East Budleigh, at the south-east corner of the Squabmoor reservoir. Seven years are required for the completion of the works. Power is sought to

borrow £18,000 for the purchase of lands and easements and the construction of the works authorized. Fifty years are asked for its repayment; and five years for any money raised to defray the expenses incurred in connection with obtaining the Act. [Parliamentary Agents: Messrs. Torr and Co.]

The Fylde Water Board Bill is to empower the Board to construct additional works, comprising a covered service reservoir and a water-tower in the township and borough of Blackpool, eleven aqueducts or pipe-lines, an equilibrium basin in the township of Barnacre-with-Bonds, and a road diversion, all to be completed within ten years. The Board wish to be authorized to borrow £140,000 for the purchase of lands and the construction of the service reservoir, water-tower, and basin, and for the road diversion, and £72,000 for the high-level mains and the extension of existing mains; to be repaid within sixty and fifty years respectively from the dates of borrowing. The Bill contains provisions for extending the period for the repayment of the loan of £137,727 sanctioned by the Local Government Board on Oct. 29, 1904, to sixty years from the date or dates of borrowing; for making the Board's stock a trustee security; and for the appointment of a Secretary to furnish returns to the Local Government Board. [Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.]

The Hastings Corporation are promoting a General Bill by which (*inter alia*) they seek authority to purchase the lands, situate in the parishes of Catsfield, Crowhurst, Bexhill, Hastings, and Westfield, in the county of Sussex, on which their pumping stations and works have been constructed; and to carry out additional works, consisting of three pumping-stations, a service reservoir, four conduits or pipe-lines, two wells, and two adits or headings. Ten years are asked within which to complete these works. The Corporation require authority to borrow £29,898 for the purchase of lands, and £98,570 for the construction of the additional works specified, both sums to be repaid within sixty years. When water is supplied by measure, the price charged is not to exceed 2s. per 1000 gallons. [Parliamentary Agents: Messrs. W. & W. M. Bell.]

Authority is being sought by the Mountain Ash Urban District Council to construct additional water-works, comprising two intercepting dams, or weirs, in the parish of Penderyn, in the county of Brecknock, a catchwater and a reservoir in the same parish, four aqueducts or pipe lines, an approach road, and a diversion of a stream. Ten years are required for the completion of these works. Borrowing powers to the amount of £80,000 are asked for in respect of the purchase of lands and the construction of works, £5000 for covering the Darranlas reservoir, and £20,000 for the general extension and improvement of the water-works. Sixty years are required for repaying the first-named sum, thirty years for the second, and forty years for the third. The Council wish to be empowered to purchase or sell water in bulk, to sell meters, and to let fittings. The maximum charges for the supply of water for domestic purposes specified in the Council's Act of 1900 are to be altered. [Parliamentary Agents: Messrs. Baker and Co.]

A Bill has been promoted to authorize the formation of a Joint Water Board representative of the Rhondda and Pontypridd Urban District Councils, the acquisition of the undertaking of the Pontypridd Water Company, and the construction of works for the supply of water. The Board is to be composed of the Chairmen for the time being of the Rhondda and Pontypridd Councils, six members of the former body, and four members of the latter; and the Chairman of the Board is to be elected by the members. The consideration for the transfer of the undertaking of the Water Company is to be £282,400, and a sum equal to the price at which the movable stock-in-trade, stores, and other materials of the Company stand in the books on the day of the transfer. The Board are also to pay the Company certain engineering costs and charges and other sums specified in the Bill. The Board require power to maintain the existing works and also construct others, consisting of five aqueducts, conduits, or one or more line or lines of pipes, to be completed within seven years. The limits of supply, which are defined in the Bill, include the parish of Eglwysilan, in the urban district of Caerphilly, and the rural district of Llantrisant and Llantwit Fardre, all in the county of Glamorgan. The rates for the supply of water are to be 7½ per cent. upon the rateable value when this does not exceed £18, 6½ per cent. if above this and under £40, and 5 per cent. above £40. But the Board are not to be bound to supply a house or part of a house for any less sum than 8s. 8d. per annum; and a second closet and a fixed bath are to be extras. When water is supplied by measure, the charge is to be according to the quantity taken per quarter—ranging from 1s. 6d. down to 6d. per 1000 gallons. Meter-rents vary with the diameter of the inlet and outlet pipes. Authority is sought to supply fittings, to sell water in bulk, and to lay mains in streets not dedicated to the public use. The Board require power to borrow the amount necessary for the purchase of the Water Company's undertaking, and £377,000 for the purchase of land and the construction of works, to be repaid within sixty years; for new mains, extensions, &c., £30,000, to be repaid within forty years; for working capital £5000, to be repaid within ten years; and the sum necessary for defraying the costs, charges, and expenses of the Act—the last to be repaid within five years from the day of transfer. The miscellaneous provisions of the Bill confer upon the Board power to acquire, hire, erect, and furnish such buildings and offices as they may need; to purchase water in bulk; and to purchase, take on lease, or exchange land. [Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.]



The Worksof Urban District Council are applying for authority to purchase the undertaking of the Worksof Water Company, and supply water within the urban district of Worksof and the neighbourhood. The purchase is to be by agreement or by arbitration under the Lands Clauses Act. The Company will, of course, carry on the undertaking and maintain it till the transfer has been effected. The rates for the supply of water are to be 8s. 8d. where the rateable value of the premises supplied does not exceed £5; where it is under £30, not more than 7 per cent. per annum; and above £30, not more than 6 per cent. per annum. All inns and hotels, whether public or private, of which the rateable value is above £5, are to be liable to a rate not exceeding 7½ per cent., whether or not the rateable value exceeds £30. The charge for water supplied by meter is not to be more than 2s. per

1000 gallons, with a minimum of 10s. per quarter. The Council require authority to contract for affording a supply of water in bulk; and likewise to make bye-laws for securing the cleanliness and freedom from pollution of tanks, cisterns, and other receptacles employed for storing water used or likely to be used by man for drinking or domestic purposes, or for manufacturing any liquid to be used by man for drinking. The Bill contains a provision to the effect that the owner of any dwelling-house which is not provided with a proper and sufficient water supply, who shall occupy or allow it to be occupied, is to be liable to a penalty not exceeding £5, and to a daily penalty not exceeding 20s., unless the dwelling-house was erected before the passing of the Bill, and a supply of water was not then available. [Parliamentary Agents: Messrs. Baker and Co.]

## ANOTHER GAS-WORKS UNDER THE WATERS OF THE SEINE.

The Gennevilliers Works of the Société d'Eclairage, &c.



View of the Gas-Works Yard, showing the Coke Ground.

In the "JOURNAL" for the 15th ult., we gave some illustrations, accompanied by a few particulars, showing the effect of the recent floods in Paris on the works of the Continental Union Gas Company at Nanterre. It was then explained that these works are situated to the west of the city, between two arms of the River Seine; and those of our readers who have perused the accounts

of the floods which have appeared in the English papers will probably remember that this locality—the Plain of Gennevilliers—suffered severely. The river winds here very much as the Thames does between Greenwich and Woolwich, only in the opposite direction; that is to say, from St. Cloud it flows to the north-east, goes round the bend at St. Denis, and then south-west,



Retort-House containing the Munich Chamber Settings.





Coal Unloading and Transporting Plant.

whereas the Thames flows south first and then north-east. On this peninsula, not very far from the river, stand the new gas-works of the Société d'Éclairage, Chauffage, et Force Motrice, which was formed on the winding-up of the old Paris Gas Company to supply the principal suburbs of Paris. The works were described in the "JOURNAL" about four years ago; and they have since been referred to and illustrated from time to time. In view of the interest aroused by the publication of the illustrations of the Nanterre works, it seemed that a few showing those at Gennevilliers would form a fitting supplement. These, through the courtesy of M. Chamon, the Managing-Director of the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, who is Vice-President of the Société d'Éclairage, we are now able to give, with some particulars which M. Chamon has supplied. It should be explained that the photographs were taken on the 5th ult., when the water was not at its highest; this point having been reached on the 29th of January.

Dealing first with the locality of the works, it appears that the possibility of the peninsula of Gennevilliers being inundated by the waters of the Seine was recognized three hundred years ago, for in 1610 a dyke was constructed for its protection. It was, however, found to be inadequate for the purpose; and accordingly it was heightened in 1811. It is a common saying that the consequences of one's actions are far-reaching. The effect of the raising of this dyke, which was evidence of the foresight of the civil engineers of the time, has been felt nearly a hundred years after, as but for it the gas-works would have suffered to a greater extent than they did. They stand on very solid ground between the railway and the river; and, by another exercise of forethought, the buildings were so located as to be protected from the greatest inundations known for the space of two centuries. They were erected, as well as the retort-settings put up in 1904 and 1905, on ground 5 ft. 3 in. above the highest water level hitherto reached. It was owing to this precaution that the works were not submerged to a greater extent than about 3 feet at the time of the highest rise, which devastated the suburb. On the evening of the 27th of January, the works were running for a production of about 8 million cubic feet per 24 hours, when at seven o'clock the water suddenly poured in with such force that it rose at the rate of nearly an inch a minute; and in twenty minutes all the ash-pans in the furnaces were flooded. Gas making was stopped in twelve minutes, and fortunately without accident to a single employee. At that time all the gas required for consumption had been produced. Next morning the different parts of the works had to be reached in boats. The anxiety of the Manager (Mr. Raoul Frère) may well be imagined.

The primary cause of the inrush of water was, of course, the rising of the river above the top of the dyke; but it was also doubtless attributable to the deterioration of this structure in certain parts. The damage done, though serious, is principally to the plant. Fortunately, the furnaces did not sustain much injury; the bench of twenty new "inclined chamber" settings on the Munich system, equal to a production of rather more than 2½ million cubic feet of gas, having suffered to hardly any extent. The trunk mains, 36 and 39 inches in diameter, were lifted in several places, their water displacement being greater than their weight, and the trenches in which they were laid being flooded. It is the repair of this damage, and the restoration of the distributing plant to normal condition, that will take most time.

In addition to the Nanterre and Gennevilliers works, those at Boulogne-sur-Seine, Passy, and Alfortville were put out of use by the floods. Some of the mains in Paris were affected, and the supply of gas was stopped in several quarters; but the service has

now been almost completely restored. The majority of the municipalities and communes have not yet ascertained the extent of the damage done to public property by the floods. In the case of Paris, the expenditure on account of repairs under this head will probably exceed £100,000. The loss and damage caused in some thirty territorial departments, in which several gas-works were flooded, have been provisionally returned at about £3,000,000. At the close of last week the principal affluents of the Seine were beginning to fall; so that it was hoped that Paris would soon be relieved of anxiety as to the possibility of the recurrence of so terrible a disaster as that with which she has lately been visited. On Sunday afternoon, however, the upward movement of the river was resumed under the influence of freshets in the more rapid affluents of the main stream.

#### High-Pressure v. Ordinary Gas Lighting for Mills.

In the course of a paper on "High Pressure Gas Lighting for Textile Mills," recently read to the Textile Society of the Manchester School of Technology, Mr. Charles Walton gave the following particulars, from his own observation, of the cost of an installation of high-pressure incandescent gas lighting: "The renewal of mantles worked out at 1·27 per light for 100-candle power burners, which at a cost of 3d. each equals 4d. per light per year. The saving on gas was 53·66 per cent.; the total costs, allowing 10 per cent. depreciation, maintenance, &c., was 28 per cent. over two adjacent years. The true comparison, however, is to be found in the cost per candle power per year. In one year the cost for ordinary lighting was 5·41d.; the following year, with high-pressure lighting, it was 0·728d., and with electric lighting it would be 1·76d., allowing a lamp a life of 1000 hours, which is a high figure." Mr. Walton said he thought he was fully justified in saying that, so far, the high-pressure gas system was considerably cheaper than any other present form of lighting suitable for textile works, and held its own in competition. It was efficient, was generally reliable, and usually simple.

By a typographical error in the editorial article under the heading "The Message and Its Effects," in last week's "JOURNAL," it was made to appear that Mr. Ambrose had increased his make by 7136 cubic feet per ton of coal carbonized. No doubt that gentleman sincerely wishes the statement were true; but it will be readily seen by anyone who has perused his paper that the "7" should have been a 1.

At a recent meeting of the Association of Birmingham Students of the Institution of Civil Engineers, Mr. A. C. Anderson read a paper on "Centrifugal Pumps for Water-Works." The advent of the electric motor and the steam turbine, with high speeds suitable for driving, were, he said, the reasons why centrifugal pumps for water-works had gained their present position. In Canada and America, special pumps were being adopted for fire services. The advantage of the electric motor for quick starting was obvious. For water-works duty, the pumps should be of the soundest construction, and reliable in every way. For main stations, the driving could be done by electric motor or steam turbine; for similar isolated plants, producer gas or oil would be most suitable. The running costs of turbine centrifugal pumping-stations were extremely low, and there was a further saving in buildings and foundations owing to the absence of vibration and the smaller space required for the setts. The author expressed the confident opinion that the high-lift centrifugal pump has a great future before it for water-works service.



THE CAUSES AND RANGES OF  
VARIATION IN CALORIMETRIC TESTS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

(Continued from p. 434.)

TEMPERATURE OF CIRCULATED AND COLLECTED WATER.

THE possibility of error due to neglect of observing the temperature of the water passed through the calorimeter, when reading its volume, has been pointed out by Mr. Coste\* ; and it may produce variations of 0.26 Cal. to 1.16 Cal. with ordinary London gas. The same principle is involved in reading the volume of

condensation water; and as it is important to ascertain with absolute accuracy the deduction for the latent heat of the steam, the temperature of the water should be observed, if it is inconvenient to weigh the water, as is done at the Leeds University. Another error applicable to the condensation water occurs, according to Mr. Coste, if the instrument is not centred properly,

COMPARISON OF THE OBSERVED AND THE CALCULATED  
CALORIFIC VALUES.

In the "JOURNAL" for Sept. 21, 1909 (p. 750), the writer showed a disparity amounting to 14.51 B.Th.U. with the gas in question. It is now proposed to review that disparity in the light of the present inquiry. Broadly correcting the analytical data for 1.72 per cent. of moisture, the modifications shown in the following table result.

TABLE XI.—Showing how the Computed Values are Affected by an Allowance for the Presence of Moisture in the Gas Analyzed.

Origin of Figures.	Percentage by Volume, Moisture Included.	Gross Calorific Value.	Net Value.	Condensation Value.	Percentage by Volume, Moisture Deducted.	Gross Calorific Value.	Net Value.	Condensation Value.
Observed values . . . . .	94.7	594.00	542.90	51.10	93.07	594.00	542.90	51.10
Simple combustibles, computed . . . . .	92.0	524.09	459.41	60.68	90.42	511.14	451.51	59.63
Complex combustibles, by difference . . . . .	2.7	73.91	83.49	9.58	2.65	82.86	91.39	8.53

This deduction for water vapour makes a slight improvement in the consistency of the condensation figure, but is by itself quite insufficient. It also so alters the heat attributed to the unsaturated hydrocarbons as to raise the question whether some benzene is present therein. As explained at the beginning of this article (Col. 2 of p. 355), a correction for moisture at the time of analysis might have further affected the comparison; but it seems quite unlikely that it would have been enough.

Having, in Table XI., accounted for a little more than 1 B.Th.U., there remain the following considerations towards the remaining disparity. They are a summary of the influences discussed in this article :

- 1.—Error due to collection of condensation water over too short a period.
- 2.—Error due to non-correction of temperature of circulation water and condensed water, possibly equal to 4 B.Th.U. too high on the gross, and 1 B.Th.U. on the condensation value.
- 3.—Errors due to non-correction for relative humidity [see Tables VII. and VIII. ante p. 433], where, as in one instance, the gross, after the application of the Referees' rule, may be 3.04 B.Th.U. too low, and the condensation allowance 4.28 B.Th.U. too low.

So far we have seen that there are a variety of influences at work which if uncontrolled may account for discrepancies too large to be considered negligible. The way to minimize them is also evident; and it is to be hoped that, for the sake of general accuracy, and also for the great benefits that will follow in our estimation of gas-making and gas-using processes, inconsistencies in calorimetric returns may be avoided.

We must now ascertain whether such errors occur in the

present practice of calorimetry when the ordinary precautions and experimental skill have been exercised. The instances mentioned by the writer, drawn from the reports on the St. Helens retorts, appear capable of explanation by the inadequacy of the ordinary routine to secure accurate results. In other words, there is no need to attribute faults to the operator of the instrument, but to the methods employed. The instances now to be adduced are drawn from equally reliable sources; and if inconsistency can there be shown, the reasonable conclusion is that the influences already investigated in detail do make their appearance in substantial discrepancies in the ordinary industrial returns.

In the returns given in Mr. Coste's paper, there are deviations from the values calculated from the analysis that are noteworthy; and in some of the series of tests it is evident that there are at work, producing the disparity, influences hitherto insufficiently recognized. Such a question as this must be considered alongside duly authenticated data; and the following are some of the details given as concisely as possible. The collateral data will in most cases be found in Mr. Coste's valuable contribution and in others he has been good enough to furnish which was necessary for my enquiry.

The comparison of the observed gross and net values with the calculated ones shows a general correspondence; but it is impossible, even in such cases, to supersede the former by the latter, because of the unknown value to be attached to the unsaturated hydrocarbons. But this restriction only applies with diminished force to the comparison of condensation values. In fact, the total amount of the condensation value that can be reasonably assigned to the unsaturated hydrocarbons is in a number of cases more than covered by the disparity between the observed and the calculated values. Here, then, is a test of reliability which is entitled to considerable confidence; and its utility is exemplified in its application. In showing its utility, it will be simplest, in the first place, to apply it to a series of gases of definite origin, and of

admittedly similar character. These are to be found in Table XII. of Mr. Coste's paper, Section A,\* as three gases made from coal at the rate of 9000 cubic feet per ton, high in the percentage of combustibles, especially in hydrocarbons, with only slight differences in the observed illuminating power and gross calorific value, but showing a marked inconsistency in the condensation figures. Merely looking at the net calorific values does not show the anomaly, but a view of the condensation figures does. These are shown in Table XII.

As set forth in Table XII., it is seen that the observed condensation figure of the first sample is almost inexplicable, for 15.3 Cal. are but 8.7 per cent. of the gross, instead of 18.4 Cal., equal to 10.46 per cent., the consistent calculated figure. This view is confirmed by the two following samples; the disparity in the condensation values being 3.1, 0.51, and 0.06 all under-estimated. These may be modified if 1.72 per cent. of moisture be assumed in the gas analyzed; leaving the values +2.78, +0.19, and -0.26. The last two may be thus considered

\* See "Journal of the Society of Chemical Industry," Dec. 15, 1909, p. 1234, col. 1.

TABLE XII.—Comparison of Observed and Calculated Values of Three Samples of Coal Gas.

Observed Values in Calories.		Calculated from Analyses.			Condensation Values Per Cent. of Gross.		Calories Observed less than Calculated.		Incombustibles.	
		By Mr. Coste.		By T. Holgate.						
Gross.	Conden-sation.	Gross.	Conden-sation.	Conden-sation.	Ob-served.	Cal-culated.	Uncor-rected.	Cor-rected for Moisture.	Volume Per Cent. Nitrogen.	Relative Weight. H = 1
175.8	15.3	177.9	18.4	18.4	8.70	10.46	3.1	+ 2.78	6.2 0.38CO <sub>2</sub>	95.16
179.6	18.2	176.8	18.4	18.71	10.13	10.42	0.51	+ 0.19	6.79	95.06
176.0	18.5	178.7	18.1	18.56	10.51	10.54	0.06	- 0.26	4.28	59.92

TABLE XIII.—Showing Relation of Calorific to Illuminating Values of Coal Gases per Table XII.

Illum. Power in No 2 Burner Per Cub. Ft. Per Hour.	Values Calculated from Analysis, Corrected for Moisture, in Calories.				Observed Values in Calories.				
	Conden- sation.	Heat Due to Hydrogen.	Heat Due to Carbon.		Conden- sation.	Heat Due to Hydrogen.	Heat Due to Carbon.		Compared with Calculated Figure Per Candle.
			Per C. Ft.	Per C. Ft. Per Candle.			Per C. Ft.	Per C. Ft. Per Candle.	
4'278	18'08	111'06	64'74	15'13	15'3	94'0	81'8	19'12	+ 3'99
4'354	18'39	112'96	66'64	15'30	18'2	111'8	67'8	15'57	+ 0'27
4'220	18'24	112'04	63'96	15'16	18'5	113'64	62'36	14'89	- 0'27
4'277	Average of tests of gases, 8 samples. Edinburgh.				15'59	95'75	65'62	15'34	..

\* See Mr. Coste's paper, "JOURNAL," Vol. CVIII., p. 816-8.



within the range of experimental error, leaving the other as an irregularity equal to 11 B.Th.U.

Table XIII. shows that the illuminating powers of the three samples are all consistent with the observed gross calorific values combined with the calculated condensation values, but inconsistent in the first sample when the observed condensation value is accepted; for the heat due to carbon then becomes 19'12 Cal., instead of 15'13 Cal. The calculated values for all the samples agree with the average of eight tests (observed values) of Edinburgh gas of similar illuminating power—viz., 15'34 Cal. per candle. It may be remarked that the condensation figure of the Edinburgh gas does not differ much from the abnormal one; but that is explained by the lower gross calorific value of the former.

Both sets of gases were too rich to burn at 5 cubic feet per hour in No. 2 burner; about  $4\frac{1}{2}$  cubic feet being the rate adopted.

In the Tables XIII. to XVIII., excepting XVI., the writer has held to the observed gross calorific values, because although possibly there may be some error enclosed therein, yet there are no means of assessing it, and it could not seriously affect the comparisons of those tables. The explanation of the anomaly to the extent of 2'78 Cal. in Table XII. may be conjectured after other examples have been considered; but it must be pointed out that the first gas was the only one of the three that contained any carbon dioxide, but only 0'38 per cent. All were free from oxygen, and had 6'24, 6'79, and 4'28 per cent. of nitrogen respectively. In other words, the high percentage of combustibles and the high

TABLE XIV.—Showing Disparities between Values Observed and Calculated from Analyses—Five London Coal Gases.

	Gross Observed Calories.	Condensation Value.		Condensation Value per Cent on Gross.		Observed Condensation.		Ditto, Corrected for 1'72 per Cent. Moisture.		Incombustibles, Volume per Cent.				Incom- bustibles, Relative Weight.  H=1
		Observed.	Calculated.	Observed.	Calculated.	Greater than Calculated.	Less than Calculated.	Greater.	Less.	Total.	CO <sub>2</sub> .	O <sub>2</sub> .	N <sub>2</sub> .	
	166·6	17·3	17·4	10·3	10·4	..	0·1	0·2	..	8·09	1·75	0·52	5·82	128·5
	152·6	18·4	17·4	12·07	11·42	1·0	..	1·27	..	..	not given	..	..	..
	145·7	16·4	15·5	11·25	10·64	0·9	..	1·17	..	7·81	2·11	1·05	4·65	126·3
	144·5	15·0	15·84	10·38	10·93	..	0·8	..	0·57	8·01	1·48	0·26	6·27	124·5
	144·3	14·7	15·8	10·18	10·95	..	1·1	..	0·83	4·25	1·00	0·05	3·20	67·6
	143·4	14·5	15·7	10·11	10·95	..	1·2	..	0·93	10·71	2·85	0·20	7·66	173·1
Aver. .	149·5	16·05	16·27	10·71	10·88	..	0·22	0·05	..	7·77	1·84	0·42	5·51	124·0

TABLE XV.—Showing Relation of Calorific to Illuminating Values of Coal Gases per Table XIV.

	Illum. Power in No. 2 Burner.	Values Calculated from Analyses.				Observed Values in Calories.					
		Conden- sation.	Heat Due to Hydro- gen.	Heat Due to Carbon.		Conden- sation.	Heat Due to Hydro- gen.	Heat Due to Carbon.		Com- pared with Cal- culated Figure per Candle.	
				Per Cub. Ft.	Per Candle.			Per Cub. Ft.	Per Candle.		
London . . .	3'642	17'10	105'0	51'6	16'91	17'3	106'2	60'4	16'584	-0'33	
" . . .	3'404	17'13	105'2	47'4	13'93	18'4	113'0	39'6	11'63	-2'30	
" . . .	2'896	15'23	93'6	52'1	17'99	16'4	100'7	45'0	15'54	-2'45	
Average of three tests . . .	3'314	16'49	101'3	53'7	16'27	17'37	106'6	48'3	14'58	-1'69	
London . . .	2'920?	15'57	95'64	48'86	16'73	15'0	92'1	52'4	17'94	+1'21	
St. Helens . . .	3'112	15'53	95'4	48'9	15'71	14'7	90'3	54'0	17'35	+1'64	
London . . .	2'930	15'43	94'8	48'6	16'59	14'5	89'0	54'4	18'56	+1'97	
Average of three tests . . .	2'987	15'51	95'27	48'79	16'34	14'7	90'5	53'6	17'95	+1'61	
Average of the six tests . . .	3'151	16'00	98'27	51'24	16'31	16'05	98'55	50'97	16'27	-0'04	

TABLE XVI.—Showing Disparity of Observed and Calculated Values, London Mixed Gases.

	Gross Observed Calories.	Condensation Value.		Condensation Value per Cent. on Gross		Observed in Excess of Calculated.
		Observed.	Calculated by Mr. Coste.	Ob- served.	Calcu- lated.	
	150'3	17'1	15'4	11'4	10'4	1'7
	148'0	17'7	15'0	11'96	10'4	2'7
	145'7	16'4	15'1	11'2	10'4	1'3
	143'5	15'6	15'0	10'8	10'4	0'6
	143'5	15'8	14'0	11'01	9'8	1'8
	143'1	16'9	14'4	11'8	10'28	2'5
	143'0	15'3	15'0	10'7	10'4	0'3
Av. of seven.	145'3	16'4	14'84	11'27	10'30	+1'56
	145'8	14'8	15'5	10'15	10'52	-0'7
	143'3	15'0	15'5	10'47	10'71	-0'5
Av. of two .	144'55	14'9	15'5	10'31	10'615	-0'6
Av. of nine .	145'1	16'06	14'98	11'052	10'368	+1'08

TABLE XVII.—Showing Relation of Calorific Values, Calculated and Observed—London Mixed Gases.

Gross Observed Calories.	Condensation Value.		Condensation Value per Cent. on Gross.		Observed in Excess of Calculated.	Ditto, after Correction for 1'72 p. ct. Moisture.	Incombustibles in the Gas.						Order of Weights.
	Observed.	Calculated.	Observed.	Calculated.			Volume per Cent.				Relative Weights. H=1		
							CO <sub>2</sub> .	O <sub>2</sub> .	N <sub>2</sub> .	Total.			
144'8	15'6	14'4	10'8	9'9	1'2	1'45	1'45	0'73	7'15	9'33	143'68	2nd	
145'1	16'0	15'2	11'02	10'4	0'8	1'06	1'74	0'37	3'24	5'35	89'56	1st	
145'2	16'7	13'65	11'50	9'4	3'05	3'28	2'13	0'28	12'02	14'43	210'62	5th	
141'4	16'9	13'5	11'95	9'54	3'4	3'63	5'00	0'00	10'20	15'20	252'80	7th	
143'5	15'6	14'5	10'87	10'10	1'1	1'35	1'51	0'53	9'79	11'83	178'76	4th	
143'2	16'9	13'7	11'80	9'57	3'2	3'43	3'83	0'29	9'86	13'98	226'91	6th	
150'3	17'1	14'82	11'34	9'86	2'28	2'53	0'00	0'27	11'10	11'37	159'72	3rd	
Aver.	144'8	16'4	14'253	11'326	9'824	2'147	2'39	2'24	9'35	9'05	11'64	181'58	..

gross calorific value involving a large air supply are in this case coincident with a low observed condensation figure; while, as shown in Tables XVII. and XVIII., gases having a low percentage of combustibles, a low gross calorific value, and a percentage of water gas admixed—both contributing to a low theoretical air supply—coincide with a condensation figure that is too high.

Tables XIV. and XV. give the results of investigating six samples of coal gas, five of which are Metropolitan and one from the St. Helens vertical retorts. They are of lower quality than those in Tables XII. and XIII., and show a higher weight of incombustible constituents, as well as a diversity in the departure of the observed calorific values from the calculated ones; for while one is 1'27 Cal. too much, another is 0'93 too little—after correcting the analyses for 1'72

—per cent. of moisture. In Table XV. these divergences are brought into two classes—the first showing — 1'69 Cal., and the second + 1'61 Cal., for the heat due to carbon per candle. Taking the table as a whole, we get an average which is apparently satisfactory; but it is only a fortuitous balance of two unsatisfactory sections.

Table XVI. deals with Metropolitan gases containing water gas; but the figures are unchecked, so far as the writer is concerned, by any analysis. It embodies in the third column the condensation figure calculated by Mr. Coste, assuming the unsaturated hydrocarbons as propylene. But as this assumption cannot make much error in the condensation figure, it is used as a check on the observed value. Generally, the result is confirmatory of that obtained by computation from analyses of similar gases by the writer given in Tables XVII. and XVIII. They reveal an important fact—viz., that in fourteen samples out of sixteen the observed condensation figure is above the calculated, and presumably the truer, one. The effect of this is to depreciate the net value attributed to the gas in the examiners' returns; for though a portion of this error may be in practice coincident with a slight appreciation of the gross value, yet this is unlikely to compensate for the loss mentioned. The explanation of this deviation is not quite

obvious; but it appears to be related to the weight of incombustible elements. This relation is shown by the numerals placed in the last column of Tables XVII. and XVIII., showing the order of the two sets of figures. The effect of a high percentage of incombustibles is very much like adding to the air supply, with the further drawback of the extra weight of the carbon dioxide. And as the gases in question were all tested in a Boys calorimeter, which has a fixed air passage space, and they were gases (by reason of their water-gas content, and low hydrocarbon content) requiring a small air supply, all three factors seem to have combined to produce an abnormal



cooling of the exit gases, with the result shown by the tables. The lowered moisture content of the exit gases would come into play, and also the error set forth earlier, due to the attribution of sensible heat to such water vapour as though it had been cooled down from 100° C. This tendency, resulting from excessive dilution, seems to be indicated by the results in Table XIX., where the rate of gas burnt was low. But the experiments are not sufficiently numerous or specific to justify any positive deduction as to the cause.

In Tables VII., VIII., and IX. of Mr. Coste's paper are given experimental data, which, when dissected, as in the following table (XIX.), show that, with the same gas and similar calorimeters, distinctly variable results were recorded for the condensation values.

The first section of Table XIX. shows that with two Boys calorimeters the first comparison was almost identical; while the succeeding four averaged a variation of 1 Cal. for the No. 1 instrument over the No. 26. The excess was always for the same in-

TABLE XVIII.—Showing Relation of Calorific and Illuminating Values of London Mixed Gases, per Table XVII.

Values Calculated from Analyses.						Observed Values in Calories.					
Illuminating Power in No. 2 Burner.	Conden-sation.	Heat Due to Hydro-gen.	Heat Due to Carbon.		Conden-sation.	Heat due to Hydro-gen.	Heat Due to Carbon.		Compared with Calculated Figure per Candle.	Order of Disparity	
			Per Cub. Ft.	Per Candle.			Per Cub. Ft.	Per Candle.			
3'33	14'15	86'92	57'88	17'36	15'6	95'8	49'0	14'7	- 2'66	3rd	
3'316	14'94	91'8	53'3	16'08	16'0	98'28	46'82	14'12	- 1'96	1st	
3'242	13'42	82'4	62'8	19'37	16'7	102'6	42'6	13'14	- 6'23	5th	
3'160	13'27	81'5	59'9	18'95	16'9	103'8	37'6	11'90	- 7'05	7th	
3'458	14'25	87'53	55'97	16'18	15'6	95'8	47'7	13'79	- 2'39	2nd	
3'362	13'47	82'74	60'46	17'98	16'9	103'8	39'4	11'72	- 6'26	6th	
3'612	14'57	89'5	60'8	16'83	17'1	105'0	45'3	12'5	- 4'33	4th	
Aver.	3'354	11'01	86'05	58'73	16'4	100'72	44'06	13'12	- 4'41	..	

strument; but what is even more noteworthy is that the third test shows a condensation value of 19'8 Cal., equal to the high percentage 13'5. This figure is difficult to understand; but it is confirmed partly by the 18'5 Cal. in the No. 26 instrument. The two sets of figures show extremes of 15'8 Cal. and 19'8 Cal., or a range of 4 Cal., equal to no less than 22 per cent. of the mean value, and

TABLE XIX.—Showing Behaviour of Different Calorimeters on the Same Gas and with Different Rates of Flow.

Boys No. 1.		Boys No. 26.		Compared with No. 26. Calories	Boys No. 26.		Junkers.		Compared with Boys No. 26. Calories.	Cubic Feet per Hour.	Boys.		Junkers.		Cal.	
Calories.	Per Cent.	Calories.	Per Cent.		Calories.	Per Cent.	Calories.	Per Cent.			Calories.	Per Cent.	Calories.	Per Cent.		Cal.
16'6	11'37	16'5	11'30	+0'1	14'8	10'21	15'0	10'29	+0'2	5	15'4	10'52	14'4	9'86	1'0	
16'8	11'52	15'8	10'90	+1'0	14'9	10'27	14'7	10'06	-0'2	4	15'0	10'34	14'3	9'85	0'7	
19'8	13'50	18'5	12'59	+1'3	14'4	9'78	14'7	10'02	+0'3	3	16'1	10'99	..	..	..	
17'0	11'50	16'0	10'97	+1'0	14'9	10'21	13'5	9'35	-1'4	2	15'5	10'75	14'9	10'15	0'6	
17'1	11'70	16'4	11'21	+0'7	14'0	9'68	14'8	10'20	+0'8	Average of four tests Average of three tests	15'5	10'65	..	..	..	
Average of five tests	17'46	11'92	16'67	11'39	+0'8	14'5	10'08	14'6	10'09							+0'1
Average of four tests	17'67	12'05	16'67	11'42	+1'0	14'1	9'80	14'8	10'24							+0'7
Burning 2½ cubic feet per hour		15'6	10'70	..	14'51	10'00	14'58	10'03	+0'07							

this within a set of four tests after they began to vary. Boys No. 26 showed a lower condensation figure—viz., 15'6 Cal.—when the gas was burning at the rate of 2½ cubic feet per hour, against the average value of 16'67 Cal. when burning 4 to 5 cubic feet per hour.

The second section of Table XIX. shows the results from a Junkers calorimeter compared with the Boys No. 26. In this series, the latter instrument shows more uniform returns—the lowest being 14'0 and the highest 14'9 Cal.; while the Junkers gives 13'5 and 15'0 Cal. respectively. Out of seven pairs of tests, the Junkers instrument gave in five of them a higher condensation figure and in two of them a lower one; these differences varying from - 1'4 to + 0'8, or a total of 2'2 Cal.

In the third section of Table XIX., the effect of a variable rate of flow is set forth; showing again a lower condensation figure for the Junkers tests, and apparently—under the conditions then prevailing—a tendency to rise in both instruments when the consumption came below 4 cubic feet per hour. This is contrary to the behaviour of the single test for the first section of the table. The most marked individual disparity in the second section is where a gas giving 14'9 Cal. in the Boys No. 26 yielded only 13'5 Cal. in the Junkers; a falling off, quite suddenly in the series, of 1'4 Cal., equal to 10 per cent. of the mean value. This occurs within a series of seven pairs of tests that otherwise show moderate disparities—thus displaying the subtle nature of the influences at work.

An instance recently occurred where the change of atmospheric temperature and of humidity was rapid, and it was possible to trace its effect upon the returns for gas tested on the two days Dec. 21 and 22, 1909. From the Meteorological Office readings of the wet and dry bulb thermometers at St. James's Park, the writer has calculated the relative humidities shown in Table XX.

TABLE XX.—Showing Rapid Change of Atmospheric Temperature and Humidity.

Hour of Reading.	7 a.m.		1 p.m.		6 p.m.		Average of the Three.	
	Temperature on Dry Bulb Thermometer.	Relative Humidity.	Temperature on Dry Bulb Thermometer.	Relative Humidity.	Temperature on Dry Bulb Thermometer.	Relative Humidity.	Temperature on Dry Bulb Thermometer.	Relative Humidity.
Dec. 21, 1909 . .	Deg. Fahr. 27'0	82'3	Deg. Fahr. 35'2	68'0	Deg. Fahr. 34'5	96'88	Deg. Fahr. 32'23	75'73
" 22, " . . . .	43'6	96'48	53'0	93'3	53'6	94'29	50'07	94'69
Rise in 24 hours .	16'6	14'18	17'8	25'3	19'1	17'41	17'84	18'96

Out of seventeen testing stations, one (Holloway) showed no change in the condensation figure, being 11 per cent. each day; six showed a reduction, the most being from 14'4 to 10'5 = 0'9 per cent.; while ten cases showed an increase, the most being Stoney Lane, Tooley Street, S.E., from 10'7 to 14'4 = 3'7 per cent. On Dec. 21, 1909, the average of the whole was 10'8 per cent.; and on Dec. 22, 11'3—a rise of 0'5 per cent., equal to about three-fourths of a calorie. The average gross value at Stoney Lane during that week was 15'1 Cal.; the net, 13'3'1 Cal.; the condensation 17'9 = 11'85 per cent. Upon 15'1 Cal., the 3'7 per cent. jump would amount to 5'6 Cal.; while if the departure from the mean value only be taken, the abnormal day represents 14'4 - 11'85 = 2'55 per cent., or 3'85 Cal.

An instance of variation in calorimetric readings recently came to the writer's notice, where a use of the two types of instruments mentioned in this article showed a lower net value from the one. This was, as a consequence, discarded, and the other substituted for the regular daily use.

It is quite evident that the disparities reached in practical work, may have an important effect now that, under recent legislation, calorimetric tests may involve forfeitures.

(To be concluded.)

Midland Association of Gas Managers.—As briefly announced in the "JOURNAL" last week, the annual meeting of the Association will be held on Thursday, at the Grand Hotel, Birmingham. According to the circular issued by the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich), a new member will be elected, the President (Mr. Vincent Hughes, of Smethwick) will deliver his Inaugural Address, and Mr. Alfred T. Harris, of

Market Harborough, will read a paper entitled "Experiences with Semi-Vertical Retorts, and Notes on Carbonizing Systems and Results." Messrs. S. Glover (St. Helens), T. Glover (Norwich), and J. F. Bell (Derby) have consented to open the discussion, and give the results of their recent experiences in carbonization. A report by the Committee on the subject of the revision of the rules will be considered. The members will afterwards dine together.



## THE GAS LIGHTING OF TO-DAY.

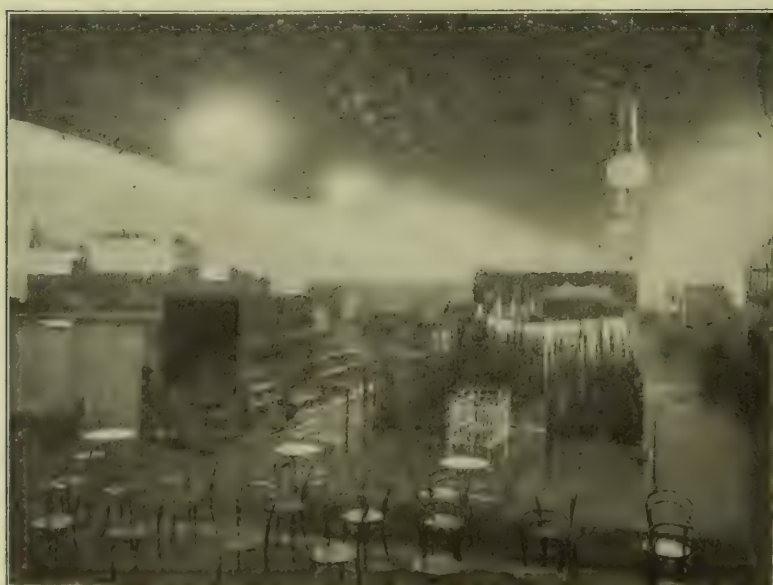
EARL'S COURT has been the scene of many exhibitions; and with one in particular it will for a long time to come remain associated in the memories of those engaged in the gas industry. There is an exhibition to be seen there now, of the trade order; and, it may



Ducal Hall, Earl's Court Exhibition.  
(Photograph taken by High-Pressure Gas-Light.)

be incidentally remarked, it is a very good one, too. The title is the Wholesale Furniture Manufacturers' Co-Operative Exhibition, of the series of which it is the seventh. It was not, however, the attractive contents of the various stalls that last week induced a representative of the "JOURNAL" to visit once more the familiar Queen's Palace, Ducal Hall, and Queen's Palace Annexe, but a rumour that there was to be seen there a first-class installation of high-pressure gas-lamps. Anticipation in this case did not exceed the pleasure of realization; for the Gaslight and Coke Company have admirably carried out the task of lighting up the exhibition. The accompanying illustrations show what has been done, and how well the stands are illuminated. Side by side with their brilliant high-pressure gas rivals, the unused electric arc lamps look disconsolate indeed.

Praiseworthy, however, as the installation would be under any circumstances, it is rendered even more creditable when one considers its temporary character; the exhibition being no more than a nine-days' affair. Housed in a make-shift sort of shed, are



Queen's Palace, Earl's Court Exhibition.  
(Photograph taken by High-Pressure Gas-Light.)

two Keith compressors, driven by "National" gas-engines, which are merely placed on a timber platform. It is the practice to use one of these in the daytime, and the other at night; the one performing the first-named part of the work being lower geared than the other. The gas is supplied to the compressors through two 4-inch mains; and it leaves them through two 2-inch and one 1½-inch pipes—the latter being for the annexe. These are controlled by cocks, so that the lighting may be partial, if desired.

Though installed in this somewhat primitive manner, no trouble whatever has been given by either engines or compressors, which are highly spoken of by those in charge.

Both the Queen's Palace and the Ducal Hall were already provided with three runs of 2-inch pipes, which were left in position after the Gas Exhibition; but, even so, the temporary lighting installation now under notice necessitated some 2½ miles of additional piping. The whole of the work of preparing for the lighting was accomplished by thirteen fitters, with their mates, in a fortnight. The lighting throughout is of one character; but choice may be made, for specific reference, of the Queen's Palace. Here are to be seen (divided over the three runs of pipe) no less than 72 three-burner Sale-Onslow lamps, worked at a pressure of about 50 inches. The candle power of these lights is 500 per burner—making 1500 candles per lamp. This would give an illumination for the Queen's Palace of 108,000-candle power; and the Ducal Hall and Annexe are proportionately well lighted. In fact, this general installation constitutes almost the whole of the lighting of the exhibition. Such lighting as is required by individual stalls, owing to their being covered in, &c., is furnished by 200 Bland inverted burners, which derive their gas from the low-pressure supply.

It was noticed that the exhibition is heated by 55 of Cox and Son's (Torquay) gas-heating stoves, having four burners; while in the adjacent Empress Hall Skating Rink there are 50 stoves of similar pattern, but each fitted with twelve burners. In conclusion, it may be said that no better way could possibly be found of inducing full appreciation of the excellent qualities of the gas lighting of the Queen's Palace than by taking a person direct from there to the electric-arc lighted Empress Skating Rink.

## NAPHTHALENE TROUBLES REMOVED IN THE TYNEMOUTH DISTRICT.

IN the course of the proceedings at the annual general meeting of the Tynemouth Gas Company last Thursday, which are noticed elsewhere, the Chairman (Mr. J. B. Williamson) read a letter from the Engineer (Mr. William Hardie) containing the following particulars in regard to the successful efforts made by him to get rid of naphthalene troubles.

For about ten years we have been trying various expedients for getting over the nuisance of stoppages due to naphthalene in consumers' service-pipes and on the gas-works; and I am pleased now to report that the efforts have at last been successful, and that naphthalene troubles no longer exist. I have had an opportunity lately of inspecting many of our main-pipes, both on the works and in the district, and when I broke-out connections to the old gasholder at Low Lights, and in no case was any trace of naphthalene found.

Much benefit was experienced by the reversible annular condenser on the principle of that described by Mr. Charles Carpenter, of the South Metropolitan Gas Company, in 1895. By the use of this condenser, we were able to reduce the naphthalene down to an average of 5 grains per 100 cubic feet of gas.

This was not found sufficient to give relief; and, after using various oils for washing the remaining naphthalene, I was able, owing to experiments carried out in our gas-works laboratory by my Assistant (Mr. G. Duncan), to prepare a specification for an oil which has given us total relief, and cost during last year only 1.25th of a penny per 1000 cubic feet of gas treated. The gas now regularly contains less than one grain of naphthalene per 100 cubic feet.

As showing the advantage to the Company, I may say that whereas the average number of stoppages due to naphthalene for the three years before we commenced using this special solvent was 4140 per annum, in 1907 they were reduced to 807, in 1908 to 238, and in 1909 to 30. The reason why they did not cease as soon as we commenced using this special solvent was owing to the large quantities of naphthalene lying deposited in the mains and services, which, of course, took time to dissipate.

In a paper on "The Pollution of Streams by Spent Gas Liquors from Coke-Ovens, and the Methods Adopted for its Prevention," Dr. H. Maclean Wilson, Chief Inspector of the West Riding Rivers Board, pointed out that these liquids could be dealt with so as to prevent stream pollution; and he said the Board felt the time had arrived when they must do their utmost to enforce the law.



# MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

## Annual Meeting in Manchester.

The Fortieth Annual Meeting of the Institution was held on Saturday, in the Grand Hotel, Manchester. Mr. J. W. MORRISON, of Sheffield, the retiring President, occupied the chair at the opening of the proceedings; being supported by Mr. H. Kendrick (Stretford), the President-Elect, Mr. S. Glover (St. Helens), and Mr. W. Whatmough (Heywood), the Hon. Secretary.

### LETTERS OF APOLOGY.

Among the letters of apology read by the Hon. Secretary was one from Mr. Lunt, a Director of the Stretford Gas Company, who desired to extend to Mr. Kendrick good wishes on his election as President of the Institution; adding that the honour done to Mr. Kendrick was much appreciated by himself and the whole of the members of the Board of the Stretford Gas Company. Sir T. Bosdin Leech, another Director of the Company, was unable to be present, having undertaken a voyage to the West Indies; and the Secretary (Mr. B. Haynes) likewise wrote regretting inability to attend the meeting. Letters of apology were also announced from the following, among others: Mr. Thomas Newbigging, Mr. W. J. Helps, the President of the Institution of Gas Engineers, and from Messrs. Vincent Hughes, T. H. Duxbury, and John Young, the Presidents of the Midland, North of England, and Eastern Counties Associations respectively.

### ANNUAL REPORT AND ACCOUNTS.

The annual report of the Committee, which was taken as read, opened with the statement that the membership roll continues to increase; the number on the books being 166, compared with 157 for 1909, or an increase of nine. The Committee expressed regret to record the deaths of three members—Mr. H. Froggatt, of Bollington, Mr. John Marsland, of Sowerby Bridge, and Mr. Robert Shadbolt, of Fleetwood. They recorded that the members continued to take an active interest in the work of the Institution, and gave a list of the papers contributed to the Transactions during the past year. They also recorded that the Commercial Section branch of the Institution's work continues to justify its adoption. These introductory remarks were followed by a short account of the proceedings at the three meetings of the Institution; and the Committee concluded by stating that all the officers, Committee, and candidates for membership included in the balloting list had been elected; Mr. H. Kendrick, of Stretford, being President for the ensuing year. The accounts accompanying the report showed a sum of £67 18s. 11d. in the hands of the Treasurer, compared with £59 18s. 5d. this time last year; but the Committee reminded the members that out of the year's accounts there had been paid the 25 guineas voted at the last annual meeting to the Livesey Memorial Fund.

The PRESIDENT said that to the list of members who had died during the year must be added the name of Mr. Edmund Lord, of Whitworth Vale, one of the oldest members of the Institution. In fact, the name of Mr. Lord, who had passed away since the annual report was printed, stood fourth on the present roll of membership. On behalf of the members of the Institution, he had written to the widow expressing sympathy with her and the family in their bereavement.

On the motion of Mr. S. GLOVER (St. Helens), seconded by Mr. W. PRINCE (Stoke-on-Trent), the report was adopted; and on the motion of Mr. S. MEUNIER (Stockport), seconded by Mr. W. S. HADDOCK (Warrington), the accounts were passed.

### COMMERCIAL SECTIONS AND THE PARENT INSTITUTION.

Mr. S. MEUNIER, in moving the adoption of the reports of the Commercial Sections, mentioned that it was intended to introduce standard clauses for the coal trade. These clauses would be so framed as to be absolutely acceptable to the colliery proprietors themselves, and allow of quotations and acceptances on the same basis. He expressed the hope that those members of the Institution who had not joined the Commercial Sections would soon do so, and give the Sections the help and benefit of their experience.

Mr. F. H. PICKLES (Kildwick), in seconding the motion, remarked that a great deal of the success which had attended the work of the Commercial Sections was, in his opinion, due to the respective Chairmen; and it was a fact that they were in a much stronger position now than twelve months ago. The rating returns had been brought up to date, and in his own case recently had proved most useful to him.

Mr. W. PRINCE (Stoke-on-Trent) pointed out that the question of the unification of the Commercial Sections had been considered by the Council of the Institution of Gas Engineers, and the opinion was expressed that they ought to be brought into closer contact with the parent organization, with a view, he thought, of securing uniformity of working. He believed this matter was brought forward by the Southern District Association, and he was of opinion that the parent Institution would in the future take more interest in the welfare and working of the sections. It was gratifying to know that the sections were being recognized by the parent Institution; and he understood that the subject would be dealt with at the June meeting.

The HON. SECRETARY said that the question of the Commercial

Sections being brought into closer union with the parent Institution would form an item on the agenda for the June meeting of that body.

Mr. R. WATSON (Doncaster) considered that this recognition of the Commercial Sections strengthened their appeal for a larger membership. If those present noted the figures, they would see that the Lancashire and Yorkshire Sections had a membership of 86, while the Manchester Institution had 166 on the books, which meant that they had only about 50 per cent. of the gas undertakings in the area covered by the Institution represented on the Commercial Sections.

The motion was carried.

### REPRESENTATIVE ON THE PARENT INSTITUTION.

Mr. W. Whatmough was again nominated as the district member of the Council of the Institution of Gas Engineers for 1910-11, on the motion of Mr. PICKLES, seconded by Mr. BARKER.

### ALTERATIONS OF RULE.

The PRESIDENT next announced that the Committee had resolved—"That the members be recommended to authorize payment of railway fares to Members of Committee and Auditors when engaged on business connected with the Institution; general meetings of members excepted." He said this was done by the parent Institution; and as the Committee had a substantial amount in hand, with an income greater than their expenditure, he saw no objection to the new rule.

The proposition was agreed to *nem. con.*

There was some opposition to the Committee's further recommendation—"That the Chairmen for the time being of the Lancashire and Yorkshire Commercial Sections respectively be *ex-officio* members of the Institution Committee."

Mr. PRINCE moved an amendment to the effect that the recommendation be rejected.

Mr. R. SURTEES (Fenton), in seconding the amendment, said he had an objection to the tail wagging the head, and expressed the opinion that it would be better if the Institution endeavoured to improve the position of members, instead of doing so much for the corporations and gas companies.

Mr. WATSON said he was in favour of the suggestion, but thought the new rule should be so worded as to ensure that the Chairmen of the Sections for the time being were members of the Institution and entitled to vote.

In the short discussion which followed, it was pointed out that one must be a member of the Institution before being elected as Chairman of a Section.

On being put to the vote, the Committee's recommendation was declared carried—only four voting for the amendment.

### THE NEW PRESIDENT.

Mr. MORRISON then said his term of office as President was at an end; but before leaving the chair he desired to thank the officers and members for the loyal support they had given him since his appointment. He had done his best to carry out the duties satisfactorily; and he trusted he left the Institution in, at any rate, as good a state as he found it when elected. It was with feelings of great pleasure that he asked Mr. Kendrick to take the chair, the more so because they as youths were in the same drawing office together at Birmingham. He hoped—indeed, he was certain—that Mr. Kendrick's year of office would be a successful one. That gentleman had been a member of the Manchester Institution for thirteen years, during five of which he was their Honorary Secretary. Mr. Kendrick had been a very hard worker, had read them papers, and done his best to further the interests of the Institution; and he (Mr. Morrison) was confident the new President would do his utmost to uphold the dignity and the prestige of the Institution over whose affairs he was called to preside.

### THANKS TO THE PAST PRESIDENT.

Mr. KENDRICK, on taking the chair, said his first duty was to move a vote of thanks to Mr. Morrison for the way in which he had conducted the affairs of the Institution during the past twelve months. The year had been one of the most successful they had had since he became connected with the Institution thirteen years ago; and Mr. Morrison had set an example which would be difficult to follow. The energy he had shown, the arrangements he had made for the members, and his conduct of the Institution's affairs, were worthy of all praise.

Mr. S. MEUNIER seconded the motion, "as a member of the trio from Brum;" for he, with Mr. Morrison and Mr. Kendrick, were boys together at the Birmingham Gas-Works.

The motion was carried with applause.

Mr. MORRISON, in acknowledging the vote, said he had tried to do his duty, and hoped he had fulfilled the anticipations of the members.

The PRESIDENT then delivered the following

### INAUGURAL ADDRESS.

Gentlemen,—I am under the deepest obligation to my fellow members of this, the premier District Association, for the honour they have conferred on me and the Company I serve in electing me to this most important position. It is not one that I have



sought—in fact, I have looked upon it as beyond my reach; there being in our Institution so many capable engineers of world-wide fame who have not occupied the chair. I am all the more grateful for the confidence of the members, and trust, with their help, to maintain the high position taken by our Institution in the councils of the gas industry, and to pass on to my successor next year the reins of office untarnished. I have a difficult task before me, and shall need all your consideration and assistance. My predecessors in the office have shown such energy in promoting the welfare of the Institution as to make it increasingly difficult to find any new subject of general interest.

The increased vitality of the Institution, under the guidance of the ex-President and our esteemed Honorary Secretary, is evidenced by the very large number of members admitted at the last meeting. As many of these are young men, with special knowledge and training denied to many of the older generation, I hope that the Institution records will be the richer in the near future, by the reading of papers on subjects which they are peculiarly fitted to expound. There are now 169 members on the books; being a net gain of eleven on the year.

#### DEPARTED MEMBERS.

The great reaper has been among us again, and has garnered more of our number. With painful suddenness, he took Mr. Robert Shadbolt, of Fleetwood, who had been a member for 29 years. Mr. H. Froggatt, of Bollington, and Mr. J. Marsland, of Sowerby Bridge, were also called home. The former joined the Institution in 1898, and the latter in 1897. And quite recently we have heard of the death of Mr. Edmund Lord, of the Whitworth Vale Gas Company. None of these of late have taken an active part in the Institution's affairs; but having borne the heat and burden of the day in years gone by, the work was passed on to younger men. Their loss we deplore; and our deepest sympathy goes out to those left behind, especially to our fellow member, Mr. R. G. Shadbolt.

#### COMMERCIAL SECTIONS.

The work done by the Commercial Sections continues to grow, and becomes increasingly useful as the possibilities are appreciated. From the informal meeting held a few years ago in Manchester, a new movement is taking place which should complete the breakdown of the old isolation of gas managers, and link them, by the exchange of ideas and information, into one whole. This should strengthen the industry in its fight with powerful rivals, who are not intrenched, as many of us are, within the ramparts of usage and cast-iron custom. Strenuous efforts are being made to wrest customers from us, without, so far, any great amount of success; but the assaults are so vigorous and so persistent that, unless we throw off our lethargy, we may awake to find that a large slice of our territory has slipped away from us. One of the subjects that is constantly recurring at our "Commercial" meetings is how may this competition be met; and on this subject, and many others of vital importance, valuable information is distributed freely by all attending the meetings. These discussions, and the weekly and other reports, must exercise a good influence on the policy of the undertakings represented by the members. As, however, the discussions are not reported, the greatest advantage is gained by the attendance of members; and as a supporter and well-wisher of the Commercial Sections, I trust that members will take a renewed interest in their work. The possibilities of the Joint Meetings are an unknown quantity. The formation of sections in all parts of the country is a most hopeful sign; and the support given to the idea of joint action on one subject leads me to hope that other matters of equal importance will be taken in hand, and that, finally, recognition will be forthcoming in the near future from the highest quarters in our industry.

#### THE LEEDS UNIVERSITY CHAIR.

The whole gas industry is to be congratulated upon the raising of the necessary funds for the establishment of the Chair of Gas Engineering and Fuel at the Leeds University; and great hopes are entertained of benefits to be derived from the lectures and studies carried out there, and from the researches being entered upon. Our appetites have so far only been whetted by the information made public, and we are impatient for more, and also more practical food.

#### CARBONIZING.

It has been truly said that all our old ideas as to carbonization are in the melting pot. It was only the other day we were informed that we were on the eve of a return to light charges and short distillations at high heats; and retorts were erected on this plan. But we had hardly grasped the meaning of this change when the reverse was forced upon our notice. The pioneer work of Mr. Bell, of Derby, and others is too recent to require further notice, as are also the vertical-retort experiments at St. Helens and Bournemouth, and by our German friends. As these systems have not yet been tried in small units in the medium-sized and small gas-works, and no information is so far to hand as to the costs of maintenance and renewals, it is necessary for all who contemplate extensions to weigh well the known advantages of the older systems before embarking on what are practically untried systems so far as the majority of gas-works are concerned. The information so lavishly given us by the inventors and promoters of the vertical-retort systems is not derived from instal-

lations that have stood the test of the ordinary working of the smaller gas-works; and the working of fairly large units continuously over long periods is no criterion of their behaviour under different conditions.

I anticipate great savings in labour expenses by the adoption of verticals in every gas-works; but the capital, wear and tear, and renewal charges are problematical, and have not been given in any communication to the Technical Press. I, of course, admit that in some cases it is impossible to give them. These remarks must not be taken as adverse criticism of the system, but rather as a statement of the direction in which further information is necessary. The yields per ton, and the illuminating and calorific values obtained, with verticals, are not unattainable with horizontal; and our friends who have been experimenting with heavy charges and eight or ten hour burning, are to be congratulated upon some splendid results. Yields of 12,000 cubic feet per ton and upwards, of good illuminating and heating value, are readily attainable; but they are for the most part only within the reach of works having an installation of power machinery.

At Stretford, we have West's "manual" machines; and the heaviest charge we have been able to put into the retorts (22 in. by 16 in. □'s) is  $7\frac{3}{4}$  cwt. But as much of the coal used swells considerably, it was with extreme difficulty that we were able to discharge the coke with the ordinary rake; and during our experiments we carbonized  $7\frac{1}{2}$  cwt. per retort. On eight-hour working over three days, we obtained as high as 12,055 cubic feet of gas per ton, of 14-candle power and 486 B.Th.U. net; the average for the seven weeks being 11,709 cubic feet of  $14\frac{1}{2}$ -candle power and 506 B.Th.U. net. The yield from  $6\frac{3}{8}$  cwt. charges, six-hour burning, for the same coals, was 10,876 cubic feet per ton of  $15\frac{1}{2}$ -candle power and 526 B.Th.U. net—showing a gain of 6 per cent. by working three charges instead of four in the twenty-four hours.

It would have been possible, had we been able with the means at our disposal, to have carbonized 9 cwt. or even 10 cwt. of coal per retort, when even better results would probably have been obtained. Other considerations have to be taken in account, however. During our regular working, we carbonize  $27\frac{3}{4}$  cwt. of coal per retort per day. But on eight-hour work, we were only able to carbonize  $22\frac{1}{2}$  cwt. per retort per day, which is a serious matter; and not having sufficient spare ovens, we were compelled to revert to six-hour work. This working of extra retorts meant an additional charge of  $1\frac{1}{4}$  d. per ton of coal carbonized (capital 1d., fuel  $\frac{1}{4}$  d., renewals  $\frac{1}{4}$  d.), or £190 per annum; also £37 per annum for extra firemen, cleaners, and stackmen, and additional enrichment of one candle, costing (1 candle  $\times$  0.47d.  $\times$  380 million) £700—a total extra charge of £927. The value of the additional gas made, 435 cubic feet per ton (12,055 cubic feet, less 11,620 cubic feet present working), is 11,310,000 cubic feet at 2s. 3d. = £1272 per annum. The net saving will be £345 per annum for a gas of lower heating value—viz., 486 B.Th.U. net. As this is rather low to give the best duty for all purposes, it is probable that there would be no gain at all. We intend continuing the experiments in the spring, when, with the improved apparatus since installed, we may be able to chronicle better results. So far, we have proved that, without power machinery and heavier charges, little or no advantage can be gained by working eight-hour carbonization.

#### MEUNIER'S HYDRAULIC MAIN FLOATS.

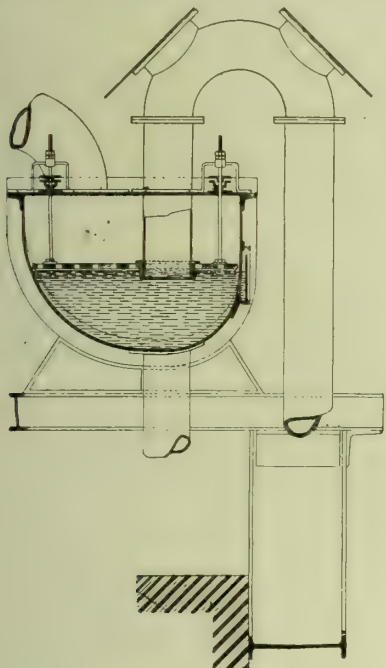
One new idea lately described in the Technical Press gives us hope in this direction, and has been the means of largely increasing our make per ton without a reduction in the illuminating power or the calorific value. Mr. S. Meunier, of Stockport, has lately patented an arrangement of hydraulic main fittings that is a distinct advance on anything that has preceded it, and places within our reach the advantages of the "anti-dip" without its drawbacks. The arrangement consists of boards extending over the whole interior surface of the mains, being cut away to fit round the dip-pipes and perforated throughout with holes about  $1\frac{1}{2}$  inches in diameter to allow the gas a free passage to the foul main. The boards are supported by rods passing through the hydraulic main covers, and are provided with bridges, extension screws, and stuffing boxes, so that they may be fixed in any required position, which should be just on the surface of the liquor. The boards may also be used to carry extension rings to regulate the depth of the dip-pipes, where the hydraulic mains are not level, and so make an absolutely level seal attainable. In connection with the above, and for general observation, it is advisable to fix one or more sight-glasses on the side of each hydraulic main, to facilitate the levelling of the boards.

There are two sets of oscillations in the hydraulic main that must be dealt with separately and successfully if we are to reduce the pressure on the retorts to the minimum and incidentally to increase the make of gas to the maximum. There is the variation of the liquor levels due to the irregularity in the working of the exhauster, which can be met by using a retort-house governor; but by far the greatest variation is due to the violent oscillations caused by the ebullition of the gas through the liquor. These are extremely marked immediately after a newly-charged retort is closed up. It is found that the liquor washes from end to end of the main in wavelets, giving rise to variations in the levels of over 3 inches, causing the dips to be unsealed one moment and heavily oversealed the next—a process that must have a deleterious effect on the quantity and quality of the gas produced. It is a *sine qua non* in every well regulated gas-works that the hydraulic

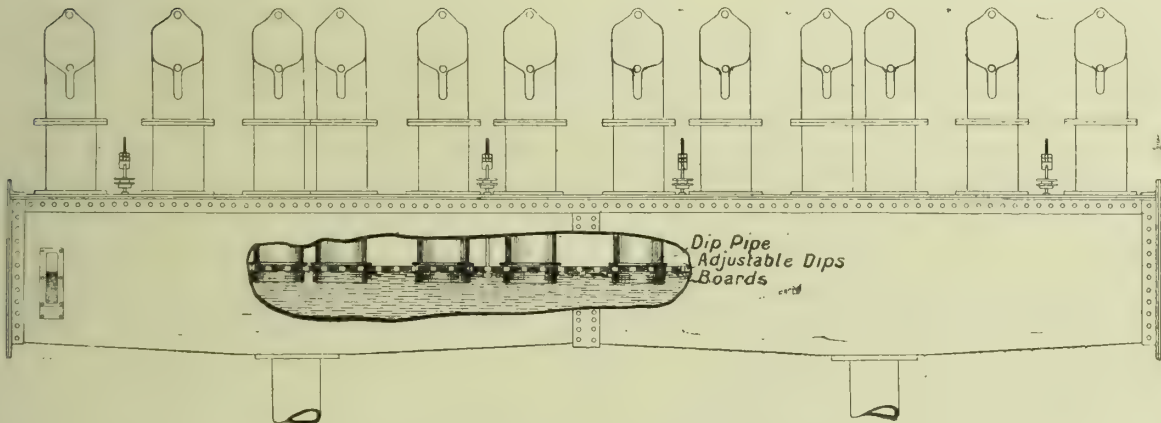


mains and dips should be periodically levelled to ensure an even seal. This is generally done when the retorts are cold; and it is assumed that the dips will be level also when the oven is at its working heat. We have, however, found that this is not so, and differences in level up to  $\frac{1}{2}$  in. and  $\frac{3}{8}$  in. have been observed on the same section after it has been put to work. The extension rings are therefore likely to be of considerable advantage in overcoming these irregularities.

Another claim by Mr. Meunier is that the fitting of the mains



Transverse Section.



Front Elevation and Part Section.

MEUNIER'S PATENT HYDRAULIC-MAIN FLOATS.

December was due to wet coal and irregularities of the stokers. The coals carbonized consisted of—

Arley medium slack	36 per cent.
Trencherbone rough slack	32 "
Silkstone pea nuts and fine slack	16 "
Hartley and Worsley unscreened coal	16 "

The main facts to be gathered from this statement are that high yields are not dependent on retort-house governors; that the illuminating and heating values are more constant and rather higher with governors than without; that the fuel carbonized is not best screened gas coal and cannel; and that Mr. Meunier's patent is undoubtedly responsible for an increased yield of at least 600 cubic feet per ton and a considerable diminution in the quantity of naphthalene in the finished gas.

NAPHTHALENE.

We have only been troubled with the naphthalene bugbear since 1906, and in 1908 the trouble was so acute (totalling 3275 stoppages in the six summer months) as to demand special measures. The use of carburetted water gas having proved ineffectual, owing to the presence of naphthalene in that gas (as much as 8 per cent. being found in the tar), various methods and solvents were tried to avoid the necessity of erecting some special plant. We sprayed solvents into the purifier outlet mains, the washer, and meter, and we tried Colson's solvent, benzol, a tar naphtha of '9 specific gravity, petroleum, and various shale naphthas without getting satisfactory results. Petroleum and shale naphtha caused the pitch to be deposited in the washer. Finally, as the cost of a washer was too heavy, we decided to try shale naphtha of '75 specific gravity vapourized in a small "Norwich" carburettor we

with his patented apparatus results in the diminution or prevention of naphthalene deposits. The prevention of the extreme oscillation of the liquor allows of the heavier tars settling in the hydraulic main, and interferes with the formation of an emulsion of the pitch with the tarry oils and vapours. These latter, not being condensed from the gas in the hydraulic main, travel forward, and, when precipitated, bring down a considerable portion of the naphthalene with them. In one works, this is brought about so effectually that no naphthalene has been found in the district for two years. At Stretford, and another gas-works where the system has been introduced, the naphthalene trouble has been very considerably reduced. We have evidence so far that Mr. Meunier's system of anti-oscillation boards in the hydraulic main will result in: (1) An improved make; (2) no loss in candle power; (3) no loss in heating value; and (4) a diminution of naphthalene stoppages.

The results for the year 1909 are as follows:—

1909. Month.	Yield per Ton at 60' and 30 Inches.	Average Candle Power.	Heating Value B.Th.U. Net.	Cannel Carbon- ized.	C.W. Gas in Gas Supplied.	Dura- tion of Char- ges.	Hydraulic Mains in Use.
	Cubic Ft.			Per Ct.	Per Ct.		
Jan. . . .	11,096	18'02	..	1'2	23'3	6 hrs.	ordinary
Feb. . . .	11,073	18'12	..	2'2	20'3	"	"
March . . .	11,095	18'12	..	1'4	20'7	"	"
April . . .	10,526	18'10	524'8	1'5	22'5	"	"
May . . .	10,874	18'03	528'0	1'2	24'8	"	"
June . . .	10,931	18'05	526'0	0'2	25'7	"	"
July . . .	11,491	18'01	506'0	1'1	28'1	8 "	"
Aug. . . .	11,223	17'94	517'6	6'6	8'5	6 "	ordy. 8 Meunier
Sept. . . .	11,609	18'05	516'4	3'3	14'4	"	" 10 "
Oct. . . .	11,697	18'20	513'6	1'1	22'3	"	" 12 "
Nov. . . .	11,710	18'08	521'6	1'1	23'8	"	" 14 "
Dec. . . .	11,426	18'11	521'2	0'8	19'7	"	" 16 "

The test of eight-hour carbonizing commenced on June 21, and ended on Aug. 10, 1909. The lower average yield during April was due to testing bulk samples of poor slacks. Retort-house governors were put to work on Oct. 26. The poorer yield in

had by us. So successful was the experiment that we installed a larger carburettor, and have not had any naphthalene in the district since April last, except for one short period in August and September, immediately following the last spell of hot weather, when we tried to do without solvent. The following table gives the particulars of solvent used, and the stoppages, &c. :—

Date.	Average Solvent Used Per Ton of Coal.	Average Cost of Solvent Per Ton of Coal.	C. W. Gas in Mixed Gases.	Stoppages by Naphthalene.
	Gallons.	Pence.	Per Cent.	
Nov. 1908.	0'60	2 3/4	22'4	133
Dec. . . . .	0'59	2 3/4	23'1	268
Jan. 1909.	0'59	2 1/4	23'3	191
Feb. . . . .	0'60	2 3/4	20'3	47
March . . . .	0'57	2 3/4	20'7	12
April . . . . .	0'53	2 3/4	22'5	45
May . . . . .	0'51	2 3/4	24'8	178
June . . . . .	0'48	2 3/4	25'7	none
July . . . . .	0'41	2	28'1	"
Aug. . . . .	0'68	3	8'5	250
Sept. . . . .	0'66	3	14'4	369
Oct. . . . .	0'41	2	22'3	none
Nov. . . . .	0'34	1 5/8	23'8	"
Dec. . . . .				
1910.	0'30	1 1/2	19'7	"
Jan. . . . .	0'28	1 1/2	18'2	"
Feb. . . . .	0'14	1 1/2	16'9	"

The carburettor was attached to the gasholder inlet main as we had evidence of an accumulation of naphthalene in the gas



holder crown; the precipitated spirit, when using petroleum, giving the following percentages :—

From vapourizer . . . .	6 per cent. naphthalene.
„ gasholder inlet . . .	23 „ „ „
„ inside of gasholder. .	31 „ „ „
„ gasholder outlet . . .	7 „ „ „

As we have never obtained any quantity of oils more than 300 yards from the works, it is evident that there has not been any accumulation in the trunk mains; also, our troubles have rarely been continuous, and have always been more acute following a rise of atmospheric temperature, which, affecting the gas in the holders first, would vapourize any accumulation there, and be carried out into the district to be re-precipitated. Since we cleared the gasholders, we have only once been troubled—viz., in August and September last. Since then we have been gradually reducing the solvent used, until we are now using less than a third the quantity we were in December, 1908. I ascribe this improvement to the working of the altered hydraulic mains, although our heats are now higher, and the make considerably greater, than last year.

COALEXLD, CHARCO, &c.

The claims of the Coalite patentees have aroused in others the ambition to provide a smokeless fuel that can be more readily ignited and burnt in the open fire than ordinary gas-works coke. The purification of the atmosphere by the abolition of raw coal, and the substitution for it of gas or coke, will meet with your approval; and, as was impressed upon us by the lecturers at the Manchester Gas Exhibition in 1907, the domestic grate has much the larger share in the vitiation of the atmosphere. We as gas suppliers are doing much to reduce the harmful effect of the noxious vapours given off by coal burning by pushing the use of gas for heating and cooking; but we have still to dispose of the coke. If this can be sold within our own areas, it will be to the advantage of every undertaking. This should not be a difficult matter if the fuel is made suitable for the open grate; for, as stated by Mr. R. Watson a year ago, taking the average of the country, the proportion of coke made was slightly under one ton per consumer, which, if we were able to induce them to use, would still leave a large margin for coal and Coalite or other similar productions.

We have for the past eighteen months been trying to cultivate a market for Coalexld, but have so far not been very successful in establishing a large trade. We have a few customers who prefer this fuel; and their number is slowly increasing. We have made, by the desire of my Directors, a series of careful tests of coal carbonized with and without the Coalexld chemicals—keeping a record of the yield of gas and residuals, illuminating power, calorific values, impurities in gas and ash, and sulphur in coal and coke. The results are tabulated, and are the average of fifteen separate tests in each case.

TABLE I.—Gas and Residuals.

—	Gas per Ton.	Illuminating Power.	Multiple Gas x c.p.	Tar per Ton.	Liquor 5° T. per Ton.	Coke per Ton.
	Cub. Ft.	Candles.	1000 C'ndleFt.	Gallons.	Gallons.	Cwts.
Without chemicals .	11,192	18'62	208'4	11	19'4	13'57
With „ „	11,614	18'24	211'8	11	18'8	13'57

TABLE II.—Impurities and Constituents of Clean Gas.

—	Crude Gas.			Purified Gas.			
	H <sub>2</sub> S.	CO <sub>2</sub> .	NH <sub>3</sub> .	CO <sub>2</sub> .	O <sub>2</sub> .	CO.	S.
	Per Ct.	Per Ct.	Grains.	Per Ct.	Per Ct.	Per Ct.	Grains.
Without chemicals .	1'19	1'44	70'6	1'39	0'16	7'87	34'28
With „ „	1'01	1'60	69'8	1'57	0'13	7'93	28'86

TABLE III.—Ash and Sulphur in Coal, Coke, &c.

—	Ash in Coal.	Ash in Coke.	Total Sulphur in Coal.	Volatile Sulphur in Coal.	Sulphur in Coke.	Sulphur in 5° T. Liquor.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Without chemicals .	3'59	7'31	1'769	0'566	1'203	0'388
With „ „	3'59	7'48	1'810	0'554	1'256	0'381

TABLE IV.—Heating Values Coal, Coke, and Gas.

—	Gas B.Th.U.		Coal.		Coke.	
	Gross.	Net.	Calories.	B.Th.U.	Calories.	B.Th.U.
Without chemicals .	609'7	524'4	7373	13,272	3753	6706
With „ „	602'3	528'2	7373	13,272	4113	7405

These tests were undertaken to ascertain what effect the process had upon the gas and residuals. The result is purely a negative one, except the diminution of the sulphur in the gas.

There was a slight increase in the ash, as would be expected from the addition of chemicals to the coal. The claim of less sulphurous fumes when the fuel is being burnt, I am able to confirm to a limited extent; and also that the Coalexld, when broken for domestic use, does ignite and burn more readily than ordinary coke.

The later rival of Coalite, "Charco," requires no chemicals; being merely coke cooled out of contact with air and water. The patentee suggests smothering the red-hot coke with small breeze. This is a costly process; and if a demand should arise for the fuel, I should suggest cooling in air-tight chambers. This method of cooling is really an annealing process; the ordinary rapid quenching with water increasing the natural hardness of the coke, and more or less saturating it with water. "Charco" is in its appearance denser than coke—more like charcoal, and tough, and absolutely free from moisture; so that when burnt in an ordinary grate it does not spurt or crackle. It burns easier, and ignites more readily than even Coalexld, and in a very short time gives a bright glowing and hot fire. I have not yet investigated the other claims of less sulphur, &c. The cost of these two processes is about the same; the additional labour on "Charco" counterbalancing the cost of the chemicals for Coalexld. Either of these processes is worth trying, and has resulted in increased sales and profits at many gas-works. In our case, we have such a good sale for the ordinary coke that we have not attempted to push the sale of Coalexld yet; but the production of a coke that could all be sold within his own area would be an inestimable boon to many gas managers.

FIRE-CLAY GOODS.

The recent "German" scare has interest for us all, if only that the opinions of the Directors and Managers of the South Metropolitan Gas Company are worthy of attention. It is distinctly hurtful to our national pride to be told that our fire-clay goods makers do not set themselves out to make the best possible articles from the materials at their disposal. This attack, following on the valuable paper read by Mr. F. J. Bywater in 1908, should cause all the manufacturers to be certain that their methods are up to date, and that the goods they produce are equal to the changed conditions of present-day retort-house practice. All will agree with me that the materials supplied by the same firms often show alarming variations in quality. The reply by some of the makers, that they produce what they are paid for, was hardly courteous. At the same time it has a very considerable amount of truth in it; and no doubt you all could name towns where the lowest tender, irrespective of quality, is always accepted. This is an expensive way of doing business; and if the cost of renewals of retorts at various works were separated and compared, I am firmly of opinion that the lowest in cost would be those that paid the most for their fire-clay goods. From personal knowledge, I can affirm that there are firms to-day who are making a speciality of goods for certain purposes that are a vast improvement on only a few years ago. But we have not reached finality yet; and there is plenty of room for improvement. If it is only the cost that is in the way, let the makers show that the value is there, and no gas committee or board would be so shortsighted as to refuse to pay an increased price for a superior article.

CARBURETTED WATER GAS AND ENRICHMENT COSTS.

As our larger neighbours certify the gas they send out to be from 17½ to 19 candle power, my Board feel compelled at present to supply gas two candles over the parliamentary standard—viz., 18 candle power tested at the works by the No. 2 "Metropolitan" burner. It is necessary therefore for the straight coal gas to be enriched by 2½ candles. A series of tests with several enrichers gave the following costs.

Enricher.	Cost of Enriching by 2½ Candles. Pence.	Cost per Candle. Pence.
Carburetted water gas . . . . .	1'18	0'47
Benzol . . . . .	1'61	0'64
Cannel . . . . .	1'82	0'73

Benzol has been given a far higher enrichment value than here found. It, however, does not carry over the long distances we have to distribute our gas; and instead of an enrichment value of 28,000 candle-feet per gallon, we are unable to satisfy ourselves that more than 13,000 candle-feet reached our consumers during the winter months, at a distance of over 4 miles from the works. We prefer to use the more stable cannel gas instead of benzol if the carburetted water gas plant is out of action, and only turn to benzol if unavoidable.

The reason for this loss is due to the presence of other hydrocarbon vapours in coal and carburetted water gas, which, when over-saturated with benzol vapours, mutually precipitate each other. This is confirmed by the report of the Committee on Benzol Enrichment presented at the annual meeting of the American Gas Institute in October last,\* which points out in addition, that, if benzol enrichment is to be successful, means should be taken to remove a portion of the low-tension hydrocarbon vapours from the gas. Blue water gas will take up and carry large quantities of benzol vapour; and a straight coal gas can be saturated more completely than carburetted water gas, or a mixture of the two, as the percentage of heavy hydrocarbons in the latter is at least double that in the former. This is one reason for our continuing to manufacture carburetted water gas. Others

\* See ante, p. 239.







PURIFYING.

In 1906, I gave the members some particulars of our trials of hurdle grids in the purifiers. I am now able to supplement this by a complete record for four years' working. As the figures speak for themselves, I give them without further comment.

Year.	Purifiers in Use with Hurdle Grids.	Purifiers Changed in the Year.	Coal Gas Made Million Cubic Feet.	Coal Gas Purified per Change Million Cubic Feet	Labour Costs per 1000 Cubic Feet of Gas Made.
1904 . . .	none	76	258	3'4	d. 0'23
1905 . . .	1 for 3 months	80	266	3'3	0'22
1906 . . .	<div>1 " 4 "</div> <div>2 " 5 "</div> <div>4 " 3 "</div>	67	262	3'9	0'18
1907 . . .	4	49	275	5'6	0'13
1908 . . .	4	41	288	7'02	0'14
1909 . . .	8	30	291	9'7	0'095

We have eight purifiers 20 feet square, which hampers us considerably. Had we larger boxes, the labour costs should be much below these, as the rate of flow of the gas through the purifiers during the winter is too high for the most efficient work, as shown by the following table:—

Months.	Gas Made. Cubic Feet.	Number of Changes.	Cubic Feet per Minute.	Rate of Flow. Feet per Minute.
May to August . .	71,023,000	4	401	0'50
November to January	103,977,000	13	785	0'98
Maximum day . .	1,450,000	—	1007	1'26

As it is our practice to put into use during November of each year a considerable quantity of new oxide, these figures are unfavourable to the summer working. The oxide used is entirely artificial, which, revivifying readily with little labour, reduces the costs considerably when compared with other material in the market. The average of the figures given by O'Connor for the size of purifier required by us is 512 square feet each for the maximum make, or 29 per cent. more than we are working with. So that for purifiers fitted with the new vertical hurdle grids, the old figure of 0'6 square foot per 1000 cubic feet of gas made is much in excess of actual requirements, but if worked to will certainly reduce the labour costs, although, at the same time, it will increase the capital charges.

DISTRIBUTION AND GAS SUPPLY.

The time has gone by for the distribution department to be merely concerned with distributing the gas; and it now adds to its originally numerous duties lighting, heating, and power in all its various forms. The day when the gas-works jurisdiction was assumed to end at the meter has gone, never to return; and many now exercise control up to the point of consumption. There are, however, still too many who keep to the old usages, and whose committees or boards effectually check any expansion for fear of interfering with a trade and robbing a ratepayer of work he never had, and cannot, in the majority of cases, carry out if he had it. To-day the gas undertakings which are most successful in retaining custom are those that are the most aggressive; and it is more than ever necessary to show a willingness to serve our consumers at all reasonable cost rather than discourage them, as was often the case in years gone by. Generally speaking, the plumbers who have had a monopoly of the gas-fitting business in any area for years are the worst enemies of the gas undertaking. They are trained to sanitary and general plumbing only; and as plumbing work includes pipe work, the business has drifted into their hands. Every manager is called upon to investigate complaints from only comparatively old property, and knows to his cost what ideas this body of men have had in the past; and many districts have to be served with pressures far in excess of their needs because of the small pipes installed before the day of gas-fitters regulations.

I should like to see our Institution and the Institution of Gas Engineers endeavour to impress the Master Plumbers' Association with a sense of the gravity of the situation. There is not the slightest doubt that we lose a far larger number of consumers to our rivals than we should had these tradesmen understood even a little about the apparatus they are so often called upon to fix and maintain; and proof has been given through the Public Press, where addresses have been known, that many of the awful examples given by our electrical friends, of saving when electricity has displaced gas, can be generally traced to ignorance of the apparatus used either by the consumer himself or by his plumber and gas-fitter. The prevailing method of authorizing plumbers as gas-fitters is to be deplored. An applicant is generally asked where he served his time, if he has tools and a workshop, and the inquiry then ends in a certificate being granted. This represents a considerable asset to the man; but because of the very insufficiency of the tests, it is actually, in many cases, a cause of trouble and loss to the gas department. I am aware there are notable exceptions to the rule; but they are as oases in a desert, and deserve every encouragement at our hands.

I should like to see established in every large centre technical classes dealing with gas supply in a practical form—not such as

are now working under the City and Guilds of London Institute, which, with the examinations held, are essentially for the chiefs and assistants of the distributing department, but classes dealing with such problems as are met with by the ordinary workman in his daily routine, to which could be added a practical course in gas-fitting, construction, and regulation of burners, fires, cookers, &c. If this suggestion meets with favour, and the powers that be can be roused to its importance, we should be able to revolutionize the gas-fitting business to our and the public's benefit.

Many gas companies—and notably the London Companies—are themselves doing pioneer work on these lines, with great benefit to themselves in the fight with electricity; and it will pay all but the small undertakings to follow their example. Men so trained will be a valuable asset to any undertaking; and whether they remain in the gas-works employ or commence in business for themselves, it will be equally advantageous to the gas department. The "Illuminating Engineer," in a recent issue, refers to this question in the following words: "The policy of reducing prices, and at the same time giving prompt and business-like attention to every requirement of their consumers . . . has already proved itself to be sound, and is destined to bear even greater fruit in the future."

The Stretford Gas Company commenced four years ago with five men on maintenance, meter-fixing, and cooker-repairs; to-day they employ eleven—all trained on the works. The work entrusted to them is increasing every year, but they do not interfere with the legitimate work of the plumber, such as pipe-laying and carcassing of buildings; their work (which is all brought to us) is confined to maintenance, and cleaning, fixing, and renewing burners, gas-fires, cookers, &c. As an advertisement, we clean the incandescent gas-burners in churches, chapels, clubs, and other public buildings free of charge; the authorities finding the mantles. Taking pattern by Sheffield, we have just completed a preliminary survey of the gas-fires in the area, with a view to the adoption of free cleaning; the result is instructive, and the figures will provide food for serious reflection.

Houses visited . . . . .	256
Not admitted . . . . .	13
Apparatus inspected . . . . .	Gas-Fires. 442 .. Cookers, &c. 133
Found in good order. . . . .	72 .. 56
„ defective . . . . .	370 .. 77

ANALYSIS OF DEFECTS.  
Gas-Fires.

Passing too much gas . . . . .	5
Adjusted, cleaned, and renewed fuel . . . . .	15
Cleaned and renewed fuel . . . . .	237
Cleaned only . . . . .	66
Repacked and renewed fuel . . . . .	38
Short of fuel . . . . .	7
Defective nipples . . . . .	4
Improperly fixed. . . . .	3
Defective firebrick backs . . . . .	6
Defective flues . . . . .	25

Cookers.

Defective pipes . . . . .	9
„ taps . . . . .	29
„ bars . . . . .	13
„ and choked burners. . . . .	52
„ grillers. . . . .	36
Dirty ovens . . . . .	8

Other Defects Noted.

Defective gas-irons . . . . .	3
„ supply to house . . . . .	18

This is a truly deplorable state of affairs, and one I hope my Directors will not allow to recur. One result of the inspection will be, I hope, a determined effort before next season to largely increase the number of fires in use.

COOKERS.

We have not seen our way to fix cookers free, but believe that it would add considerably to our expenses did we adopt the plan. An estimate made a short time ago, after allowing for the gross profit on the extra gas sold, showed a probable loss amounting to 1½d. per 1000 cubic feet on the total gas sent out. Our statistics relating to cookers for the past four years are:

	Cookers on Hire.	Rental.	Repairs and Maintenance.
1906. . . . .	1164 ..	£644 ..	£423
1907. . . . .	1151 ..	600 ..	592
1908. . . . .	1335 ..	484 ..	443
1909. . . . .	1463 ..	562 ..	461

The hire-rates were reduced in 1907. The gas consumed per cooker in our area does not exceed 11,000 cubic feet per annum; the net profit per annum being:

Gas.—1463 × 11,000 cubic feet = 16,093,000 cubic feet at 10d. per 1000 cubic feet profit . . . . .	£670
Add rentals . . . . .	562
	£1232
Deduct.—Interest on cost, 6 per cent. on £6584 =	£395
Repairs, cleaning, refixing, &c. . . . .	461
	856
Net profit . . . . .	£376
or 5'7 per cent. on the outlay.	

The figure of 10d. per 1000 cubic feet includes gross profit 6½d., and 3½d. saving on working expenses, as there will be no extra



charge for distribution, management, clerks, inspection, and collection.

From these figures, it will be seen that all we could do to balance the items would be to reduce our hiring-rates by half. If they were abolished altogether, there would be a loss of £200 per annum on the present cookers, which would be greatly increased, and the average consumption reduced by the fixing of large numbers of cookers in houses where the main reason for having them would be that they were free.

GRILLERS.

Instead of fixing free cookers, we have fixed free grillers; the expense being less than one-fourth that for cookers, while the gas consumed is nearly half, and the profit one-and-a-half times as much. The griller we generally fix is 12 in. by 9 in. by 7 in. inside, provided with base and door, grill burner with deflecting grill plates, and separate boiling burner on top. A separate  $\frac{3}{8}$ -inch gas supply is laid from the nearest  $\frac{1}{2}$ -inch pipe in the house. The total cost for the 4813 now in use is £3991, or 16s. 7d. per house. What they have done for our consumption can be seen from our slot-meter statistics.

Year.	Total Gas Consumption.	Slot Meters Fixed.	Average Consumption per Meter.	Grillers Fixed with Slot Meters.	Total Grillers Fixed.
	Cubic Feet.		Cubic Feet.		
1905 . .	12,104,200	1501	8,421	..	..
1906 . .	14,759,800	1732	9,133	1021	2693
1907 . .	21,206,800	2156	10,426	1306	3029
1908 . .	25,684,100	2494	10,656	1495	3820
1909 . .	30,320,900	2762	11,323	1873	4813

This shows an increase of 2902 cubic feet per consumer in four years, and a consumption of  $\frac{2902 \times 2762}{1873} = 4334$  cubic feet per griller per annum.

The net profit per annum is—

Gas.—4334 cubic feet $\times$ 452s (average grillers in use)	
= 19,611,000 cubic feet, at 10d. profit . . . . .	£817
Deduct.—Interest on cost, 6 per cent. on £3991 . . . . .	£241
Repairs, renewals, cleaning, and refixing . . . . .	216
	457
Net profit . . . . .	£360

equals 9·05 per cent. on the outlay, or one-and-a-half times the return on cookers, even with the hiring-rate added.

STREET LIGHTING.

Patient, plodding work always tells in the end; and the inventors of street-lamp controlling devices can congratulate themselves that their probationary period has passed, and the days of the man with the torch are numbered. The use of controllers is extending rapidly; but the number of new devices is legion, and adds to the difficulty of the seeker after the best apparatus. We have had trials of both pressure and clockwork arrangements. Personally, I prefer the pressure type, for the following reasons: They are certain in their action; more simultaneous in lighting up; not so liable to be lighted up by vibration; less working parts to get out of order; repairs and cleaning at a minimum; first cost usually less; action not dependent on attendant; can light up at any time without sending round the lamplighter.

The only troubles we have had with the pressure controllers (not due to naphthalene) has been the corroding of the exposed parts (since done away with by the protecting of the working parts from atmospheric influences) and occasional variations of the district pressure at or near the critical point, which has twice resulted in the lamps being extinguished in the middle of the evening, and nine times extinguishing them by the pressure rising late at night (owing to the consumption falling) and subsequent relighting again when the pressure was raised for extinguishing. All but one of the latter occurred during the first few months of working. The cost per annum of the same lamps with and without controllers has been :—

Without controllers—Gas . . . . .	13 9
Maintenance . . . . .	3 10
Wages, repairs, painting, &c. . . . .	16 4
	£1 13 11
With controllers—Gas . . . . .	14 4
Maintenance . . . . .	5 7
Wages, repairs, painting, &c. . . . .	8 8
	£1 8 7

This shows a saving of 5s. 4d. per lamp, or £63 14s. per annum on the 237 fitted. The inclusive cost of fixing was £242 2s. 8d. The saving shown will, therefore, have covered the outlay by 1911; the work having been carried out in July, 1907. The saving shown would have been greater had we not been compelled to dispense with the anti-vibration frames, owing to the lanterns being small; the mantles used having increased by more than 100 per cent.

A record of the mantles employed, and also under various different circumstances, is interesting.

Type of Lantern and How Secured to Column.	Anti-Vibrator Used.	Size of Lantern.	Mantles per Annum.	Means of Lighting.	Remarks.
		Inches.			
Wind proof, fixed by frog	Frame	16	4·4	Flash torch	Average of district
Do.	None	16	9·3	Controller and bye-pass	"
Do.	None	16	10·1	Flash torch	"
Good ordinary, not wind proof, fixed by frog	Frame	17	12·8	Torch with hood	Subject to heavy traffic, main road
Do.	Spring and weight	17	20·2	"	"
Cheap ordinary drop doors, loose in head frame	None	14	39·7	"	Ordinary traffic in by street
Do. do. fastened in head frame	None	14	18·0	"	"

ILLUMINATION AND ILLUMINATING EFFECT.

The formation of the "Illuminating Engineering Society" should be a matter for congratulation; and though some of the questions discussed may be abstruse, yet many of the articles printed in the "Illuminating Engineer" have a direct bearing on our profession, and we should at least keep in touch with them. At present, the Society consists largely of members of the electrical professions; gas being represented by only five members of the Institution of Gas Engineers. Consequently, most of the articles appearing have dealt with electrical matters. As a mixed Society, it should be neutral ground, where all will receive fair and equitable treatment. That neither gas nor electricity receives it from the other cannot be denied, and statements and claims are continually being made that depend on experiments carried out under perfect conditions in ideal laboratories, and which cannot under ordinary circumstances be attained. When tests are made for public consumption that are founded on results obtained by a process of rejection until the highest or lowest possible readings are reached, can it be surprising that such alarming discrepancies occur between the figures relied on by competing authorities? We have one redeeming feature on our side; in our comparisons, we do take the latest electric lamp, but our friends and opponents still cling to the out-of-date flat-flame gas-burner.

We gas engineers are slowly shaking off the old shackles; and the sharpening of our weapons in the arena of such societies as the Illuminating Engineering Society should be to the benefit of all, and assist us to break through obsolete and, if necessary, modern rules as well. In a recent issue of the "Illuminating Engineer" occurs the following remarks by the Secretary of the Michigan Gas Association and Mr. P. J. Thompson, of the Pacific Coast Gas Association. The former, after referring to a good bridge-player as winning games when he knows how to break rules, says: "In illuminating engineering, it is the ability to know when to break rules that secures business;" and the latter defines an illuminating engineer as: "A gas engineer with common sense." This is very tersely put with true American bluntness; but it is so true that we cannot afford to ignore the mines of information contained in any technical lighting journal, whether written by gas engineers or not. Unless we keep abreast of the times, and do something more than point out how much cheaper and healthier gas lighting is than its rivals, we may be left behind in the race. The electricians are fitting the light to suit the circumstances, and we must do more than merely flood rooms with (sometimes) superfluous light.

A comparison of illuminating powers of burners with different globes and shades, with a table of reflected light from different decorations, would be useful information for our inspectors to have; and a series of experiments to determine the exact effect would increase our chances with our rivals and answer many queries as to poor illuminating effect. Some rough tests made in our photometer room gave the following figures :—

Globes, &c., Used.	Best Type of "C" Burner.			Cheap "C" Burner.		
	Gross Candle Power.	Gas Used per Hour Cub. Ft.	Candle Power per Cub. Ft.	Gross Candle Power.	Gas Used per Hour Cub. Ft.	Candle Power per Cub. Ft.
No chimney or globe . .	69·27	3·46	20·02	44·71	3·28	13·71
Straight chimney . . .	74·21	"	21·44	48·17	3·15	15·33
Straight chimney and metal reflector . . .	88·00	"	25·42	57·74	"	18·36
Clear domestic chimney.	71·44	3·55	20·12	37·17	2·95	12·59
Clear domestic chimney and opal reflector . .	92·12	"	25·95	50·49	3·12	16·13
Opaline chimney . . .	61·29	"	17·26	38·87	"	12·44
Opal globe . . . . .	34·81	"	9·81	26·73	"	8·52
Pale ruby globe frosted .	30·56	3·45	10·50	26·31	3·14	8·39
" " " cut . . . . .	45·83	"	13·28	32·40	"	10·34
" green globe frosted .	44·11	"	12·78	33·22	"	10·59
" yellow " " . . . .	51·93	"	15·05	36·48	"	11·58

The amount of reflection from walls assisting the illumination of a room varies considerably as they are light or dark, glazed or



matt surface, and in conjunction with tinted globes, which are so greatly in fashion now, detract largely from the quantity of light available. The following will give some idea of the results to be obtained. The burner used was the best type of "C" burner, with a straight, clear chimney. The various papers were placed on a screen behind the test-burner and arranged to reflect the light on to the disc in the first series. In the other, the burner was placed at one side, and only light reflected from the surface of the paper was measured.

Description of Wall Paper.	Light Reflected through Mantle.			Reflected Light Only.		
	Candle Power.	Gas Used per Hour Cub. Ft.	Candle Power per Cub. Ft.	Candle Power.	Gas Used per Hour Cub. Ft.	Candle Power per Cub. Ft.
Chimney only, ordinary background . . . .	74'06	3'45	21'46	..	3'45	..
Cream glazed . . . .	81'59	..	23'65	8'16	..	2'36
Medium blue, glazed . . . .	73'30	..	21'24	not	measurable	..
Light buff, smooth . . . .	77'31	..	22'41	5'91	..	1'71
Light brown matt . . . .	74'83	..	21'68	4'38	..	1'27
Medium art green, smooth	73'15	..	21'20	3'99	..	1'16
Deep red matt. . . .	71'10	..	20'61	not	measurable	..
Medium red, smooth . . . .	73'14	..	21'19	2'65	..	0'77
Light red, glazed . . . .	75'08	..	21'76	3'36	..	0'97
Medium brown, glazed . . . .	73'45	..	21'29	3'02	..	0'87

From these figures it will be observed that cream, buff, and light brown papers assist the illumination by reflection, but that blue, red, and green papers detract from the light by absorption. The matt surfaces is much worse than smooth or glazed.

GAS EMPLOYEES "VADE MECUM."

In comparing lights and meeting consumers' complaints of poor illumination, the effect of colour and reflection is too often overlooked; and if we possessed someone with sufficient enterprise to write a small volume for gas employees (embodying similar information to the foregoing) on all uses of gas, corresponding to one entitled "Electricity for Everybody," he would do the industry good service. This book is divided into sections dealing with lighting, heating, power, engineering, canvassing, &c., and under each heading is put in a clear and concise form information to enable the chief or his subordinate to quickly deal with practically all the questions he will meet with in the daily routine. Under the head of "Canvassing" are some suggestions that we should do well to study. But I hope that any writer taking my suggestion would be fairer to electricity than the compiler of this book is towards gas; for, however good the other sections are, this one is full of "terminological inexactitudes." Writers on gas subjects should be careful to see that their statements cannot be used against them; for in this book there is as fine a collection of "facts" about gas-cookers as one would wish to see—many of them culled from makers' catalogues and cookery books issued through makers, and here used against us under circumstances that render correction almost impossible. I have myself seen in makers' advertisements statements that definitely assert that all others goods are faulty. These may be good business methods; but they are questionable tactics.

GAS-FIRES.

We are still looking for a really efficient and flexible gas-fire that will rival solid fuel in cheapness and be equal to meeting all

the vagaries of the English climate. The fires supplied by most of the makers are not sufficiently flexible for every-day use, and cannot easily be adapted by the ordinary householder to meet the changes of temperature to which we are subject. It is no use telling the lady of the house or the maids that, when they wish to adapt the fire to the needs of the moment, they must alter the adjuster. This work requires a certain amount of skill, which is rarely to be found even among the men of the household; they would either use the tap or ask you to remove the fire. Regulation by the tap is wasteful, and will nullify any advantage obtainable by the use of gas and air adjusters. In the fires we have tested, the effect of this, with one exception, is to reduce the efficiency out of all proportion to the lessened consumption. To obtain every advantage, all gas-fires should be fitted with duplex or even triple burners, according to their size, and with burners also that, within certain limits, retain their efficiency and give a flame of such a shape as will ensure the fuel radiating heat waves into the apartment proportionally to the consumption. The additional cost of fires so fitted will no doubt be an objection at first; but so was the price of the incandescent gas-burner when first introduced. Only a few years ago, it was difficult to persuade a consumer to spend a penny on a new flat-flame burner; now they will spend shillings on incandescents. So it would be with gas-fires. The consumer would soon realize their economy, and in the end gas-works and manufacturers would benefit.

The single row fuel fires are not all they were represented to be. The efficiency and the duty have been enormously improved; but the fires now supplied do not generally give the same heating effect, size for size, as the old fire with deep back. The rush to reduce consumptions was pushed to the extreme; and no doubt other gas undertakings beside ourselves had to fix old pattern fires to meet the complaints of want of heating capacity. Matters were better in 1909; but there is still room for improvement.

The size of room a given fire will heat is often stated in makers' catalogues. We have proved these figures to be unreliable. They need to be corrected in many ways; and we have repeatedly failed to obtain similar results. Most of the testing-rooms are specially constructed for the purpose, some with double doors and windows; and even where this is not so, they rarely approach the ordinary conditions of a living room. Either the window spaces are not proportionate, the doors all open out into other rooms, outside walls are shielded from cold winds, draughts and cold air are rigidly excluded, and altogether artificial conditions are set up, which vitiate all results obtained, except for comparisons. I grant it would be more difficult to obtain comparative results unless more than ordinary precautions are taken; but in certain cases these laboratory results are given to the world as those which may be expected in practice.

The latest improvements in the fuels and burners fitted to gas-fires are self-contradictory. The Venturi tube burner gives a short, hot flame, wide at the base, that can be heavily supplied with air; while the pillar fuel requires a long flame, which can only be produced by a restriction of the air supply, and, consequently, a less intense flame. If the Venturi burner becomes general, there will most likely be a return to the 6-inch fuel of two years ago. Our consumers naturally object to a fire that roars; but a roaring flame gives the better duty. We have carried out a few tests in order to decide which fires we could recommend to our consumers; but, unfortunately, the most efficient are difficult to sell when in competition, as they are encased in what has been termed a poor "envelope." The tests were made with the fires adjusted to give the best flame—as a consumer would arrange them—not finding the best conditions and tabling these results. The following is a selection:—

Gas-Fires.									
—	Silent Flame. Full Consumption.			Roaring Flame.		Silent Flame. Reduced Consumption.		Fuel Used.	Type of Fire.
	Gas Used per Hour.	Galvanometer Reading.		Gas Used per Hour.	Galvano- meter Reading at 3 Feet.	Gas Used per Hour.	Galvano- meter Reading at 3 Feet.		
		3 ft. from Fire.	With Wilson Reflector.						
	Cubic Feet.	"	"	Cubic Feet.	"	Cubic Feet.	"		
A . . . . .	25	24'2	34'8	25	28'5	18	20'3	6-inch	Adjustable
B . . . . .	27'5	32'9	35'6	9	10'0	21'3	22'7	Pillar	"
C . . . . .	24'7	30'5	38'2	10'7	11'6	19'3	19'8	"	"
D . . . . .	25'5	26'0	33'2	14	15'8	14	15'4	"	"
E . . . . .	24	21'2	..	..	..	20	11'6	Short	Not adjustable
AA { full . . . . .	28'5	28'6	..	20	18'8	16	16'3	6-inch	Adjustable
duplex { half . . . . .	16'9	19'8	..	12	14'5	9'4	12'4	"	"

Gas-Fire Fuels.

Fire from Fire.	Fire "A," Consumption 25 Cubic Feet per Hour.	Fire "B," Consumption 21'7 Cubic Feet per Hour.	Fire "C," Consumption 24'7 Cubic Feet per Hour.	Fire "D," Consumption 25'5 Cubic Feet per Hour.	Type of Fuel.
	Galvano-meter Reading.	Galvano-meter Reading.	Galvano-meter Reading.	Galvano-meter Reading.	
A . . . . .	21'2	31'9	31'9	29'5	6-inch
B . . . . .	21'5	21'2	27'5	22'9	Pillar
C . . . . .	27'9	27'5	30'5	31'6	"
D . . . . .	24'9	29'1	26'5	26'0	"
E . . . . .	28'1	..	..	..	6 inch

The main information to be obtained from these figures is that certain makers' fires and a certain form of burner are more efficient than others, and that a duplex burner fire is an advantage, and, as stated by Mr. J. H. Brearley, gives a higher duty with half the burners than with all. The tests of fuel also prove there is a wide divergence, and only emphasize the deductions to be made from the tests of the fires. There can be no doubt that my Company must recommend fires "A" and "C" only, as they give the best rests. The fuel "F" is not obtained from a gas-apparatus maker, but from the fuel-maker direct. Some of the fuel tests were affected, as the fuel did not fit all fires alike. I suggest this is bad for gas undertakings. It would be much better if all fires and fuels were standardized. Standard sizes would eliminate one source of competition, but still leave the two main factors of design and efficiency. A reduction in the number of



designs would also cheapen production and benefit both makers and consumers.

STAND-BY METERS, ETC.

The question of stand-by meters has received a large amount of attention during the past two years, and was rendered acute by the rejection of the Mirfield clause in 1908, and the acceptance of it in a modified form in the Heywood Gas Act of 1909. That powers to arrange terms for these services is necessary cannot be denied when the intermittent nature of the demand is considered; but it ought to be possible to arrange amicably most of these matters with the individual consumers without the necessity of an appeal to Parliament. My Company have 209 consumers who have gone over to electricity, and three who are users of suction gas for motive purposes. We have arrangements with all of the latter—one paid the whole cost of main and meter; a second guaranteed a minimum amount per quarter or paid the difference; and the third pays a rent for both service main and meter. The private consumers were treated differently. They were originally nearly all large householders, with 20-light and 30-light meters. We drew up a scale of charges for the hire of meter and service-pipe, in which we stipulated that, unless the gas consumed per quarter reached a fixed quantity, we should impose the rent set out in the schedule. The immediate effect was what we wanted—a request to remove the large meter and fix one sufficient for the quantity of gas they did consume. It is not likely that any of these consumers will revert to gas lighting; and the Company were saved a considerable outlay for large meters, while still retaining the partial custom of these electricity consumers.

BYE-PASS LIGHTS AND DRY METERS.

The question of dry *v.* wet meters is one that has given rise to debates at former meetings. It is not, however, my intention to defend one or the other that I make mention of an experiment we have carried out to decide a vexed question. It arose out of a public lighting account; and as we supply most of the gas to the lighting authorities in our area on the average meter system, we were exercised by doubts as to whether the gas consumed by the bye-passes on the incandescent street-lamps was registered by the dry meters in use. The following record amply proves that it is not:—

Three-Light Dry Meters from District (Old).

No. of Bye-Passes in Use.	Gas Registered by Wet Test Meter.	Gas Registered by Meters under Test.					
		1880.	1885.	1893.	1886.	1897.	1897.
1	103'4	81'5	11'9	50'6	0'1	0'1	1'9
2	101'5	46'7	0'0	0'4	0'0	0'0	0'6
6	115'5	131'3	0'1	119'5	0'1	0'0	100'7
12	122'6	120'7	0'1	2'1	0'1	0'1	1'6
6 burners } on full }	97'7	110'3	91'0	110'2	60'6	0'0	98'9

Three-Light Dry Meters from Stock (New and Repaired).

No. of Bye-Passes in Use.	Gas Registered by Wet Test Meter.	Gas Registered by Meters under Test.					
		1909.	1909.	1906	1906.	1906.	19'6.
1	95'8	100'5	90'2	3'4	0'0	90'1	0'3
2	97'0	97'7	96'2	50'3	9'9	101'1	0'0
6	100'9	94'3	99'4	91'2	110'5	101'3	110'7
12	103'1	106'0	109'5	109'0	89'6	119'9	100'3
6 burners } on full }	127'3	154'0	131'5	143'2	130'3	130'9	140'0

Three-Light Wet Meters (New).

No. of Bye-Passes in Use.	Gas Registered by Wet Test Meter.	Gas Registered by Meters under Test.					
		1909.	1909.	1909.	1909.	1909.	1909.
1	101'0	106'6	107'2	100'8	83'2	92'5	79'2
2	102'4	103'5	93'7	101'8	80'0	78'6	81'9
6	109'4	72'0	119'4	110'2	116'7	102'1	111'0
12	54'7	45'3	56'7	59'4	49'7	64'9	55'4
6 burners } full on }	138'4	144'0	151'3	153'8	158'7	140'1	138'3

All these meters, both wets and drys, had been stamped as correct. The date at the head of the columns is the year when the meter was made. The figures show that the old dry meters registered very badly for the Company; three of them being hopeless. The new dry meters were nearly as bad, but improved when the amount of gas passing increased. On the other hand, the wet meters were better for one bye-pass, two were 20 per cent. and one 8 per cent. slow, instead of the 100 per cent. on the drys. The registration of all the meters when on full load leaves much to be desired, and only emphasizes the general dissatisfaction with the regulations of the Sales of Gas Act and its

absurd instructions for testing meters. The most serious aspect is the extent of the use of the bye-pass with incandescent gas-burners and its effect on the unaccounted-for gas. If one bye-pass per house is in use throughout the year, and 75 per cent. of the gas were registered by the meters, the loss at Stretford would be 1 per cent., or 3,200,000 cubic feet per annum, at ½ cubic foot per bye-pass per hour—a result that only strengthens my belief in the wet meter.

G.P.O. TELEGRAPHS.

It is desirable that all gas undertakings, in view of the proposals to place all telephone and telegraph wires underground, should carefully study the Telephone and Telegraph Acts. My Company had recently a sharp experience which may involve them in very considerable and avoidable expense in the future. Two lines of cast-iron pipes have been laid for a distance of over 4 miles within our district by the G.P.O. Telegraph Department; nearly 2½ miles being under the jurisdiction of the Stretford Council and the remainder under the Sale Council. In the Stretford area, the G.P.O. pipes are laid either immediately over or in far too close proximity to the gas and water mains. In the Sale area, the District Surveyor has stepped in and insisted upon them keeping sufficiently far away from both to leave us plenty of room. The Stretford authorities apparently gave their sanction to the application of the G.P.O. without making any inquiries or consulting the other pipe-owners; while, acting on our information, the Sale authorities exercised their powers to the full.

Briefly, the powers of the G.P.O. Telegraph Department are:

Act of 1863—Section 6.

... power ... amongst other things to place and maintain a telegraph under any street or public road and to alter or remove the same.

Section 7.

... in the exercise of such power the G.P.O. shall do as little damage as may be, and shall make full compensation for all damage.

Section 8.

... may remove pipes (but not mains) of gas companies.

Section 9.

The G.P.O. shall cause as little detriment or inconvenience as circumstances admit.

Section 8, 1863 Act, and Section 3, 1892 Act.

... prohibited from placing telegraphs under streets or roads without the consent of the Urban District Council or any other body having control of the road.

It is also provided that in the event of the Gas Company damaging the pipes and cables of the G.P.O., they are liable to a penalty of £50 per day.

Under these Acts, a gas company has no power to enforce its demands except through the road authority; and probably the G.P.O. officials in most cases will send notice to the surveyor before informing the pipe-owners. It is not obligatory for the G.P.O. to give any information to the latter. This is what occurred at Stretford; and as the only free path for the telegraph conduits was in the roadway, which is paved with pitched granite setts on concrete, they proceeded to lay their pipes under footways that were already occupied by gas and water mains and electric lighting and traction cables. No notice was taken of our protests; and as the Council Surveyor had apparently already committed himself, he was powerless. We have on all occasions been met with the quotation from the 1863 Act, that "as little damage has been done as circumstances permit." The Company cannot prove present damage; therefore, they have no case to take into Court, but will be put to additional and unnecessary expense when any extensive alterations or repairs are necessary.

The corporation undertakings must move to obtain protection through their highways committees; but when supplying outside their own boroughs, they, with the companies, must move the district surveyors to take action as soon as they hear that any such work is in contemplation. This is their only remedy.

This information, with full details, has been placed before the Institution of Gas Engineers and the Gas Companies' Protection Association, with a view to their taking action the next time the G.P.O. have any Bills in Parliament relating to the telegraph or telephone service.

As I fear I have trespassed too long on your patience, I must now conclude with the hope that, if I have not added to the general store of your knowledge, I have directed your attention to certain matters that will do with ventilating; and with the consent of your Committee, I propose to follow the example of our brethren across the Border, and give you an opportunity of discussing the various matters I have raised.

THANKS TO THE PRESIDENT.

Mr. J. G. NEWBIGGING (Manchester), in moving a vote of thanks to the President, said the address dealt with many matters of vital importance to the members as gas engineers, especially in view of the great competition they had to face. There were some points raised to which he would have liked to refer, but refrained because he understood there would be opportunities afforded for discussing the address at some future meeting. Certainly there was no dearth of subjects in it; and he thought one of the best compliments members could pay the President was to contribute papers on any subjects they considered would be of interest to the members generally. He trusted it would give



Mr. Kendrick as much pleasure to conduct the affairs of the Institution as it had given members to elect him to the chair.

Mr. T. DUXBURY (Oldham) seconded the motion. In doing so, he remarked that when they came to read quietly the various subjects dealt with in the address, they would doubtless find it even more interesting than it had been to listen to; and this was saying a great deal. He agreed with Mr. Newbigging that if the members wished to back up the President during his year of office, one of the best ways of doing so would be by contributing papers on subjects of interest to them as gas engineers.

The motion having been carried with applause,

The PRESIDENT, in reply, said he desired to acknowledge the help rendered him in the preparation of his address by his two assistants, Mr. E. Meunier and Mr. James Bridge, and especially the latter, who had carried out the bulk of the tests given in the paper.

Mr. W. LEWIS GALLOWAY, the Chairman of the Stretford Gas Company, said he desired to express the pleasure he and his co-Directors felt at the honour bestowed upon their Engineer by the Manchester District Institution. He and his colleagues recognized that they had in Mr. Kendrick an engineer of considerable ability, whose reputation had been further enhanced by the address he had delivered that afternoon and the compliments paid to him by the speakers.

#### Vertical Retorts—Discussion on Mr. Samuel Glover's Paper.

The next item on the agenda was the deferred discussion on the paper read at the meeting at St. Helens on the 30th of October last, entitled "Vertical Retorts at St. Helens," and given in the "JOURNAL" for Nov. 2.

Mr. GLOVER, on being asked by the President to introduce the subject, said he had nothing really fresh to communicate about the installation which members saw when they were at St. Helens, except to report the continued success of the new venture. He might add that the installation at St. Helens had been visited by engineers and others from north, south, east, near east, and west—in fact, as far as civilization extended. Many of those who had visited the St. Helens Gas-Works came, without notice of their intention, to find the retorts working; subsequently expressing their great satisfaction at what they had seen. Another thing was that the retorts continued to be satisfactory to the workers; and, as engineers, they ought to keep this point in view. If they could introduce a new process, or improve a process, so as to ameliorate the position of the workers, it ought to be done. He claimed that this had been accomplished by the installation of the vertical retorts at St. Helens, and that they had achieved their object in increasing the make of gas per ton better than could be done by any other method. One of the first expert carbonizing engineers on the European Continent paid an unexpected visit to St. Helens, and, after spending several days—Sunday included—examining the practical working of the retorts, expressed his clear conviction that in them they had the simplest, most economical, and most practical retorts for the carbonizing of gas coal extant. Recent examination of the retorts satisfied him that the wear and tear was, as he had anticipated, very small indeed; and he was now more than ever convinced that the cost under this head was going to be small. The absence of expansion of the setting anywhere was very satisfactory; and their highest anticipations had been justified. Mr. Glover added that he had with him plans, which he would show members, if they so desired, of an installation of forty retorts at the St. Helens works on the site of the old baths. These retorts would be erected this next summer.

Mr. T. DUXBURY (Oldham) said he was sure they all agreed—at any rate, he did—that vertical retorts had come to stay. In his opinion, they would be the retorts of the future, so far as they could see at present. The advantages claimed seemed to him to be so great, that sometimes one was inclined to look upon them as fairy tales. They were so many that he was afraid there would not be time to go through them all. There seemed to be a saving in every way, and in every respect. The chief point to him was the great saving effected in labour. He had been making a comparison between the figures given by Mr. Glover and the cost by the combined stoking machinery they had at Oldham; but there was no comparison, if Mr. Glover's figures were really correct. The cost per ton for the two settings was given as 275d.; and, taking the same items as Mr. Glover, he found that with the combined stoking machinery at Oldham the cost came to about 11d. per ton, and with their hand charging they got up to 43d. per ton. Another point about these vertical retorts was that by them they would get a much better class of labour. In the future, with vertical retorts in use, the stokers would work under much better conditions. He might add that they had practically decided to put in vertical retorts at the central gas-works in Oldham, because they hoped, among other things, to have from them less dust and smoke in the centre of the town. It seemed to him that if they could adapt to their gas-making business a system similar to that which they had seen at St. Helens, they would certainly get ahead of their electrical friends, in being able in the future to make gas without causing any nuisance whatever. There was one question he desired to ask with regard to the illuminating power of the gas obtained from certain classes of coal by these vertical retorts. This was a matter of importance to towns such as Oldham, where they had to supply gas of a high light-giving quality—as much as 20-candle

power—owing to many of the mills having still in use the old flat-flame burners. He wanted to know what gas was made by these retorts per ton of Yorkshire Silkstone coal and Arley Mine coal—if it was 18-candle gas by the "Metropolitan" No. 2 burner. He should also like to know something about the quality of the coke produced by the continuous process compared with that obtained from the intermittent process. He had heard that the coke resulting from the former process was not so good in quality or so hard as that produced by the intermittent charge.

Mr. J. G. NEWBIGGING (Manchester) said most of those present were aware that Messrs. Glover and West were putting up an installation of their vertical retorts for the Manchester Corporation at the Droylsden station. They were making good progress with the work, and he was sorry the installation could not possibly be got ready in time for the members attending that meeting to inspect it. However, it would be completed shortly; and it would be a pleasure to him to show the retorts in operation to any member of the Institution who desired to inspect them. Or if any members cared to look at the work in progress, which was always interesting, he would be pleased to see them. He felt confident in his own opinion that the results which had been realized at St. Helens would be attained in Manchester. In fact, as their installation was a larger one than that at St. Helens, they anticipated improving upon the results. At any rate, in a very short time they would see what they would see.

Mr. E. H. HUDSON (Normanton) asked Mr. Glover if he had fully considered the effect of expansion and contraction on the tiles of the retort; and, if so, what was his opinion on the matter. He also asked if, in view of the repairs and renewals which must necessarily take place at some time, a lot of the saving, compared with horizontal retorts, would not be discounted.

Mr. JOHN WEST said he was glad his friend Mr. Duxbury had raised the question of the illuminating power of the gas, and pointed out that if reference was made to the brochure issued on the Glover-West system at the St. Helens gas-works they would find the result of experiments made by Dr. Colman—and he could give no greater authority. In the test with Arley Mine coal, the yield was 11,590 cubic feet with the carbonic acid left in, and an illuminating power by the "Metropolitan" No. 2 burner of 17·82 candles. But they could do almost what they liked in this direction; for, in a test made by himself with a combination of coal and cannel, he got 20½-candle power with a No. 1 "London" burner. If they wanted to make a large volume of gas, the best method was to use vertical retorts; and he thought, from a gas-makers' point of view, and on the ground of economy, it was best to work each coal for the making of the largest volume of gas per ton, and, if necessary, enrich it up to the standard required. They had the matter in their own hands; just as with the horizontal retorts, and could regulate according to the speed and working.

Owing to the lateness of the hour, the discussion had unfortunately to be curtailed.

Mr. S. GLOVER, replying to the remarks which had been made, said he was convinced, from his experience, that vertical retorts, as Mr. Duxbury had observed, had "come to stay." He was distinctly of this opinion, and believed that in future the extensions at all large gas-works would be on the vertical system, especially where constant working and an extra make of gas per ton of coal were desired, and where economy of space in the erection of buildings was a point for consideration. Referring incidentally to the methods of carbonizing adopted by engineers in the Scottish shale-oil works, and to the surprise expressed by them that gas engineers had not adopted their methods, Mr. Glover pointed out that there was a very great difference between the materials to be dealt with. What was good for Scotch shale was not, he said, suitable for gas coal—the systems were quite different. As to the question put by Mr. Duxbury about the quality of the coke obtained from the continuous as compared with that from the intermittent process, he might say that from the latter the coke produced was of closer texture, like foundry coke; while the other was somewhat of the kind of coke coming from a coke-oven. In answer to the question put by Mr. Hudson, Mr. Glover said the expansion and contraction in the ordinary way was very slight and very even. Each part of the setting was maintained at a constant temperature; and, the interior of the retort always working in the same condition, the expansion, whatever it was, was small. It was less than an inch over the whole of the setting; and the contraction being equally divided, the tiles of the setting adjusted themselves to the tapering shape of the retort, making it complete. He did not expect, from his experience, that the saving in labour would be at all discounted by the extra cost of the settings; and he was satisfied, after a fourteen or fifteen months' trial with the vertical retorts, that the cost for repairs and renewals would be small indeed.

#### VOTES OF THANKS.

A vote of thanks was accorded to Mr. Glover—on the motion of Mr. WATSON, seconded by Mr. JOHN BOND—for the interesting paper he had contributed to the "Transactions" of the Institution, and for his remarks that afternoon.

Before the business concluded, a vote of thanks was passed to the Hon. Secretary, on the motion of Mr. MORRISON, seconded by the PRESIDENT, both of whom paid a warm tribute to the way in which Mr. Whatmough discharges the duties of his office.

The members subsequently had tea together.



# ILLUMINATION.

At the Royal Institution, last Thursday afternoon, Professor Silvanus P. Thompson, D.Sc., F.R.S., delivered the second of his course of three lectures on the subject of "Illumination, Natural and Artificial."

The first lecture (a notice of which appeared in last week's "JOURNAL," p. 499) was on the subject of light and lighting; while the second dealt with sources of light, and was illustrated with quite a number of different types of gas and electric lamps—all of which were shown in actual operation. In his opening remarks, the lecturer stated that he had to speak that day of the sources of light and their dependence on certain laws which had to be studied in order to understand what was the value of the recent improvements that had been made in methods of illumination by both gas and electricity. He referred first of all to Tyndall's work on the subject, and to the subsequent further investigations which had been made. The inventions of the last quarter of a century in connection with gas and electric lamps all practically turned upon the question of getting the dominant wave length in the spectrum that was most suitable for the human vision.

The lecturer showed how it was possible to improve the light obtainable from gas by putting into it a solid body which, when hot, would give off more illumination than a gas-flame itself. The early suggestion to hang in burning gas little baskets of platinum wires was referred to; but it was pointed out that these would not for long stand without disintegration the temperature to which they were subjected. He followed the proposal of Welsbach to employ, in a non-luminous or barely luminous flame, a mantle composed of rare earths possessing peculiar radiating qualities. The mantle was no hotter than the flame, though it appeared to be so. Great attempts had been made to secure an actually hotter flame; and the Welsbach "C" and Kern burners embraced various improvements having this end in view. How gas engineers had turned to account the various discoveries that had been made, was demonstrated by the following table.

Light Emitted Per Cubic Foot of 16-Candle Gas Consumed Per Hour.

Burner.	Candle Units.
Incandescent, high pressure . . . . .	30 to 35
"    Kern . . . . .	20 to 25
"    ordinary . . . . .	14 to 19
Regenerative . . . . .	7 to 10
Standard argand . . . . .	3'2
Ordinary argand . . . . .	2'9
Union jet, No. 7 . . . . .	2'44
"    "    No. 0 . . . . .	0'59

Thanks to the Gaslight and Coke Company, proceeded the lecturer, he had burners of all kinds on view. Some of these were inverted—a delightful and efficient form. Great ingenuity had been exercised in the construction of this type of burner, in order that the heat should not destroy or deteriorate too rapidly the metal work above. With high-pressure air or gas, of course, a higher temperature was at once attained with greater specific radiation; and effects in the same direction were secured with self-intensifying lamps. He drew special attention to the Chipperfield lamp, in the top of which there is an engine worked by the waste heat. This engine, it was pointed out, is of a most simple kind—having no cylinder and no piston—operating a bellows made on the principle of a concertina.

Turning to the parallel improvements in electric lighting, the audience were shown that, instead of the ordinary carbon, there were now flame arc lamps, fitted with carbons impregnated with various chemicals. By this means, it was remarked, a flame was obtained at the bottom of the lamp, which could therefore throw its light uninterruptedly straight downwards; and this flame gave more of the rays to which eyes were accustomed than did the white light. The Nernst lamp with its filament of rare earths provided a good light; but a drawback to its use was the fact that it was necessary to wait two or three minutes for the preliminary heating which had to take place before the glower began to glow. Then there were metallic filament lamps—the result of the finding of materials which could be heated up to a higher temperature than the practical limit of carbon. The first of these was osmium, which, strangely enough, had also been suggested by Welsbach, Osmium, however, was a very rare material; and there was not enough in the world to render it possible to manufacture the lamps in sufficient numbers. Tantalum was next brought into service, and afterwards tungsten—which was a most unmanageable metal. The difficulty had been to make wires out of tungsten, and extraordinary ingenuity had been exercised in this direction. Now, everybody was substituting for the ordinary carbon glow lamp these tungsten lamps, under the name of "osram." One other improvement that should be mentioned was the Cooper-Hewitt vacuum lamp, consisting of a tube containing only mercury and mercury vapour. The last type described was the regenerating flame arc lamp.

In conclusion, the lecturer remarked that he had gone over some of the matters connected with specific radiation, and the improvements that had been made with gas and electricity in this direction. It was obvious that with these higher temperature sources, the light must be produced under better conditions, as there was being obtained a larger proportion of those radiations to which the eyes were most sensitive.

# SOCIETY OF BRITISH GAS INDUSTRIES.

The Annual General Meeting was held last Thursday, at the Waldorf Hotel. Mr. CHARLES CLARE, the Chairman of the Council (who on this occasion was retiring from that office), presided.

The SECRETARY (Mr. Arthur L. Griffith) read the minutes of the last general meeting; and they were confirmed.

The CHAIRMAN then presented the following

## REPORT OF THE CENTRAL COUNCIL.

In presenting the fourth annual report to the members of the Society, your Council have pleasure in recording that, during the past year, good work has continued to be done. There are various important subjects claiming the attention of the Society which require time for development.

The membership of the Society has steadily increased; and now includes most of the important firms in the gas industry. The Council are pleased to note that members are making full use of their respective Sections by bringing forward for consideration from time to time matters of interest, as only by this means can they derive full benefit from the Society.

A final meeting was held in February, 1909, with the Institution of Gas Engineers on the question of Standard Clauses of Contract; and the clauses were then finally approved by both Councils, and recommended for adoption. It is encouraging to note that many engineers have already made use of, and referred to, these clauses in issuing specifications.

One of the principal matters now under consideration is the abatement of the smoke nuisance. A valuable paper was read by Mr. C. E. Brackenbury at the autumn meeting on "Some Legal Aspects of the Smoke Nuisance," and an interesting discussion followed. It is hoped to arrange a conference on the question with representatives of the Institution of Gas Engineers, the Coal Smoke Abatement Society, and other Societies.

Your Council regret that the Bill introduced into Parliament in June, 1908, with the object of extending the powers of the Board of Trade in granting Provisional Orders, and of simplifying and cheapening procedure under the Gas-Works Facilities Act, was not proceeded with, owing to pressure of business. It is hoped that the Bill will be brought in again at the earliest opportunity.

The important question of the standardization of refractory materials is receiving the careful attention of the members interested.

The Society is fortunate in having secured as its President for the coming year Mr. J. H. Balfour Browne, K.C.; and your Council look forward with confidence to a successful year under his guidance.

The Society is much indebted to Mr. Thomas Newbigging, M.Inst.C.E., the retiring President, who has taken the greatest interest in its welfare, and tenders him its very best thanks for his valuable services and for his encouraging addresses. The Council are gratified that he has accepted a Vice-Presidency, and hope to have the benefit of his experience and advice in the future.

The financial position of the Society is satisfactory.

## INDISPOSITION OF MR. THOMAS NEWBIGGING.

In connection with the reference in the report to the retiring President, a letter of regret at absence from Mr. Newbigging was read by the Secretary. It ran as follows:

I regret to say that I am still laid up by the doctor's orders, and by my own bodily weakness. The illness from which I am slowly recovering has left me in a very frail state, and quite unfit to travel. I need not tell you how much I feel the deprivation. I was looking forward to the great pleasure, as well as privilege and honour, of installing my friend, Mr. Balfour Browne, K.C., as my successor in the presidency of the Society on Thursday next, when this unfortunate illness intervened. You cannot regret my enforced absence more than I do myself; but there is no help for it. Fortunately, the Council will have no difficulty in providing a substitute to do what is necessary. You will have a successful and pleasant reunion; of that I have no manner of doubt. My warm good wishes will be with you on the occasion.

## OFFICE-BEARERS.

It was announced that the office-bearers for the ensuing year were:

### PRESIDENT:

J. H. BALFOUR BROWNE, Esq., K.C.

### VICE-PRESIDENTS:

DUGALD CLERK, Esq., F.R.S., M.Inst.C.E., F.C.S.  
THOMAS NEWBIGGING, Esq., M.Inst.C.E.

### CENTRAL COUNCIL:

Chairman: FRED. J. WEST.

Vice Chairman: H. JAMES YATES.

W. ARMITAGE DRAKE, representing Section I.	
HUGH F. WRIGHT	" II.
HARRY J. DONKIN	" IIA.
THOMAS S. CLAPHAM	" IIB.
W. J. JENKINS	" III.
J. R. PICKERING	" IV.
JOHN MACKAY	" V.
H. JAMES YATES	" VI.
THOMAS G. MARSH	" VII.
W. D. HELPS	" VIII.
H. N. BICKERTON	" IX.
W. B. GIBBONS	" X.

Honorary Secretary: CHARLES CLARE

Honorary Treasurer: H. M. THORNTON

Secretary: ARTHUR L. GRIFFITH, 46, Queen Victoria Street, E.C.

## THE NEW CHAIRMAN.

It will be observed that there is a change in the chairmanship of the Council; Mr. Clare, who has held the position from the



inception of the Society, has retired, for the sole reason that he believes the occupying of such an office by one man tends to cause affairs to drop into a sort of rut. On this ground only, the change has been made.

On Mr. FRED. WEST taking the chair, the members enthusiastically passed a vote of thanks to Mr. Clare for his services.

#### HONORARY MEMBER.

Mr. C. E. Brackenbury, Barrister-at-Law, Assoc. M. Inst. C. E., who has rendered considerable and valuable service to the Society by the reading of papers, and by the drafting of the model contract clauses, was elected an hon. member of the Society.

#### VICE-PRESIDENTS.

It was formally, but with much gratification, announced that Mr. Thomas Newbigging had accepted a vice-presidency of the Society; and the honour of election to a similar position was conferred upon Mr. Clare for his conduct during the past four years of the duties of Chairman of the Council.

#### INDUCTION OF MR. BALFOUR BROWNE, K.C., AS PRESIDENT.

Mr. DUGALD CLERK, F.R.S., said he was sorry that the retiring President (Mr. Thomas Newbigging) had been ill—it was nothing serious—and was unable to come to the meeting to inaugurate the presidency of Mr. Balfour Browne. He (Mr. Clerk) was sorry on account of the illness of Mr. Newbigging, but was glad to have an opportunity of transferring the presidency of the Society to another brother Scot. It was rather remarkable that, of four Presidents the Society had chosen, three of them should have been Scots—Mr. Newbigging, Mr. Balfour Browne, and himself. In their new President, the Society was exceedingly fortunate. The first three Presidents were all engineers; and Mr. Balfour Browne was an industrial and (as he reminded him) an industrious lawyer as well. Mr. Balfour Browne had long been connected with industrial matters. His earliest book relating to anything dealing with the subject was "The Law of Carriers," published in 1873, "The Law of Rating" in 1874, "The Rating of Railways" in 1880, "The Law of Compensation" in 1896. Then there was a general book on South Africa in 1895; and "Essays, Critical and Political" in 1907. Their new President had, in fact, done a large amount of book-writing; and he (Mr. Dugald Clerk) could sympathize with him. Mr. Balfour Browne assured him that he found the writing of books one of the greatest pleasures and most restful occupations that a busy man could have. He (Mr. Clerk) had also found the same thing. Without further words, he would transfer Mr. Balfour Browne to the presidency of the Society.

Mr. BALFOUR BROWNE, on stepping to the chair, was received by acclamation. He thanked the members for the honour done him in electing him their President, and then proceeded to read an Inaugural Address, entitled

#### TRADE AND LEGISLATION.

The PRESIDENT commenced his address by referring to recent events in the political world—more especially to the demand for a reform in the constitution of the House of Lords. He was distinctly in favour of a Second Chamber; but not one constituted like the House of Lords of to-day. After alluding to some of the schemes of reformation proposed, Mr. Balfour Browne proceeded: Now Britain is a trading nation; and the trade and industries of the nation are the foundations of our national greatness. It is true we have produced men great in science, in law, in world politics, in government; and it is well that these should find places in a reformed Second Chamber, as, indeed, they do find places in the unreformed House of Lords. But I am convinced that no Second Chamber, no Senate, no House of Parliamentary Lords, would be complete without direct or indirect representation of the trade of Britain.

That there has been a necessity for a closer connection between trade and legislation has been widely felt; and Lord Wemyss, in July, 1909, gave notice of a motion in the House of Lords which purported to deal with this matter. The resolution was—

That, in the opinion of this House, it would be for the public good that important national trading and other representative societies should each name three members of the existing peerage in the current and each succeeding Parliament to speak and act on behalf of such societies on all questions on which they are interested, and that the names of the Peers so nominated be entered in the "Journals" of the House. (2) That the Lord Chancellor, the Marquess of Landsdowne, the Earl of Crewe, and the Earl of Halsbury be empowered to determine what societies are of sufficient importance to be admitted to the said privilege of nomination.

Although, in my view, the scheme was a crude one, and amounted to little more than the retaining of certain Peers of Parliament to act as it were as Counsel for the great trade organizations of the country, it was a recognition of the necessity to which I have referred—of a closer connection, even in the Second Chamber, between the great trades and industries of the country and the legislation which finds its way on to the Statute Book. At that time, the opportunity of giving effect to this important claim did not offer; but now that reform of the House of Lords has become part of the policy of the Unionist party, and that the Government has hung a sword by a thread over the Peers, it seems to me the right moment to urge the claims of societies such as yours to representation in our new Second Chamber.

Lord Wemyss, in a letter to the "Financial News" of July 29,

1909, made the suggestion that the societies who were to have as it were the privilege of being represented by Counsel in the House of Lords were the Royal Institute of British Architects, the Royal Academy of Arts, the Society of Authors, the Building Trade Federation of the United Kingdom, the Society of Engineers, the Gas Companies Association, the London Chamber of Commerce, the Machinery Users Association, the Royal College of Physicians, the Railway Companies Association, the Royal Sanitary Association, the Shipping Federation, the Surveyors Institute, and the Employers Parliamentary Council; and he hoped that other bodies would be added to the list. I confess that many of these bodies seem to me to have already ample representation in relation to legislation, and, further, that the list—in including artists, physicians, and authors—is not really nearly so representative of trade and industry as it ought to be; and I am convinced that our Society has, for many reasons, a strong claim to be more in touch with the legislative proposals of Parliament. That is why I desire to see the trade of this country directly represented in the House of Lords.

In your memorial to the President of the Board of Trade of June 23, 1908, you pointed out that the industries carried on by the members of your Association suffered from the way in which lack of security deters the proprietors of non-statutory gas undertakings from developing their business, and that the lack of security was a very serious obstacle to the formation of small local companies, and the construction of works to supply gas in many small towns and country villages. You also drew his attention to the fact that the uncertainty as to the result of, and the cost inseparable from, an application for a Provisional Order deters undertakers from approaching the Board of Trade, and you stated that the powers of the Board of Trade in granting Provisional Orders, and of simplifying and cheapening procedure under the Gas-Works Clauses Act, would result in increase of home trade and employment, both to you as manufacturers and to the public.

In that memorial you called attention to some great and some minor evils; and concerning these I would desire to say a few words. On the memorial nothing seems to have been done. It is true that a Bill, called the Provisional Order Procedure Act—to enable rules to be made regulating the procedure with respect to Provisional Orders made by the Board of Trade and the Local Government Board under certain Acts of Parliament—was introduced; but nothing came of it. In one of the sentences I have quoted, you touched on the real germ of the disease from which you and trade generally is suffering; and that is the lack of security. This is due not only to the facts you point out, but to the trend of current politics and legislation.

There has for a good many years been a tendency to concentrate all public functions in the hands of public authorities, instead of allowing them to be carried on by individual and private enterprise under the control of the State. There may have been much to be said for the transfer of some of those semi-public duties from the hands of companies into the hands of municipalities. Water, for instance, is a necessity of health; and its supply in ample quantity and of excellent quality is a sanitary necessity. Again, it cannot be superseded by any other article of commerce; it must always remain a monopoly. But it is not at all certain that the same reasons apply to the transfer of gas undertakings. The manufacture and distribution of gas is a trade, and a trade in a manufactured article. Gas is a commodity that has to be sold and is not paid for by a rate. It is a competitive illuminant with many others; and when these undertakings get into the hands of corporations, which may also be the owners of electric lighting and power works, there may be a serious detriment to the public from such monopolistic appropriations.

But when municipalities have become monopolists of any great industry, there is a tendency for that monopoly to extend itself in various directions. We know how railway companies, which were introduced in the first instance merely to be the providers of iron roads upon which the public were to be entitled to run with their locomotives and carriages, became, in time, the sole carriers upon their own permanent way. We have seen how this monopoly of the long-distance traffic of the country has spread itself, and how to-day railway companies are not only doing the carriage by rail, but the collection and delivery of goods by carts in our towns, and how they are running the great town carriers off the road. We know, too, how they have become on a gigantic scale the owners of steam-boats, which not only carry on a ferry service ancillary to carriage by rail, but carry on an extensive trade with Continental ports. Further, we see how this species of monopoly spreads when we know that railway companies have become hotel proprietors on a large scale. The same observation is true of the municipal monopoly which it has been the desire of the State to create. Corporations not only run tramways but have in that connection provided extensive manufacturing and rolling stock repairing shops, and in that way are competing, with ratepayers' money, with a legitimate enterprise which used to be carried on by means of private capital. We know, too, that some corporations have not only made a good thing out of their gas undertakings—I see that one of them last year carried the large sum of £70,000 from the gas profits to the relief of rates—and that they have, again in unfair competition with private enterprise, started shops for the sale of gas and electric fittings. In all these respects private enterprise is going to the wall; but it is upon private enterprise that you must rely for all pioneer work, for all initiative in trade, and for the real adventurous development of industry. If you kill that, the country must stagnate; and in



national life it is impossible to stand still. Unless we go on, we must fall back; and this is one of the perils to the country to which I desire to point.

This tendency to acquisition of gas-works by local authorities has operated largely. So much so that, when a non-statutory company applies to Parliament for statutory powers to get the necessary security the absence of which you deplore in your memorial, it has almost become the invariable rule for the local authority to apply for, and secure, a purchase and sterilization clause as a condition of the passing of the company's Bill. Under such circumstances, it is not a matter for wonder that, as your memorial pointed out, during the 38 years since the Gas-Works Facilities Act became law, only fifty non-statutory undertakings have applied to the Board of Trade for statutory powers, and that there are still 880 gas-works in the United Kingdom being worked as non-statutory undertakings. If they enjoyed the better security which statutory recognition would give them, it would undoubtedly lead the companies to invest money in useful developments, and it would induce others to supply the small towns and villages which are at present without a supply.

It is, of course, true that the expense in obtaining Orders from the Board of Trade, and the uncertainty, have prevented the Act being of much use; and it is obvious that these expenses should be cut down. Why the promoters of Private Bills and Orders should have to pay fees to the Houses of Parliament, which, in the aggregate, are sufficient to provide for the maintenance of the structure and the payment of the whole staff of the Palace of Westminster, I never could make out. But a mere Private Unopposed Bill, when no counsel's fees have to be paid (so my withers are unwrung), costs some hundreds of pounds; and all this, of course, is dead capital—a millstone round the neck of the enterprise, not living capital which is going to produce gas.

This question of "security" for home enterprises is even larger than it seems. We have recently heard of the flying millions which are seeking investment in foreign countries, instead of staying at home to enrich our own wage-earners and manufacturers. It is obvious that this drain of capital out of the country is a matter which has to be deprecated in the interests of manufacture and of labour. It has, in recent heated controversy, been ascribed partly to the lurid political atmosphere which has been produced by the Finance Bill, and partly to the inducement which the existence of tariffs in other countries, and the absence of protection in our own, gives to manufacturers to establish works in foreign countries behind the tariff walls. Such matters are too political for me to deal with in this place. But I can, without becoming a partisan, point out that, to some extent, the insecurity which has led to the decampment of capital is due to our past legislation. We know that the Patent Act, which was passed with the object of compelling those who took out English patents to work them in this country, has already had a beneficial result in bringing foreign capital into this country, and also in finding employment for many workmen here.

If it is good to have foreign capital invested here, surely it must be bad to have so much of our own capital invested in foreign countries. But the unwise legislation of the past has been a means to that ruinous deportation. The legislation I refer to is that which has checked private enterprise in this country, and has unduly favoured the cumbrous operations of municipal corporations and local authorities. For instance, the necessity under which promoters of tramways were to obtain the consent of the road authority as a condition precedent to the obtaining of tramway powers has been a distinct disadvantage to the development of tramway enterprise in this country. The petty jealousies which have existed between small local authorities have prevented the useful development of running powers over light railways and tramways; and in most cases where compulsory running powers have been asked for, Parliament has—in its favour for municipalities—refused the grant of these. I only refer to this class of legislation as an illustration of the trend of legislation which is apparently to municipalize most of our public enterprises.

This tendency is not only manifested when a transfer takes place, but the coming events cast their shadows before. For years before the water undertakings were transferred by statute to the Metropolitan Water Board, Parliament was in the habit of putting in the Companies' Acts clauses forcing them to provide sinking funds for the benefit of any ultimate purchaser, and also clauses, which were called "sterilization clauses," which prevented the Companies reaping any benefit, in case of such a purchase, from the capital expenditure which was necessary to keep pace with the public requirements. Indeed, in effect, Parliament was making the Companies, who were in the inception trading companies for profit, trustees for the public. Under such circumstances, no enterprise could prosper. In the same way the London Dock Companies recognized the necessity for improvements in their docks. The competition for the shipping of the world is exceedingly keen. Some of the Continental ports have been enlarged to a great extent, and have been assisted in their enterprise by Government subsidies. But in the case of some of our London Docks, though Parliament recognized the necessity of improvements, they also desired that the shareholders in these Companies should derive no benefit from the improvements which were to be made by the new capital, and insisted on a sterilization clause similar to that which had been put in the Water Companies' Acts. The result was that the improvements were not carried out; and the London Docks fell behind in their competition with foreign ports.

Here, again, is an illustration of the effect of the short-sighted legislation which has discouraged by every means in its power private enterprise, and has encouraged by various means the municipal trading which has certainly not been an unmixed benefit to the community. It may be known to some of you that, with a like object in view, when electricity as an illuminant first sought parliamentary sanction, the Legislature, with the view of securing that electrical undertakings should only in their pioneer stage be in private hands, provided that after 21 years these should be purchasable by the local authorities. This provision was made by the Electric Lighting Act, 1882; and the clause in question was on similar lines to that which was contained in the Tramways Act, 1870. The result of this legislation was that capital buttoned up its pockets, nothing was done under the Act, and Parliament had to climb down, and passed an Act in 1888 extending the period of concession to 42 years.

In the same connection, Parliament made another mistake. In relation to electrical undertakings in London, with the view, I suppose, of keeping the undertakings small and confining them to limits within which the local authorities could at the end of 42 years purchase, forbade the companies to make any contracts among themselves, and made it illegal for one such company to supply electrical energy to another. The result of this prohibition has been to make Londoners pay far more for the illuminant than they ought to have done. The secret of cheap production is large-scale production; and this is essentially the case in relation to the generation of electricity, where success depends so much upon the load-factor, and where a large area with varied industries gives what the producer requires for economical production—a large diversity factor.

I have given enough illustrations to show that legislation has produced frost; that it has discouraged private enterprise in this country; and that, in consequence, there has been a trek of capital into other lands.

It is sometimes said that the depression of trade from which this country is suffering, the want of employment of which the labouring classes have to complain, is due to some defect in our manufacturers or to want of technical education in our workmen. With regard to the latter libel, I say it is not true. There is no use talking to men about better technical education when they cannot get work. It is prosperity which will teach men accomplishments. Adversity, which cannot be mended, only teaches despair. As to our manufacturers, again I say that they require the encouragement of prosperity to embark in new developments and in enterprises. I was glad, however, to see from the valedictory address of your last President, my friend Mr. Newbigging, that, in his recent visit to the United States and Canada, he found that the gas machinery apparatus and plant of British makers are held in high estimation, and that lack of originality and imitation of your work were striking characteristics of their manufacturing methods. These excuses, therefore, are unfounded; and the insecurity which has been produced by errors in legislation, by faults in policy, is the real reason why we have to deplore a stagnation, or retrogression in our trade, which, if it were to continue, would spell ruin for the country.

It is these considerations which force upon one the immediate necessity of further and better representation of trade interests in the legislative machinery of the country; and your Association, of which you have asked me to be the somewhat unworthy head during the present year, must use every effort to bring about this much-needed reform, not merely in the selfish interests of the trade you so ably carry on, but in the interests of the country as a whole.

At the close of the address,

Mr. DUGALD CLERK said they had to thank their distinguished President for his able and interesting address. He found himself thoroughly at one with him on many of the points raised in the address. All the points were interesting; and all were ably dealt with. But there were two sides to politics; and it was quite natural that some people should look at the matter in one way, and some in another. He (the speaker) happened to be a Liberal, and accordingly he did not sympathize with some of Mr. Balfour Browne's remarks. From his point of view, he could quite see the full logical justification; and he sympathized entirely with him in his scheme for the reform of the House of Lords. There should undoubtedly be a Second Chamber. He agreed with him that the Second Chamber should have due powers, and also that it should act as a brake and fly-wheel. He had not one word to say against the House of Lords. It contained a lot of distinguished men. A House that had included such men as Lord Kelvin, Lord Rayleigh, and other eminent scientific men and statesmen, was a House that should command respect. He was not in sympathy with those who were always abusing the House of Lords. It had done good service; but the times were altering. He was quite in agreement with the President as to trade and commerce being represented in the Second Chamber; this being essential to the success of the country. In his opinion, one-third of the members should be hereditary peers; and the remaining two-thirds should be elected by the great bodies of men who had organized themselves in the country in connection with its business, scientific, and industrial work. The engineering societies should certainly be represented. The Institution of Civil Engineers, for instance, included 8000 members, who were doing practically all the engineering work of the world. In the same way, the Institution of Gas Engineers and the Society of British



Gas Industries had a right to be represented in the new body proposed by Mr. Balfour Browne. He most thoroughly concurred with what had been said as to Great Britain being a trading nation. Much had been said lately about Britain being degenerate. Neither in Science, Art, nor Industry had Britain been so thoroughly alive and progressive as now. He did not agree with those who talked about German education being superior to that of this country. Great Britain was second to none in the world in its inventions and discoveries. If America or Germany had invented the steam-turbine, the whole world would have rung with the achievement; but because it was our own modest Parsons, nothing was heard about it but abuse. He did not consider the country was in any danger from capital going abroad; and he gave his reasons. Regarding the new Patent Act, he had got out a list of concerns that had been established in this country directly through its operation; and they amounted to practically nothing. In his opinion, the Act had done more harm than good. He was decidedly at one with Mr. Balfour Browne, as to the desirability of modifying legislation in such a way as to encourage the sense of security. There had been a great deal of legislation due to the legislators not being business men; and he instanced the Coal Mines Regulation (Eight Hours) Act. The address of their President was a stimulating one; and he hoped it would lead to great improvement in the law of the country, and to an awakening in the great industrial bodies that at present stood indefinitely in the legislation of the country.

Mr. FRED. WEST, in seconding the vote of thanks, said the address had been most interesting; and he was quite at one with the President in almost every point he had touched upon. The connection that Mr. Balfour Browne had made between the House of Lords and business was a clever one; and he agreed with him entirely as to the industrial world being represented in the Second Chamber. With reference to municipal trading, he thought they as a Society might have a discussion on the subject, as most trading firms were badly hit by it. Such a discussion might take place during the presidency of Mr. Balfour Browne, who had a large knowledge of this important question.

The motion was carried by acclamation.

The PRESIDENT, in responding, said he had just returned from a General Election, in which he had fared badly; and, in preparing his address, he had prided himself on its being absolutely colourless. But Mr. Dugald Clerk had fallen foul of him, and had questioned some irrefragable truths. He should like not only to discuss municipal trading, but to have a night with Mr. Dugald Clerk on certain of the matters to which he had referred. He thanked the members for the way they had listened to him. He was convinced that both tariff reformers and free traders had one object at heart, and that was the prosperity of the country. They merely looked at the matter from different points of view; but he thought free traders were getting converted. [Laughter.]

Shortly afterwards, the members informally dined together. "The King" and "The President" were the only toasts proposed; but there was an excellent musical programme, and this and social intercourse combined to make a pleasant evening.

## THE RETORTING OF COAL.

By HENRY O'CONNOR, F.R.S.E.

[A Paper Read before the Scottish Branch of the Society of Chemical Industry.]

On the evening of Tuesday, the 22nd ult., Mr. H. O'Connor, Assoc.M.Inst.C.E., F.R.S.E., read a paper on the above subject, before the Scottish Branch of the Society of Chemical Industry, in the Glasgow and West of Scotland Technical College—Mr. DAVID J. PLAYFAIR presiding.

The author said that the subject he was to introduce was a very important one, when it was considered that in Great Britain alone some 15 million tons of coal were annually carbonized for the making of gas. For many years gas engineers were justly accused of showing little progress in the methods of applying the necessary heat to the conversion of the solid coal into the very complex matter called "gas" and the residual coke. Of recent years, however, proposals had been brought forward for improving the yield of gas, both as to quantity and quality, whether illuminating or calorific, and also making a better coke. There was no doubt that one of the greatest advances was made when Siemens introduced his gas-fired furnace, when he proposed the partial combustion in the furnace and the final conversion to carbonic acid among the retorts. The adoption of most of the modern methods of retorting coal would be impossible without this system of firing.

The next movement in the direction of improvement occurred about twenty-five years ago, when M. Coze introduced his system of sloping retorts at Rheims. He was not the inventor of sloping retorts, as these were apparently tried by Murdock, the discoverer of gas. A description of the setting and working of inclined retorts was given; and then the author proceeded to say that the most recent adoption of sloping retorts on a large scale was probably that of Mr. W. R. Herring, at the Granton Gas-Works, Edinburgh, where the average make per ton throughout the year 1904 was 10,423 cubic feet, in 1905 10,802 feet, and in 1906 10,973

feet. The entire costs of carbonizing, including wages for foremen, discharging coal, attending to coal-breakers, elevating and conveying coal to the bunkers, charging and drawing the retorts, attendance to mouthpieces, cleaning and repairing retorts, greasing machinery, furnace attendants, hot-coke conveyor and engine men attending to the machinery, were in 1904 1'482d. per 1000 cubic feet, in 1905 1'3d., and in 1906 1'28d., or probably little more than half the average cost of such work in the principal cities in this country. These figures were actual working results, and not test results only. The results in residuals obtained in the working of the "forty-fives" of the late Mr. G. R. Love, of Guildford, were given in a report by Dr. Harold G. Colman. A more recent plan, which had been adopted in England with horizontal retorts, and which was first suggested by Mr. Charles Carpenter, of the South Metropolitan Gas Company, was to fill the retort completely with coal, so as to utilize the whole space and cause the gas to pass quickly out of the retort, and so reduce the number of times the mouthpieces had to be opened, which, of course, caused a certain loss of gas. There was no doubt the idea of this system was due to the methods adopted in coke-oven plants.

Coke-oven installations were described, as well as the chamber retorts of Mr. Thomas Glover, of Norwich. There was, it was stated, a marked decrease in the free carbon in the chamber-retort tar, as compared with ordinary retort tar, and an increase in the proportion of heavy oils, showing that the volatile products of the coal were not subjected to the action of so high a temperature before escaping from the chamber, as was the case with ordinary retorts. The gas made per ton amounted to 13,247 cubic feet, of an illuminating power of 14'94 candles, as compared with 15'84 candles in ordinary retorts. The gross calorific power, by Junkers' calorimeter, was 549'48 B.Th.U., as compared with 565'9 B.Th.U. in ordinary retorts; and the net calorific power, 493'9 B.Th.U., as compared with 512'6 B.Th.U.

The Dessau vertical retorts were then described, and the results obtained at Sunderland given; these being, for 48 hours, in a setting of sixty retorts, with eleven-hour charges, a yield of 12,028 cubic feet of gas per ton of coal carbonized (Holmside Durham), of 17'55-candle power, with a calorific power of 635'4 B.Th.U. gross, and 568'9 B.Th.U. net. The Woodall-Duckham system of vertical retorts, with continuous carbonizing, was described; and the results obtained at the Nine Elms Gas-Works were given as: Coal used (Birley Silkstone), 86'3 tons; gas made per ton, 12,423 cubic feet; illuminating power, 15'82 candles; sperm value, 674; calorific value 596'6 B.Th.U. gross, and 530'7 B.Th.U. net. It was at first thought that the introduction of steam to make some water gas would be advantageous; but up to now this had not been found so. This would, of course, utilize some of the heat in the coke after carbonization, which, unless it could be fed into the furnace directly while hot, was lost. If a lower candle power and calorific value would satisfy the people of this country, as it did on the Continent, then no doubt steaming could be carried out, and full advantage of this heat be obtained. The Glover-West verticals at St. Helens were then described; and the results were given as: Coal used, Thornley, Barrow, and Wigan Arley; yield per ton, 12,561 cubic feet; illuminating power, 15'66 candles; calorific power, 578'2 B.Th.U. gross, and 517'6 B.Th.U. net.

The latest proposals for vertical retorts came from Mr. Herring, of Edinburgh, who was erecting at the Granton Gas-Works a single setting of these retorts upon the same area as is at present occupied by one of the ordinary sloping retort beds—a set of six verticals, of which he was able to show them the drawings, kindly lent him by Mr. Herring. The arrangement allowed of the heating of the retorts in almost any manner, either with the greatest heat at the top, the middle, or the bottom, by means of ports for the admission of the producer gases and the secondary air at any level from top to bottom; suitable means having been provided to close off any ports not required. Mr. Herring did not suggest that these designs were in any way final; but he had erected them purely as experimental retorts, with every possibility of testing, so as to obtain the best arrangement for future carbonization of the coal with which he had to deal. The retorts were built of grooved bricks, and were made square to avoid the expense of special bricks, and in the hope that the corners would become filled up in time with carbon. A good taper was given to them, so that the coke might not be obstructed in leaving. In most things he had followed vertical oil retort practice, as he pointed out that this industry had had a number of years' experience, which must have led to the survival of the fittest.

With small charges, the separation of the carbon occurred so energetically that the ascension pipes were constantly becoming blocked, and coke must be drawn before being completely burned off. A large charge, on the other hand, was more evenly distributed than a thin one, and the decomposition, with filled retorts, was avoided; so that higher temperatures of carbonization could be employed. It was evident that filling the retorts had made a different tar, which should be easier handled, and had removed many of the gas manager's greatest troubles—viz., stopped ascension pipes and pitched hydraulic mains. Heating surface, compared to the weight of the charge, was a good indication of the comparative efficiency; but this was only the case with vertical and completely filled retorts, as it was the heat acting directly on the coal which only was wanted. Tests had shown that with tiles and asbestos on the tops of horizontal ordinary retorts, where the heat was not wanted on the inside, the quality of the gas had been improved. This might be expected, as the heat would convert some of the hydrocarbons into the solid carbon which usually



collected on the inside of a partially-filled retort, and must thereby reduce the illuminating power. The lengthy contact with the hot side of a retort which was partially filled must injure the gas; so that an improvement might well be expected when there was little room, and, consequently, a quick passage of the gas away from the heat.

The requirements of coal gas, and the illuminating power, were daily becoming of less value, and the calorific value was of more and more moment. What this calorific value was to be fixed at was a matter of the coal available. On the Continent they were satisfied with a much lower figure than in this country; but tests must be made, and without delay, by all gas undertakings so as to ascertain the extent of the calorific power obtainable from the coals that were ordinarily procurable. In many cases they would not have the necessary apparatus at hand for the purpose; but they should arrange for a periodical test of each of the coals which they were using when being carbonized under the usual conditions prevalent in their works. Further than this, they should aim to find out the particular method which would give the best heating result from these coals, so that they could alter the processes accordingly. The published tests by the coalowners were not of much assistance in this matter; but they could be taken as a guide to the extent to which their efforts might be aimed. The apparatus for carbonizing coal varied so greatly in certain ways that similar results could not be looked for in different gasworks. The great aim should be to obtain as much methane as possible, as such a gas had a calorific power of 1024 B.Th.U. gross and 919 B.Th.U. net; while hydrogen had only 326 B.Th.U. gross and 272 B.Th.U. net, and carbonic oxide 323 B.Th.U. gross and net—all per cubic foot. Consequently, any process which would increase the proportion of the former in the gas made must prove the one which would be likely to succeed in the future.

[The paper was illustrated by a number of views, shown by means of a lantern which has been designed by Professor Gray, of the Technical College.]

#### Discussion.

The PRESIDENT, in inviting discussion, said they would be very glad if any of the visitors who were favouring them with their presence would join in the proceedings.

Mr. JAMES M'LEOD (Greenock) considered that Mr. O'Connor's paper was very opportune, coming at a time when the gas industry was more or less on the *qui vive* on the question of vertical or horizontal retorts. The idea of the vertical retort was not a new one. On looking over some old minutes of the Greenock Corporation Gas Department, he found that Mr. Samuel Stewart had gone into this question about thirty years ago, and had made a report upon it to his Committee. Although there was a good deal of opposition to the vertical retort, he thought it would be the ultimate system of carbonizing coal. He had occasion to get some information about one of the systems quite lately, and one of the points about it that struck him was that for an output of 750,000 cubic feet of gas the ground space necessary was only some 30 ft. by 70 ft. This was very economical. Another thing was that the machinery required was of the very simplest kind. It stood to reason that a machine which had merely to drop the coal into the retort was much less subject to wear and tear than a horizontal charging machine. He considered the vertical retort had a very great future before it; and while, on the whole, he did not think that the results were as yet very much better than those obtained with the best systems of horizontal charging, he still thought that, for the reasons of less ground space and less wear and tear in the machinery, it had come to stay.

Mr. D. VASS (Airdrie) referred to the coal which could be used. Nuts were quite sufficient. In gas-works they had been in the habit of breaking coal into cubes of from 4 to 6 inches. With vertical retorts, on the continuous system, it would be necessary to reduce the coal to a much smaller size. But if they did so, he thought they would have a much better coke. The Woodall-Duckham system was the best arrangement he had seen—taking in a few pounds of coal every minute. It worked very sweetly. To his mind, verticals were to be the retorts of the future. At present, they were trying to get improved results from horizontal retorts by charging them heavier; but the difficulty of getting a pusher which would push out a large quantity of coke was troubling them. In coke-ovens they had found it advisable to stamp the coal into a solid mass before putting it into the oven. In this way they had a coherent mass, which was easily pushed out after it was carbonized. In gas-works the coal was thrown in loosely; and when they subjected it to a pusher after it was carbonized, it did not come out freely. The vertical retort got over this difficulty by the mass bearing its own weight and falling to the bottom, and so being formed into something like foundry coke.

Mr. J. ARNOLD FLEMING (Glasgow) had been very interested in the firing of the retorts. He was interested in the construction of ovens, and specially interested in the building of these vertical retorts. He had found that in building square retorts or furnaces, about 20 feet long, with special bricks, they were troubled by the expansion to a much greater extent than with either the round or the oval shape.

Mr. G. R. HISLOP (Paisley) said Mr. O'Connor had raised some very important points. All who were connected with gas manufacture had been giving the question of horizontal or vertical retorts considerable attention during the last few years. No doubt many were very much gone on the idea of vertical retorts; but he maintained that it would require a good deal of time yet

before horizontal retorts were all displaced. If they took the opinion of the South Metropolitan Gas Company as of any interest, they found that this Company had permanently abandoned the idea of vertical retorts. They were about to greatly extend their horizontal system, and had ordered additional Arrol-Foulis charging machines, showing that they had made up their mind to stick to horizontals. In his own case, he had looked into the question very carefully. He got about 11,000 cubic feet of gas from the ordinary splint which Scotland supplied. There was no doubt they had a difficulty in Scotland with regard to the distillation of coal. It was proved now to be of great advantage to push the coke out. It was well known by those who made and sold discharging machines that in Scotland the coke was soft and entirely different from that which was made from the bulk of English coals, which were more of a caking character, and adhered together—a sort of conglomerate, and was easily pushed out. In the case of Scotch coals, the coke was very soft; and if they attempted to push it out with a ram, they ran the risk of bursting the retort. No doubt, the difficulty might be reduced by the adoption of vertical retorts; and he supposed it was a question of this and of the reduction of space and labour. These were all considerations to take into account; and no doubt within the next year or two the matter would be finally settled as to which was the best. Every man must judge for himself—much depending on the locality—as to what would be the best thing for him to do. If space were of great value, he might adopt vertical retorts, and perhaps do fairly well with Scottish coal; but he thought that where space was not of much account, the extra cost of distillation by the vertical system would certainly be against it. No doubt it had many advantages. If they diminished the space for radiant heat in a retort, over the top of the fuel, the gas would suffer less deterioration. He had always pointed out to those who would insist upon having a through retort, with an ascension pipe at one end, that they would be bound to suffer considerably in the gas. If they were making gas of (say) 26 candles, as they had been doing in Scotland, he found that 1½ candles was lost by taking the gas over the top of the coal to the other end of the retort. These were important matters to consider. However, the standard having been reduced, this loss had also been reduced, because as they went down in the quality of the gas it did not take effect so readily as in a richer quality.

Professor T. GRAY, of the Technical College, said one point which had struck him was that it was a very curious fact that it had taken so long for the coal-gas industry to adopt the vertical retort. It seemed to him that the best results must be obtained from a system of continuous distillation, because all the parts would remain pretty much under the same condition. With an intermittent system it would be quite different. He was impressed with the great similarity there was between the vertical retorts and those which were at present used for the distillation of shale. One point of difference seemed to be that the temperature in the coal-retort was higher, if anything, at the top than at the bottom; whereas exactly the reverse obtained in the case of shale distillation. In shale distillation, the aim was to have the temperature very high at the bottom of the retort and comparatively low at the top, because a low temperature was necessary to prevent decomposition of the gases. There was this further difference, that the gas produced in shale distillation was only of value as a source of heat. There were several points which required to be looked into very carefully—such as the nature of the gas obtained, the nature of the coal tar, and of the coke. With regard to the quality and yield of the gas, it struck him as rather peculiar that in an inclined or vertical retort a larger yield of gas was obtained, and that at the same time the coal tar was more fluid. He should have expected that if they got a lower yield of gas, the coal tar would be less fluid. A yield of 13,400 cubic feet was exceedingly high; and if the gas had an illuminating power at all equal to the gas made in a horizontal retort, it did not seem to him to be obtainable except at the expense of the tar. On the other hand, he should imagine that tar obtained in a vertical retort should be more fluid. He should therefore like Mr. O'Connor to explain these two apparent difficulties.

Mr. WILLIAM KEY (Glasgow) said the trend of modern gas engineering effort leant towards the production of the greatest volume of gas by vertical retorts, and on the smallest possible space. The lecturer had given them an enormous amount of matter of great importance to the gas and chemical industries, and had shown and described many photographs and drawings illustrating his subject. He (Mr. Key) had never witnessed so extensive a production carried through in so small a space of time. The trend of present-day designs for retort charging and drawing aimed, among other things, at the improvement of the working conditions of the furnace stoker and retort charger. The old method of working horizontal retorts at high heats had been faithfully represented on one or two of the photographs exhibited—showing stokers entirely enveloped in flame and smoke. He had himself gone through this fire of experience, both on day and night shifts. The conditions were much worse when the bottom of a retort fell out and they had to make it good again by filling up the hole with coke and carefully building in a new bottom with bricks. Of the numerous methods for the construction and working of vertical retorts shown by the author, the one designed by the speaker some 18 or 20 years ago was not among them. The remarks of Mr. Vass, on the use of small coals in the Woodall and



Duckham vertical retorts, reminded him of his own design, in which he was to utilize small and dross coals. The dross after passing through the rollers became coal dust. A cast-iron trough extended the whole length of the setting, with a depressed portion opposite each retort, which might be to the right or the left; and a plate and chain belt continually brought the coal dust along the trough, thus keeping the pockets filled. A revolving shaft extended along the bench operating cams at each retort, which caused an oblong plunger to push the coal dust from the pocket into an enclosed oblong cast-iron box extending into the retort, and from which the dust fell on to a tapered spreader, and thence into the 20 feet deep empty white-hot retort. For 3 or 4 feet only were the coke and refuse allowed to accumulate within it above the water line; and this was removed by a slow continuously moving Archimedean screw. His intention was to push 1 lb. of coal dust into each retort every five seconds. Any retort could instantly be put out of action by lifting up and throwing back a jointed connection with a cam; and as easily restarted by throwing it forward. He placed this design in the hands of a Patent Agent (the late Mr. Hunt, of Glasgow), whose health was impaired and entirely broken down about this time. His death decided him (Mr. Key) not to proceed further with his application, as he was then about to enter on another and different sphere of business.

Mr. R. HAMILTON (Glengarnock) asked if there was any difference in the yield of ammonia with a vertical retort as compared with a horizontal retort.

Mr. J. ROBERTSON (Bedlay) asked Mr. O'Connor whether he was aware of difficulty having been experienced in the matter of the descending of the charge in a vertical retort. He had had difficulty with this.

Dr. G. B. NEAVE (Glasgow), the Hon. Secretary, read an extract from a letter which had been received from Mr. Glover, of St. Helens, in which he described the working of the vertical retorts there, and went on to say that the lifetime of the retorts would be a long one, and the coal carbonized greater than with horizontal, inclined, or German retorts. Mr. Glover considered that this development had come into the gas industry at the right time, as it would help to cheapen the production of coal gas, and improve the lot of the stoker.

The PRESIDENT remarked that Mr. O'Connor had dealt with the subject more from an engineering point of view than from that of the chemist; but it would be interesting to know the difference in the value of tar produced by the continuous as against intermittent feeding. To an outsider, it seemed a very rational process to have a continuous feed and a continuous discharge, not only with reference to the comfort of the men, but there should be a great saving in heating, and greater regularity in the quality of the output. There had been a good deal of talk about improving the quality of the coke made in gas-works, in order to give a flameless fuel for houses. He supposed a gas-works manager might either be a gas maker or a chemical manufacturer, or he might be a benefactor, to supply them with the best fuel. He supposed that all this was represented in the balance-sheet at the end of the year, and that it would depend very much upon circumstances as to what extent he could improve the selling price of coke, by reducing the temperature of carbonization, or, on the other hand, how much more he could get for his gas by making the largest amount possible. There was, of course, a third point—viz., how much he could improve the value of the bye-products, by varying or decreasing the temperature of distillation. To an outsider, it would seem rather like a rational process to have the highest temperature brought well down from the top—to the middle, or below the middle—and to have steam injected through the hot coke (the first distillation taking place at the top), and then, when the hot coke sank, it would meet with steam, and water gas would be produced. Mr. O'Connor said it would reduce the candle power of the gas; but incandescent gas lighting had so very largely taken the place of the ordinary burner, and gas was being so extensively used for heating purposes, that it seemed to him that illuminating power at the old figure was not so important as it used to be.

Mr. O'CONNOR, in closing the discussion, said that at Musselburgh there was a sample of a vertical retort which had not been in use for many years. A piece of the vertical retort was still lying in the Manager's garden there; but he was satisfied it had not been in use for thirty or forty years. They would thus see that the idea of vertical retorts was, at all events, as old as that. As Mr. McLeod mentioned, there was an enormous advantage in the vertical retort where the ground space was limited; but he believed that the extra amount of gas that could be obtained on a certain space by these means was only possible at somewhat heavy cost. He heard recently of an estimate for a setting of vertical retorts, which came out at something like four or five times the price of a horizontal setting for the same quantity; and therefore it might be possible to buy an increased amount of gas at too high a price if vertical retorts were to be so expensive. The tapering of a vertical retort was only obtainable by either building up in rings, each ring being made of the proper taper, or else by building it up with special bricks, or, as in the proposal of Mr. Herring, building it up square with ordinary patent bricks, with grooves only to prevent the gas escaping, by which the cost of the settings would be considerably less. No doubt there would be great difficulty with Scotch coal in trying to push it out at one end—the coke being so very soft. As to the South Metropolitan Gas Company and stoking machinery, he knew it was Mr. Carpenter who first suggested

the complete filling of a horizontal retort. This was really utilizing what might be called a chamber setting, with a completely filled retort; and in this way he might not so readily take up the vertical retort, which would require more experiments and tests before it could be regarded as quite satisfactory. In vertical coal retorts there was one particular point which had to be thought of—that was to get the heat out of the coke as much as possible before it left the retort, because it was almost impossible to arrange for the taking of the hot coke from the bottom of the retort and putting it into the producer. His opinion was that the increased quantity of gas came from the reduced quality. It was simply spreading the hydrocarbons over a larger quantity of carrying power. The matter of the tar was, he thought, largely due to the fact that the gas had to pass up through partially carbonized coal, which kept it from becoming of a hard, pitchy nature, and also prevented a great quantity of very fine dust from passing away with it, which would increase the quantity of the carbon and the quality of the pitch. Mr. Key's description of a vertical system was very interesting. In a presidential address which he read to the Society of Engineers seven or eight years ago, he advocated a somewhat similar system; but his idea was to use a 45° retort, and not a vertical one. He suggested the pouring in of small quantities of powdered coal, and allowing it to run down the sides of a fairly steep retort, becoming coked on the way—of course, removing the coke from time to time. He did not think that anybody ever tried it—it was only a suggestion; but it came back to him directly he heard Mr. Key's remarks. Inquiry had been made as to the yield of ammonia. He did not read all the figures he had in the tables in his paper. For instance, with the Glover-West verticals the yield of ammonia was 28.1 gallons of 10 oz. liquor per ton. A considerable increase of ammonia was claimed with the Dessau retorts; and in the chamber retorts there was as much as from 15 to 17 per cent. increased yield of ammonia, as compared with the same coal used in ordinary horizontal retorts. He had not yet seen any results of tests which had been made as to the temperature at the various heights in the retorts. As soon as Mr. Herring got his retorts into use—they were at present red hot—he proposed to carry out a number of tests, to see what temperatures he would get at the various parts of the retort throughout the charge, and also, by having the greatest heat at the top, the middle, or the bottom, and trying in every possible way to see how the best results were to be obtained. The installation he was putting down was simply an experimental setting. He did not expect that the settings to be afterwards put up would be anything like these. He gave some figures as to the work at Sunderland, where steam was employed; but in Scotland, where Parliament insisted upon a certain candle power, a large quantity of steam could not be used, as it would reduce the candle power. In Scotland, the increased yield of gas per ton would only be about 450 cubic feet, and the illuminating power would fall about three-quarters of a candle; so that there did not appear to be great advantage in steaming when the gas was required to be of a high illuminating power. In Germany, with the Dessau vertical retorts, steaming was practically used on every occasion. At every charge steam was put in; and the illuminating power was about 11 or 12 candles. It was with reference to the Woodall-Duckham process that he mentioned that, although they had anticipated that steam might be introduced, they themselves had not found it advantageous to do so. In reducing the candle power, the great point was not to lower the calorific value; and to attain this, the aim of gas manufacturers just now ought to be not to manufacture hydrogen but methane. If they were making water gas, they would be manufacturing carbon monoxide, which was not so valuable for heating purposes as hydrogen. So that the mixing of water gas with coal gas was likely to have a tendency to reduce the calorific power, which, however, was what they wanted to retain, for the purposes of heating, of lighting, and of cooking.

On the call of the President, a very hearty vote of thanks was awarded to Mr. O'Connor for his interesting communication.

It will be seen, from an announcement which appears elsewhere, that the Directors of the Bournemouth Gas and Water Company are inviting tenders for 2019 £10 "B" shares (7 per cent.). The minimum price of issue is £15 per share; and tenders are to be sent in not later than the 17th inst.

In another part of the "JOURNAL" will be found the prospectus of the Trinidad Oilfields, Limited—a Company which has been formed with a capital of £300,000, in £1 shares, to acquire from the Trinidad Petroleum Company, Limited, their oil and other mineral rights in and over lands situated in the Guapo and La Brea districts in the Island of Trinidad, aggregating 3791 acres. Of these, 3200 acres are Crown lands; and the vendors have obtained from the Trinidad Government a lease of the crude oil, bituminous minerals (including asphalt), and natural gas in them, for a term of 21 years from July 1, 1909, with the right of renewal for a further similar period. The vendors have also acquired the oil and mineral rights in two other estates to be transferred to the purchasing Company. The price to be paid is £153,000, of which £68,000 is to be in cash and the remainder (£85,000) in fully-paid shares. The Company are making an issue of 260,000 shares, and they invite applications for 175,000 of them—the minimum on which the Directors (one of whom is Mr. Corbet Woodall) may proceed to allotment. The subscription list opened yesterday and will close to-morrow.



## LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Last Friday's meeting of the London and Southern District Junior Gas Association—which took place at the Cripplegate Institute, Golden Lane, E.C.—was of a highly interesting nature, including, as it did, many practical demonstrations, and a paper which dealt fully with the subject of "Incandescent Mantles, with Special Reference to the Use of Non-Collodionized Mantles." The chair was occupied by Mr. W. J. LIBERTY, the President; and there was a gratifying attendance of members. No doubt additional interest was imparted to the proceedings by the fact that the members of the Association so recently visited the works at Wandsworth of the Voelker Lighting Corporation, where they were enabled to see the entire process of manufacture of collodionized mantles—a brief description of which was given in the "JOURNAL" for the 15th ult., p. 434.

Mr. PERCY G. SOMERVILLE, a member of the Chief Inspector's Department of the Gaslight and Coke Company, was the author of the paper, which was divided into four parts. The first part consisted of a brief history of the incandescent mantle; the second dealt with the manufacture of the collodionized mantle; the third, with the non-collodionized mantle; the fourth, with the comparative advantages of the collodionized and the non-collodionized mantle. With the subject-matter of the first two parts, most of those interested in the gas industry are already fairly familiar; and we may therefore pass them over with the remark that the author dealt with them in an able manner, and in such a way that the attention of his audience was not for a single moment relaxed.

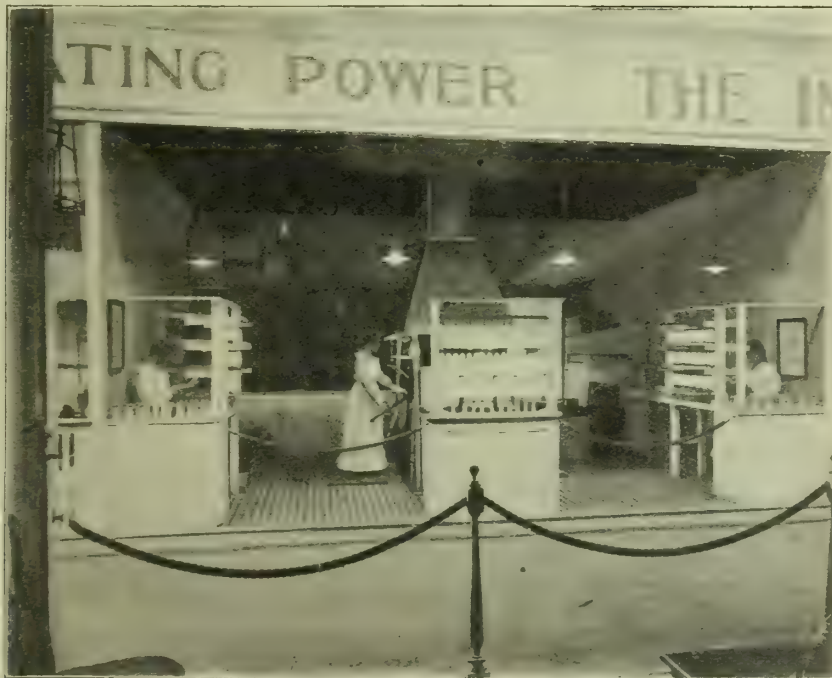
Mr. Somerville's remarks on the third and fourth parts of his paper were as follows.

### THE NON-COLLODIONIZED MANTLE.

The system of using non-collodionized mantles was first introduced into this country about six years ago by Mr. Corbet Woodall, then a Director, and now, as you all know, the Governor of the Gaslight and Coke Company. It was at Mr. Woodall's suggestion that this system, which had been widely adopted on the Continent, was investigated, and subsequently brought into operation by Mr. Goodenough, with whose permission I am able to put before you this evening some particulars respecting its operation.

It may be advisable to mention, first, that the difference between mantles treated under this system and collodionized mantles as usually purchased, is that the latter have been dipped into a solution of collodion (or gun-cotton), which is done simply for the purpose of enabling the mantles to be handled and transported freely without any damage. This coating of collodion has, as you know, to be flared off when the mantles are first put upon the burners. Under the system now being considered, the mantles are bought in the limp stocking condition. They are afterwards modelled over a wooden shaping-cone, and placed on a rack in front of the modeller. This rack, when it is full, holds sixteen stockings. It is an essential point that the operator who performs the work of modelling should have cool hands; otherwise the heat of the hand will absorb to a certain extent a portion of the metallic oxides which are contained in the stocking.

The stocking is then fired, and the ramie fibre burnt out, leaving only a skeleton of the ash, consisting of the thoria and ceria



Mantle Burning-Off Exhibit at the Franco-British Exhibition.

which constitute the essential portion of the mantle. Each mantle is then partially hardened and shaped by means of a single bunsen burner, before placing it on the seasoning machine. The reason of this is that if the stockings were placed direct on the machine, fired, and allowed to cool, the natural shrinking that takes place in the burning-out of the fibre would prevent the operator getting the seasoning burners up the mantles, as they are then in such a fragile condition that the least touch at this stage would be fatal to the mantle; whereas by using a single burner first, away from the machine, the operator is able to manipulate each mantle, and thus get it open by means of the gas pressure from the bunsen burner.

After the operator has carefully done this part of the work, the rack containing sixteen mantles is placed on the machine; the mantles being then the proper shape, thus allowing the burners to go straight up the centre, without touching them in any way. They are then seasoned and hardened for an average of four minutes by means of bunsen burners, working at a pressure varying from 50 to 100 inches of water (the pressure being governed entirely by the quality of the stocking being burnt off). You will no doubt be surprised to hear that the mantles at this stage are practically as firm as ordinary collodionized mantles, with the exception that they have not, of course, the elasticity which the collodion imparts.

This process being finished, they are trimmed either on a "C" or No. 4 burner-head, a piece of cotton is tied carefully on the loop, and they are next labelled and boxed in glass cylinders ready for transit, in this non-collodionized, and therefore rather more fragile, condition. They are then taken by the public lamp or ordinary maintenance men, carried about with a reasonable amount of care, and placed on burners either in the street-lamps

or in the consumers' premises as required. Not more than 2 per cent. of the mantles so carried are broken in transit. There are many reasons for packing the non-collodionized mantles in glass tubes, instead of cardboard. The men using them can at once see whether the mantle is perfect; and as they are handling glass, they naturally exercise greater care. It has also been found by experience that the inside surface of cardboard tubes is generally rough; and if a mantle in being extracted should accidentally come in contact with this rough surface, it would at once be rendered useless.

The clear glass tube also acts as a splendid check on the work of the hands, as it prevents anyone from packing mantles with the slightest defect. The labels which the packers and trimmers use have their initial on; so that in the event of any carelessness occurring, it is quite an easy matter to trace the girl responsible. It is therefore obvious that, after taking the many advantages into consideration, the glass tubes well pay for the initial expenditure, as they are capable of being used over and over again, and, provided ordinary care is exercised by the operators, should have a very long life. To ensure the non-collodionized mantles being up to their standard of efficiency, they are tested weekly both for illuminating power and durability, and are generally found to stand, without appreciable damage, 1000 shocks on the Woodall-Moon shocking-machine.

No doubt many of you saw the burning-off process being carried out in a portion of the exhibit arranged by the Gas Undertakings of the United Kingdom at the Franco-British Exhibition, and in respect of which a Gold Medal was awarded. This exhibit proved to be of great interest to the public generally, but was more especially appreciated by the numerous gas managers, and other officials from almost all parts of the world, who visited the



Exhibition—the majority of them going out of their way to show their appreciation by making exhaustive inquiries.

This brings me to the chief part of the paper—namely, that which refers to the advantages obtained by a gas undertaking, in using non-collodionized mantles in place of collodionized, for maintenance purposes. Speaking generally, the first and most important point when considering the advantage of one system over another, is cost; so I will deal with this first of all.

The average difference in the cost of collodionized mantles and the mantle stocking is 4s. 6d. per gross. Out of this 4s. 6d., the cost of turning the impregnated stocking into a finished non-collodionized mantle has to be deducted; but even when taking this into consideration, there is still an appreciable margin of economy which averages about 3s. per gross. When this is multiplied by the enormous quantity of mantles that are used by many companies in the course of a year, it is seen to be an item of no mean importance, but well worth serious consideration. It is not, however, only in the actual saving in cost of the two articles that the advantage of the non-collodionized system lies. The Gaslight and Coke Company have found, after long experience and a large number of exhaustive tests, that the general usage of mantles per burner per annum averages considerably less when non-collodionized mantles are adopted—resulting in their employing this particular kind of mantle on every possible occasion. This is clear evidence of their belief in its undoubted superiority.

The last and one of the most important points in favour of the non-collodionized mantles is that, by adopting them, one is absolutely certain of having a mantle as near perfection as it is at present possible to get. This cannot be said definitely when using collodionized mantles, as it is a very difficult matter indeed to tell whether a collodionized mantle is sound or not, until the collodion is flared off; and then it is too late. That such defective mantles do get on the market, is accounted for by the fact that in every incandescent mantle factory, at the end of the day's work, they have a certain proportion of mantles which are in some way or other defective. These are called in the factory "throw-outs," or "seconds," and are put on the market and sold as second quality mantles; so that the majority of cheap mantles constantly seen on the market (sold at 1½d. and 2d. each) are either factory throw-outs or else single-thread mantles which have little or no life, and are therefore as big an enemy to the gas industry as the flat-flame burner.

A pinhole defect in a mantle, when collodionized, is hardly visible to the eye, except on very close scrutiny, which is not likely to be given in daily practical use; so that it is obvious that the collodion to a mantle acts like an overcoat to a man—it may cover a multitude of threadbare spots. This drawback is safeguarded against by the use of very carefully inspected non-collodionized mantles, for reasons already explained.

The difference in illuminating power between the collodionized and the non-collodionized mantle is not marked, but at the same time is in favour of the latter system, which is, as a rule, about 1-candle power per cubic foot to the good.

To give an idea of the staff required to burn-off and finish a given quantity of mantles, I would mention that the Gaslight and Coke Company are at the present time burning-off 10,000 mantles per week (520,000 a year) with a staff of seven girls, including the forewoman and packers. An operator can burn-off and model 300 mantles per day of 9 hours, which is ample time to allow of the work being done thoroughly. The cost of fitting up the necessary plant depends entirely on the quantity of mantles required to be burnt-off; but it is not a serious matter.

At the conclusion of the paper, the author gave practical demonstrations on many of the points to which he had referred. He showed the operation of burning-off and seasoning and hardening uncollodionized mantles; and he also exhibited samples of defective inverted collodionized mantles, the defects in which became evident as soon as the mantles were burnt-off, as well as a single-ply upright mantle, which began to break away immediately after lighting-up. Great interest was taken in the manipulation of the No. 4 Kempton special striped uncollodionized mantle, which is chiefly used in the City, and is strengthened so as to withstand the vibration of the heavy traffic. A number of lantern slides showing the microscopic structure of the mantle were thrown on the screen; and members were subsequently able to make further examinations under a microscope which Mr. Henry Austin had thoughtfully sent to the meeting.

#### Discussion.

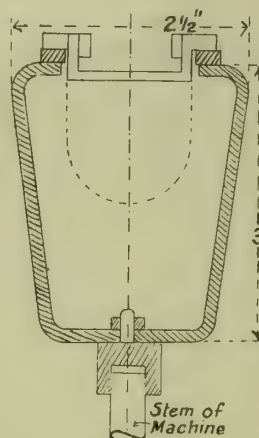
The Hon. SECRETARY (Mr. S. A. Carpenter) remarked that when non-collodionized mantles were purchased, they were rolled up; and on being burnt-off without any of the apparatus which had been described, they were apt to shape-up rather badly—especially the inverted forms—and one did not get anything like the light obtainable with the ordinary collodionized mantle.

Mr. WEDD said he would like some further information on the comparative values of silk and ramie. Another question he had often asked, but without getting a satisfactory answer, was whether China grass was the same thing as jute. He had heard that it was; but the texture did not seem the same.

Mr. D. W. WINSLOW thought Mr. Carpenter's point was a most interesting one, as it showed that a special department was necessary for the burning-off, &c., when gas companies adopted non-collodionized mantles. On the question of cost, if the saving was what the author calculated it at, it looked as if there was money

in the matter. Did Mr. Somerville get a proportionate number of throw-outs; and did he ever reject any soft mantles as received from the makers, or was it subsequently that the defects appeared?

Mr. J. G. CLARK remarked on the importance of testing the mantles. They had heard the large number that the Gaslight and Coke Company used, and consequently could see how necessary it was to keep a very close check upon the quality. The tests that were needed to settle the question of whether a mantle was good or not were really three in number. First came the durability test. A mantle was run for a number of hours, during which time it would show whether any pin-holes existed or shrinkage took place. The photometer test would follow; and this was perhaps best carried out after the mantle had been burning (say) 50 to 100 hours. Of course, in special cases a longer period of burning was resorted to; but the time he had mentioned they found to be a very good average. The third test was that of shocking, which could conveniently follow the photometer test. Referring to the Woodall-Moon shocking-machine, it should be noted that there were two or three points that must be attended to, if really good results were to be assured. One of these was the proper lubrication of the hammers by means of which the shocks were delivered. They must be carefully lubricated where they passed through the casting. It was a seemingly small detail; but it made all the difference between a scientific and an unscientific test. Then, again, it was better to use always the same burner. Different burners would vary in the niceness of their fit on to the head; and if the same one was kept to, strictly comparable results would be secured. With reference to the shocking of inverted mantles, the arrangement generally adopted, so far as he was aware, was to have an ordinary swan-neck fitting; and the arm would act to a large extent as an anti-vibrator. Therefore one did not get anything like the full shock of the impact at the mantle. The accompanying sketch would explain a device he had adopted for the purpose, as the result of his own experience. Briefly explained,



Fitting for Testing Inverted Mantles on the Woodall-Moon Shocker.

the arrangement consisted of a frame of stiff brass, having at the top a plate pierced with a hole. The mantle was suspended in the top plate, and was held by rubber bands. In this way, a very effective shock test could be brought about.

Mr. SOMERVILLE, before replying on the discussion, asked Mr. Carpenter to make his point a little clearer.

Mr. CARPENTER said the Gaslight and Coke Company had special apparatus for shaping the mantles, and by this means they secured excellent results. If, however, they procured the rolled-up soft mantles, and used them apart from this special apparatus, would the same good results be obtained? His own experience was that they did not shape-up well. The system that had been described could, of course, only be applied to a company large enough to have its own staff.

Mr. SOMERVILLE remarked that he had not had much experience as regarded Plaissetty mantles. With the system he had described they could, if desired, have only one machine with two girls doing the whole of the work. It depended entirely upon the number of mantles it was desired to turn out.

Mr. CARPENTER: Small companies would not, however, even require that.

Mr. SOMERVILLE (continuing) referred to the question of knitting and weaving, which he said was simply a matter of expense. Although a vast number of the stockings manufactured at present were knitted, there were, at the same time, a good proportion of woven stockings on the market. The woven stocking was far superior, because it possessed greater strength, and also because there was less likelihood of stitches being dropped. The cost of production was naturally greater, on account of additional labour and more expensive machinery being necessary; but when the manufacturers were in a position to supply these stockings at a reasonable figure, it was certain they would ultimately supersede the knitted stocking. As to the difference between silk and ramie mantles, he was not in a position to say much. The only artificial silk mantle he had personally had to deal with was the "Ceroform." Mr. Winslow had alluded to the difference in cost between collodionized and uncollodionized mantles. He (the speaker) figured it out at 3s. a gross; and this was a very fair average to strike. The figure could not, of course, be taken as



strictly applicable to other cases, because it was governed by the number of mantles that had to be burnt-off. The average cost to the Company of burning-off was about 1s. 4d. a gross, to which had to be added the cost of the stocking. On the other side, there was not only the cost of putting through collodion, in which the breakages were pretty high, but also profit. When a gas company took up non-collodionized mantles, they were really doing a part of the manufacturer's work, because they were using a mantle which was not in a saleable condition. Of course, they did get breakages, but practically nothing to speak of.

Mr. EDE alluded to the weight of mantles; saying that he had found various mantles had different weights—there was a varying amount of ash of thorium and cerium left after burning-off. It was not always the mantles which had weighed the heaviest that had been the best.

Mr. WINSLOW, on this point, remarked that the best Graetzin inverted mantles were of a very fine mesh; and they had been found to last materially longer than the ordinary thicker mantle, which had a tendency to break away round the ring. It would appear from this that the extra weight proved too great a strain upon this portion of the mantle.

Mr. SOMERVILLE said, referring to upright lighting, that it had not been his experience that the thicker mantle had a shorter life. In fact, it was rather the other way about. Of course, a mantle could be made at any price that was desired—everything depended upon the weight of the metals in the mantle, and the quality of the yarn used. The mantles of to-day nearly all consisted of 99 per cent. of thorium and 1 per cent. of cerium.

Mr. WEDD said he had carried non-collodionized burnt-off mantles 30 miles, through five changes of railway carriages, and had had no trouble. He had also sent them to friends, who had been better pleased with them than with the collodionized kind. If the gas companies could take the matter up and burn-off the mantles, he did not see why they should not be sold in that condition. The mantles he had spoken of had been packed in cardboard boxes; and he had never had a breakage.

Mr. SOMERVILLE: All I can say is you are very fortunate. We do not get many breakages; but we have a special case for carrying these mantles fitted with drawers which are partitioned to exactly fit the glass tubes, and which hold about 300 mantles. This box is suspended from strong spiral springs in a frame which stands on the floor of an ordinary one-horse van. The springs absorb all shocks and vibration; and we are thus enabled to take about 1800 mantles at a time to any of the district offices.

Mr. WINSLOW proposed, and Mr. E. SEARS seconded, a hearty vote of thanks to Mr. Somerville for his paper.

Mr. L. F. TOOTH, in supporting the motion, said he thought the general use of the more heavily impregnated mantles, and what had been described as two-ply, three-ply, and striped mantles, was because they had longer life. Of course, gas was consumed at much higher pressures than formerly. A few years ago, they could not have used these specially strengthened striped mantles.

The vote having been carried with applause,

Mr. SOMERVILLE acknowledged it, and expressed his thanks to Professor Vivian B. Lewes for placing at disposal his valuable notes on "The Theory of the Incandescent Mantle," and for the loan of the lantern slides showing the microscopic structure of the mantle. This information had been exceptionally interesting, and had also greatly enhanced the practical value of the paper. It was encouraging to members to know that they had patrons like Professor Lewes, only too willing to assist them.

#### COMING EVENTS.

The PRESIDENT said that two new members had to be announced: Mr. J. H. Donaldson, Assistant Engineer and Secretary of the Tonbridge Gas Company, and Mr. George E. Palmer, of the Harwood Terrace branch of the Gaslight and Coke Company. The next visit would be on the 12th inst., to the Hornsey Gas Works; but previous to this there was the annual dinner, to take place next Saturday, when the delegates from the other Junior Associations would be present. On March 18, there would be the lecture by Dr. Harold G. Colman; and on this occasion it had been decided to meet at 7 o'clock, and hold a sort of informal reception previous to the business meeting, which would begin at 8 o'clock. The subject Dr. Colman had fixed upon was gaseous combustion and some of its applications; the plan adopted being first to discuss flames in general, and the development of flame temperatures, and then to discuss the practical application of the principles, on the one hand to the heating of retort-settings, and on the other hand to incandescent gas-burners. When preparing the lecture, however, Dr. Colman found that it would hardly be practicable to compress the whole of the matter into one lecture; the general discussion of flames being sufficient in itself for one lecture. He did not like the idea of giving simply the general side of the subject, without considering its practical bearing in some respects; and rather than cut the first part short, and perhaps make it much less intelligible, he had kindly suggested that he should give two lectures—the second (on the applications) to be delivered perhaps at the close of the present session or the beginning of next. The Council felt deeply indebted to Dr. Colman for his offer, to which they had readily agreed; and they had since heard that the titles of the two lectures would be: (1) "The Development of High Temperatures by Gaseous Combustion;" and (2) "Some Practical Applications of Gaseous Combustion." It had been arranged that the second lecture should be given at the November meeting of the next session.

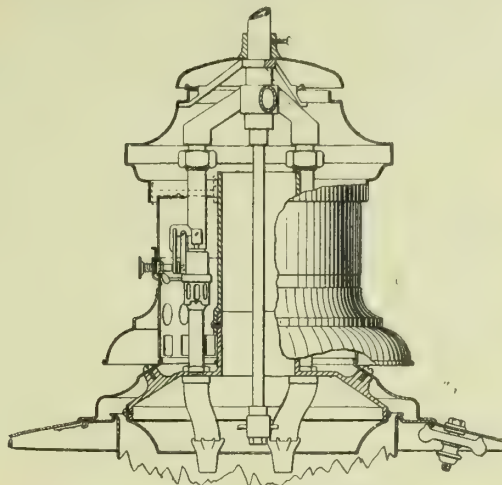
## REGISTER OF PATENTS.

### Incandescent Gas-Lamp.

HANDS, G., of Farringdon Road, E.C., and BREEDEN, F., of Moseley, Birmingham.

No. 27,775; Dec. 21, 1908.

According to this invention, the cap or bonnet of the lamp is provided (as shown) with a sleeve or boss adapted to surround, and to be pushed up and down on, the gas-supply pipe or other means of suspending the lamp. The sleeve has a set-screw by which the cap may be clamped if desired, either in the normal position or in a raised position, so as to leave the top of the lamp open and permit of gaining access to the interior. Below the cap is a centreing piece—a ring or annulus with radiating arms adapted to hold a surrounding cylindrical sleeve central while the annulus surrounds the chimney. This centreing piece also serves for the cap to rest on; and the latter is somewhat larger in diameter, to allow of the products of combustion escaping.



Hands and Breeden's Incandescent Gas-Lamp.

The lower part is perforated centrally, and is made inverted dish-shaped with projections, so as to leave spaces for the supply of air. Below the cylindrical sleeve is a bottom sleeve (in the form, more or less, of a hollow truncated cone) with a cylindrical part; holes being provided in the cylindrical part and a space being left between the cone and the reflector for the inlet of air to the annular chamber surrounding the chimney, so as to produce the gaseous mixture and promote proper combustion in the lamp. The dish part of the chimney has holes through which the burner-tubes pass; and the base of the chimney has also connected to it a reflecting plate provided with holes to allow the burner-tubes to pass through and permit of the escape up the chimney of the products of combustion. In the case of a cluster of burners, these holes are set close together so as to merge into one large hole, and the burner-tubes are cranked accordingly.

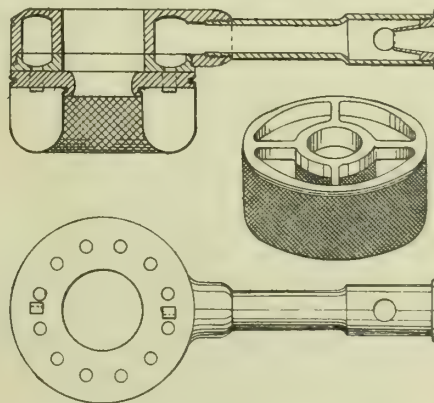
A lamp of this description may be provided with an ordinary bye-pass and a pilot burner or with an additional bye-pass of the flash-light variety.

### Burners and Mantles for Incandescent Gas Lighting.

CHATTERTON, J., and COVENTRY, W., of Salford.

No. 3786; Feb. 16, 1909.

This invention comprises "a burner of annular form, with perforations or slits on the underside for the gas to pass through and a gas-inlet at one side to receive a mantle of corresponding annular form;" also "a mantle of trough-shape to fit on to the arms of a flat or straight burner having a number of perforations or slits on the under side."



Chatterton and Coventry's Incandescent Burner.

The illustration shows a sectional elevation of the annular burner and mantle; a plan of the burner from the underside with the mantle removed; and a perspective view of the mantle with its support.

The burner is made of the ordinary bunsen construction with gas-nozzle and air inlets placed in any convenient position, and preferably



with regulators to control the air and gas supply—all of the ordinary construction. The gas inlet-pipe is placed at one side of the burner to prevent the heating of the gas before entering the annular burner. The burner is of annular form, with an opening through the centre and a number of perforations on the under side. Or (instead of perforations) a number of cross slits or an annular slit, with or without a ring of gauze, may be substituted; but at present the perforations are said to give the best results.

The body of the burner, for convenience of construction, is made in two parts—the lower part (carrying perforations) being screwed to the upper part; and, for the purpose of preventing lighting-back or of more thoroughly mixing the air and gas, a ring of gauze may be placed in the interior of the burner above the perforations.

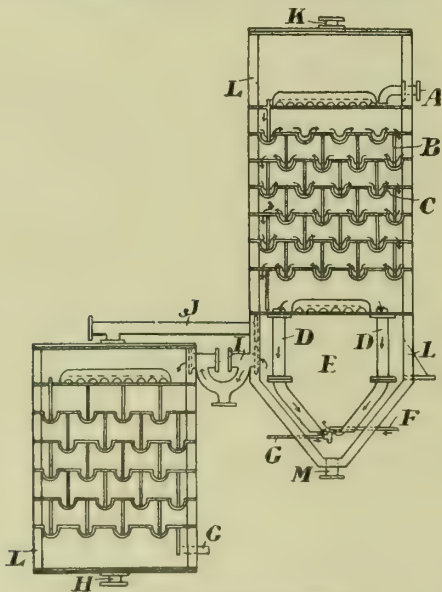
The porcelain mantle support is of annular form with concentric rings to which the edges of the mantle are attached. The mantle is made from a conical blank; the smaller end being attached to the inner ring of the support and the larger end turned up and attached to the outer ring. An annular mantle is thus constructed with a central opening which fits over the ring of perforations in the burner.

The patentees say they are aware that annular mantles have been applied to certain types of inverted incandescent gas-lights, and make no claim, *per se*, to annular incandescent mantles. They are also aware that circular burners are not new, and that burners with straight arms have been employed with ordinary mantles placed upon them horizontally, and so they make no claim therefor.

### Still's for Ammoniacal Liquids.

ANDREWS, W., of Pye Bridge, Alfreton.  
No. 3477; Feb. 12, 1909.

The internal arrangements of these stills are "designed to give as long a contact-time as possible, and at the same time to thoroughly agitate the liquor to be distilled." The channels and serrated baffle-plates are so arranged that the liquor is "more evenly split up by the steam, which takes out the compound to be distilled much better and with more economy." The liming chamber is so designed that the liquor, on entering, comes into immediate contact with the steam and lime—"thus ensuring all being uniformly mixed before entering the secondary still." The steam inlet is so arranged that it "prevents the outlet valve becoming choked with sediment owing to the thorough agitation of the liquids at this point." The stills are so designed that, in case of cleaning out, by taking down one side of the still the whole of the channels and baffle-plates can be readily cleaned.



Andrews' Ammonia-Still.

A is the liquor inlet to the primary still; B are baffle-plates; and C, the channels referred to above. The pipes D convey the liquor to the mixing or liming chamber E. F is the lime inlet, and G the steam inlets. H is the waste spent liquor outlet from the secondary still. I is the overflow from the mixing-chamber to secondary still; and J is the gas-pipe from secondary still to the primary still. K is the outlet for the ammonia or other gases. L is where the liquor gauges are placed. M is the outlet for the waste spent lime.

### Gas-Regulator for Bunsen Burners.

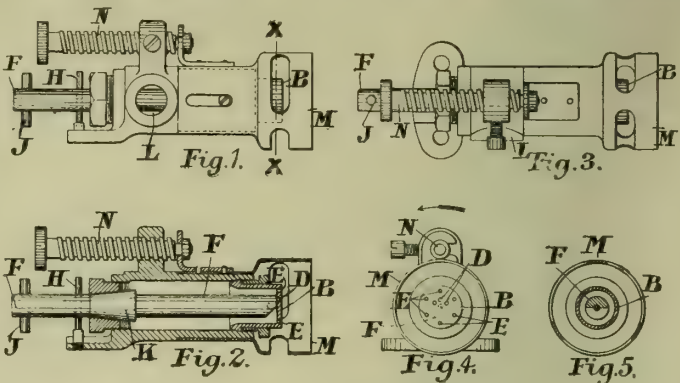
ROSE, A., BELLAMY, W., and YATES, H. J., of Birmingham.  
No. 5499; March 8, 1909.

This invention relates to regulators as employed with bunsen or atmospheric gas-burners for heating and lighting purposes, and has for its object "to construct an improved regulator of the type in which a number of apertures can be opened or closed, successively or individually, to increase or diminish the gas supply."

Fig. 1 is a side elevation, and fig. 2 a longitudinal section, of the regulator. Fig. 3 is a plan. Figs. 4 and 5 are a front elevation and transverse section on the line X of fig. 1.

In carrying the invention into effect, the body of the regulator is fitted with a detachable nozzle B held in position by a gland. In the end face of the nozzle are formed a series of apertures D. There is also provided a ring of other apertures E, which determine the amount of the minimum gas supply. The maximum supply is obtained when both sets of apertures are open. In conjunction with the apertures D is

mounted a regulator stem F, which passes axially through the regulator body and projects beyond the rear end of the latter. The stem abuts against the inner face of the nozzle, and while covering the apertures D does not interfere with the apertures E. To enable the former to be successively opened or closed, the adjacent extremity of the stem is cut away along one side of a diametral line, so that in one limit the apertures are completely open and in the other limit completely closed.



Rose, Bellamy, and Yates' Bunsen Burner Regulators.

Rotation of the stem between these limits causes the apertures to be successively or individually cut out or brought into operation. With a stem as shown, a movement of approximately half-a-revolution is required to completely open or close the apertures D. Figs. 2 and 4 show the apertures closed. Rotation in the direction of the arrow (fig. 4) causes the apertures to be gradually opened one after another until about half-a-revolution has been completed, when the apertures are fully open.

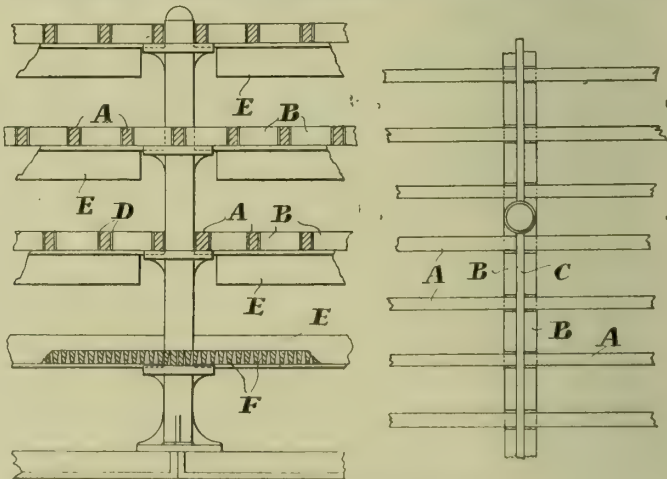
For limiting the motion of the stem F, a transverse pin H is arranged for abutment against either side of a stop; and a similar pin J (or a knob) enables the stem to be rotated. To prevent the escape of gas, the stem is preferably formed with a conical shoulder K—an arrangement which also serves for taking up any endwise freedom of the stem and for maintaining the latter in close contact with the inner face of the nozzle. Gas is admitted to the body part through a branch or inlet L.

With the regulator described may also be provided any suitable air-regulator. In the arrangement shown, the air-regulator is in the form of a sleeve M adjusted by a screw N.

### Supporting Oxide in Gas-Purifiers.

WRIGHT, J. C., of the West Ham Gas-Works.  
No. 11,058; May 10, 1909.

This support or grid for use in gas purification comprises, in combination, a series of bars loosely fitting in slots formed by, or in distance-pieces connected to, suitable timbering adapted to rest on the existing T-iron bearers or bars of the purifier box.



Wright's Purifier Material Supports.

As shown in the sectional elevation of a series of grids, and a plan view taken at right angles, A represents battens and B distance-pieces secured to, or formed in one with, a quartering or other suitable timber C, in such a manner as to leave slots D for the reception of the ends of the battens, which, with the distance-pieces, are carried by the existing T-iron bearers or bars E. By using such a support or grid as that shown, the area of the openings for the passage of gas is considerable—a result "unobtainable" with the construction of grid F shown in the lower tier, which represents a grid as at present in use. By having the bars loosely fitting in the slots D and supported by the existing T-iron bars E, as in the present invention, it "becomes an easy matter to clear out the oxide without destroying the timber or bars, which can be used again."

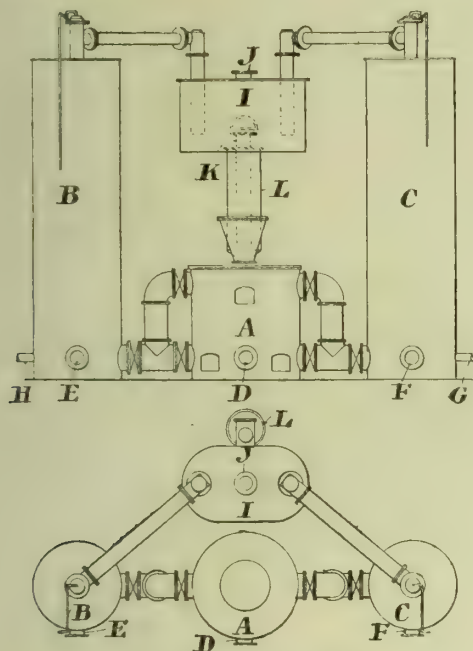
### Purifying Gas.

HALL, E. L., of Portland, Oregon, U.S.A.  
No. 14,200; June 17, 1909. Date claimed under International Convention, July 11, 1908.

This invention has for its object "to remove from gas, after it has been purified as much as possible by hitherto known methods, the organic compounds of sulphur which remain therein and which hitherto



have been considered unremovable." Concerning it, the patentee remarks: Illuminating gas, and especially that made from the crude oils of the Pacific Coast, contains, when first manufactured, organic sulphur in the form of carbon bisulphide and inorganic sulphur in the form of sulphuretted hydrogen. Heretofore but little difficulty has been experienced in removing the sulphuretted hydrogen, by passing the gas through a body of lime or oxide of iron and by other methods—an operation which has no effect on the carbon bisulphide, but leaves it remaining in the gas. The object of the invention is the removal of this carbon bisulphide from gas, by first converting it into sulphuretted hydrogen and then removing the latter by any method heretofore used for the purpose.



Hall's Gas Purifying Process.

A is the generator, and B and C the reheaters similar to ordinary water-gas superheaters, containing loose or chequerwork fire-brick. The generator is provided with a hopper for the continuous supply of fuel, and with cleaning doors and an air inlet D. The generator is connected by means of pipes with both the reheaters. After the reheater B has become sufficiently heated for service, it is cut off from the generator and connected with the reheater C. Gas to be purified is admitted to the reheaters by the inlets E F, and steam is introduced at G H. The reheaters have valves by which they are connected with the stack during the process of heating. They are also connected by pipes with a seal I, which is provided with an outlet J leading to the coolers and purifiers (not shown), and also with a water overflow pipe K leading to an overflow tank L, by means of which the water in the seal is maintained at a proper level.

The generator is operated continuously, and connected alternately with the reheaters. Gas is introduced with steam into one of the reheaters after it has been raised to the proper temperature, and carried to the seal and coolers and purifiers; the generator being meanwhile connected with the other reheater for the purpose of raising its temperature sufficiently to receive gas, when the first reheater has been cooled in service—thus making the operation continuous. The steam, in passing through the chequerwork of the reheater, is decomposed; its hydrogen uniting with the freed sulphur of the gas, producing sulphuretted hydrogen, which is removed from the gas by the succeeding ordinary process of purification.

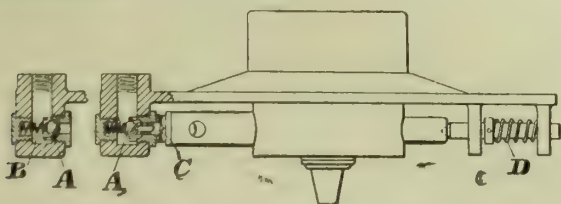
In converting carbon bisulphide and organic sulphides into sulphuretted hydrogen in the manner described, a range of temperature between 400° and 1000° C. may be employed; but in practice, between 400° and 900° is preferred.

### Valvular Devices for Incandescent Burners.

NEUE KRAMERLICHT G.M.B.H., of Charlottenburg, Germany.

No. 19,212; Aug. 20, 1909. Date claimed under International Convention, Aug. 26, 1908.

This invention consists, broadly, of an automatic obturating or valvular device arranged in the gas-supply pipe adjacent to the burner nozzle, and adapted to become operative as soon as the nozzle is removed from its seat; while when the nozzle is replaced, the valvular device is re-opened.



The Kramer Light Company's Burner Regulator.

The operation of the device, as illustrated, is as follows: When it is closed, the ball A is tightly pressed by the spring B on to its seat; so that in this position the gas-pipe is closed. When the tubular exten-

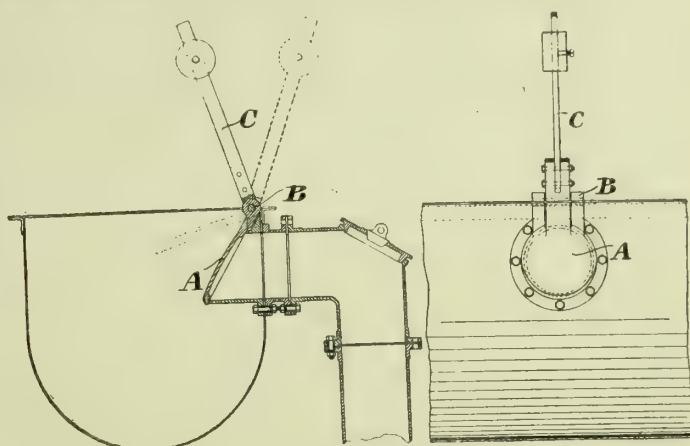
sion C of the nozzle is inserted in its sleeve, and the mixing-tube fixed by the locking device D, owing to the preponderating force of the spring, the ball is pressed inwards in opposition to the pressure of the spring B—that is to say, lifted from its seat—whereupon the gas flows through the lateral perforations in the sleeve to the nozzle opening. As, however, the spring B permanently holds the ball against the projection C when the mixing-tube is withdrawn, the conduit is re-closed. The arrangement of these springs, acting one against the other, presents the advantage that if the locking means should fail or the mixing-tube be incorrectly inserted, the spring B becomes operative and cuts off the supply of gas to the burner.

### Valves for Closing Ascension Pipes.

BEIMANN, W., of Bishop Auckland.

No. 25,043; Oct. 30, 1909.

As the patentee points out, the valve that cuts off communication of the ascension pipe of a gas-retort or coke-oven with the hydraulic main generally slides through a stuffing-box and "becomes very troublesome, not only on account of the friction set up by accumulations of hard pitch or the like on the guiding surfaces and spindles, but because similar accumulations prevent the valve from closing properly." The present invention relates to a valve for closing the ascension pipe, which is contained wholly within the hydraulic main (so that no stuffing-box is required), and turns upon a hinge instead of sliding in guides. "Being continuously exposed to fresh gas on both sides, of sufficiently high temperature to prevent any accumulation of pitch, it keeps comparatively clean, and therefore rests properly on its seating."



Beimann's Hydraulic Main Valve.

The valve A, as shown, is mounted to turn on the pin B, and carries the weighted arm C. As the hinge is cylindrical, the valve can be turned from the closed to the open position from outside the main without loss of gas. The portion of the cover of the hydraulic main which is adjacent to the hinge is slotted to accommodate the latter, and a part is adapted to be slid out when the pin B is to be removed for lifting-out the valve for repairs.

The patentee says he is aware that he is "not the first to close the ascension pipe of a gas-retort or coke-oven by a valve which can be turned without escape of gas on a hinge from outside a main, other than the hydraulic main, within which main the valve is situated," and his invention does not include this feature alone. He claims: "A valve for closing the ascension pipe of a gas-retort or coke-oven which is situated wholly within the hydraulic main and is turned on a hinge from outside the main without permitting escape of gas substantially as described."

### APPLICATIONS FOR LETTERS PATENT.

- 3536.—BRUCE, A. G. M., & A., JUN., "Air-gas plant." Feb. 14.
- 3548.—LANGFORD, P. N., and SHILTON, W. A., "Fastenings for retort mouthpieces." Feb. 14.
- 3589.—COPPERSMITH, J., "Joints for pipes." Feb. 14.
- 3619.—PARKER, C. H., "Gas-producers." Feb. 14.
- 3648.—NORTH, R. B., and THOMPSON, C. H., "Fluid meters." Feb. 14.
- 3696.—THOMAS, J., "Incandescent gas-lamps." Feb. 15.
- 3713.—ROBIN, J. I., "Manufacture of mantles." Feb. 15.
- 3780.—DRAEBLE, H., "Reflecting light and heat produced by a gas-burner." Feb. 16.
- 3791.—VALENTINE, H. S., "Recovering and utilizing waste heat from gas-fires." Feb. 16.
- 3822.—WOLF, O., BAMBURY, N. F., and BERNARDY, E., "Brackets and pendants." Feb. 16.
- 3857.—ROWELL, J. & R. H., "Petrol air-gas generators." Feb. 16.
- 3861.—LEES, M., "Gas-governors." Feb. 16.
- 3900.—STEVENSON, A. H., "Boxes for mantles." Feb. 17.
- 4010.—MUIR, T., "Bunsen burners." Feb. 18.
- 4040.—WILSON, J., "Gas-turbine." Feb. 18.
- 4090.—LAKE, W. E., "Gas-turbines." A communication from E. F. Bour. Feb. 18.
- 4124-5-6.—HALL-BROWN, E., "Gas-producers." Feb. 19.
- 4169.—BALE, E. A., "Gas-pipes." Feb. 19.
- 4202.—HANWELL, H. W., "Gas-pendants." Feb. 19.
- 4205.—HARRIS, H. E., "Atmospheric burners." Feb. 19.

The Norfolk County Council intend to tar nearly 70 miles of roads this summer in different parts of the county, at an estimated cost of £3500, with the view of abating the dust nuisance.



## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### Gas Companies as Suppliers of Electrical Energy.

SIR,—In the last number of the "JOURNAL" I notice a letter from the Sales Manager for the Borough of Marylebone electricity supply; and I think you occupied much more space than was necessary as an answer thereto. I have had a fair experience of the cost of both gas and electrical energy as lighting agents, and I know, and have proved again and again, that, light for light, electricity costs more than double what gas costs—not in the laboratory, but in every-day ordinary use, and with prices as generally charged to-day. Nevertheless there are many people who are willing to pay this extra price; and the demand for electricity is a growing one.

My reason for writing this letter is to call attention to the fact that gas authorities in many of our smaller towns and villages are letting slip opportunities that shortly may be beyond them. We gas suppliers claim that we have cheap power to sell; yet we generate very little electrical energy for public supply. In fact, I believe that in one or two cases gas suppliers themselves are using suction plants or steam for the purpose of generating a supply of electricity for public use. In my opinion, the time is coming when most small towns will possess an electricity supply station; and I am certain also that such stations can only become really successful, for both consumers and suppliers, if and when installed at the gas-works.

I am fortunate in having charge of one such station supplying a small village; and I can tell anyone interested that it is possible for a station of this kind to pay its way, letting both departments stand on their own footing. I believe that to-day our electricity undertaking is one of the most successful in England; and we also admit that it is about the smallest giving a public supply. We attribute the success of our station to the following: (1) Using our own power gas; (2) not having cutting competition; and (3) having a single staff for both concerns.

H. MARSDEN, Manager,  
Gas and Electricity Works, Honley, Huddersfield.

Feb. 25, 1910.

### The Largest Gas-Supply District.

SIR,—I notice in the report of the proceedings at the half-yearly meeting of shareholders of the Croydon Gas Company that Mr. J. W. Helps considers his statutory area of supply the largest in the country. I am afraid I must lay claim at any rate to a larger—if not the largest—area; our gas districts covering over 128 square miles in 28 parishes, astride two counties—Surrey and Hants. Our electrical and water areas are not quite identical, or so large as the gas area.

Aldershot, Feb. 24, 1910.

R. W. EDWARDS,

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

In accordance with the Standing Orders, the Chairman of Committees of the House of Lords (Lord Onslow) and the Speaker's Counsel (Mr. Ernest Moon, K.C.) had a conference to determine in which House the respective Private Bills should be first considered; and they decided that the following should originate in the Upper House:—

Abertillery and District Water Board Bill, Ammanford Gas Bill, Bishop's Stortford, Harlow and Epping Gas and Electricity Bill, Cambridge Water Bill, Farnham Gas and Electricity Bill, Garrant Gas Bill, Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Gowerton Gas Bill, Great Grimsby Gas Bill, Havant Gas Bill, Maltby and Tickhill Water Bill, Maltby Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, South Lincolnshire Water Bill, Southend Water Bill, Thorne and District Water Bill, Wicklow Gas Bill.

Petitions have been presented against the following Bills:—

Abertillery and District Water Board Bill, by the Blaenavon Company, Limited, the Monmouthshire County Council, the Abergavenny Corporation, and the Usk Conservators.

Bishop's Stortford, Harlow and Epping Gas and Electricity Bill, by the Essex and Hertfordshire County Councils and the Bishop's Stortford and Sawbridgeworth Urban District Councils.

Cambridge Water Bill, by Corpus Christi and Trinity Colleges, Cambridge, the Cambridge County Council, and the Cambridge Corporation.

Farnham Gas and Electricity Bill, by Conservators of the River Thames and the Farnham Urban District Council.

Gas Companies Standard Burner (No. 1) Bill, by the London County Council; the Wandsworth Borough Council; the Bootle, Hastings, Liverpool, Maidenhead, Scarborough, Swansea, and Torquay Corporations; the Allerton, Chiswick, Great Crosby, Heston and Isleworth, Ilford, Letherland, Twickenham, and Waterloo-with-Seaforth Urban District Councils; and the Mersey Docks and Harbour Board.

Gas Companies Standard Burner (No. 2) Bill, by the Bournemouth, Cambridge, Faversham, Hemel Hempstead, Newport (Mon.), Poole, Reading, Shrewsbury, Tunbridge Wells, and Wolverhampton Corporations; and the Cheshunt, Harrow, Herne Bay, Radcliffe, Romford, Wealdstone, and Wembley Urban District Councils.

Gas Companies Standard Burner (No. 3) Bill, by the Bath, Exeter, Godalming, Guildford, Ipswich, Plymouth, and Southampton

Corporations; and the East Stonehouse, Teddington, and Walton-upon-Thames Urban District Councils.

Gowerton Gas Bill, by the Gorseinon Electric Light Company and the Swansea Rural District Council.

Maltby and Tickhill Water Bill, by the Rotherham and Sheffield Corporations, the Tickhill Urban District Council, and the Rotherham Rural District Council.

Maltby Gas Bill, by the Dinnington and District Gas Company, the Rotherham Corporation, and the Rotherham Rural District Council.

Matlock Bath and Scarthin Nick Urban District Council Bill, by the Matlock Urban District Council.

South Lincolnshire Water Bill, by the Bourne Urban District Council and the Bourne Water Company.

Southend Water Bill, by the Leigh-on-Sea Urban District Council.

Thorne and District Water Bill, by the Crowle Urban District Council.

Wicklow Gas Bill, by the Rathdrum Urban District Council.

### HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bills presented, read the first time, and referred to the Examiners: Brighton and Hove Gas Bill, Bristol Gas Bill, East Grinstead Gas and Water Bill, Exmouth Gas Bill, Mallow Gas Bill, Pontypridd Water Bill, Shirebrook and District Gas Bill, Slough Water Bill, South Hants Water Bill, Staffordshire Potteries Water Bill, Tipperary Gas Bill.

Bills presented, read the first time, and ordered for second reading: Bradford Corporation Bill, Egremont Urban District Council (Gas) Bill, Exmouth Urban District Water Bill, Gas Companies Standard Burner (No. 1) Bill, Kingswood Water Bill, Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Middlesbrough Corporation Bill, Middleton Corporation Bill, Mountain Ash Water Bill, Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Warrington Corporation Bill, Worksop Urban District Council Bill.

## LEGAL INTELLIGENCE.

### WATER SUPPLY FOR RAILWAY STATIONS.

#### HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Feb. 24.

(Before Justices PHILLIMORE and BUCKNILL.)

Metropolitan Water Board v. London, Brighton, and South Coast Railway Company.

This was an appeal by the plaintiffs from the decision of His Honour Judge Woodfall, at the Westminster County Court; and it raised the question whether water supplied to railway stations for the purpose of being used in water-closets and urinals was a "domestic" use within the meaning of the Act.

Mr. DANCKWERTS, K.C., and Mr. A. B. SHAW appeared for the appellants; Mr. YOUNGER, K.C., and Mr. CLODE represented the respondents.

Mr. DANCKWERTS said the decisions went to show that, in determining the purpose for which water was supplied, one had not to consider the use of the premises, but the purpose for which it was supplied; and Mr. Justice Neville had lately held, in the South Suburban Gas Company's case, that water supplied to gas-works for sanitary purposes was a "domestic" use of it.\* In the present case, the water was supplied to the West Norwood Station, and was used, among other purposes, for flushing urinals. The question turned on the proper construction to be put upon the Metropolitan Water Board (Charges) Act, 1907. Section 3 incorporated the Water-Works Clauses Act, 1847, except section 35, which obliged the undertakers to keep their mains supplied with sufficient water for domestic use. Section 8 provided that the Board should, at the request of an owner of any tenement, supply a sufficient quantity of water for domestic purposes at a certain rate per cent. This was qualified by section 9, under which, if premises were used for trade purposes, the occupier obtained a rebate. Section 16 related to a supply by meter for other than domestic purposes; and section 25 enacted that, for the purposes of the Act, the expression "domestic purpose" included water-closets, and also baths capable of containing not more than 80 gallons, but not water for steam, gas, or other engines, &c.

Justice PHILLIMORE asked whether plaintiffs contended they were entitled to 5 per cent. on the rateable value of the whole station.

Mr. DANCKWERTS believed not, but said the amount was not in question in the Court below. His contention was that water supplied to closets was a "domestic" purpose within the meaning of the Act, and had been so held by Mr. Justice Neville in the case cited.

Mr. YOUNGER argued that the decision referred to had no application to the present case. *Prima facie* a supply of water to urinals on the platform of a railway station could not, by any stretch of language, be treated as a supply for "domestic" purposes. The Court had to consider the elements of domesticity; and unless it found domesticity in the *locus in quo*, it had never been held to be a "domestic" purpose. Here the rateable value of the station was £240, and the Water Board, finding that water was being used for cleaning and flushing urinals, claimed £12; whereas the respondents contended they ought only to pay £8 9s. 3d.—the rate for a supply by meter, which sum had been

\* See "JOURNAL," Vol. CVIII., p. 191.



paid into Court. There never yet had been a decision that water used in urinals at railway stations was a "domestic" purpose within the meaning of the Act. He submitted that, under section 16 of the Act of 1907, the supply of water to urinals and closets was one for "railway" purposes. The contention on the other side really amounted to this—that the words "domestic purpose" meant "for the use of man;" but he could not find any authority to justify such a proposition. Their Lordships reserved judgment.

### Ticehurst and District Water and Gas Company.

Last Tuesday the action of *Locke v. Ticehurst and District Water and Gas Company* was heard as a short cause before Mr. Justice Eve in the Chancery Division of the High Court of Justice, on a motion by the plaintiff, for whom Mr. Hurrell appeared, for judgment to be entered in accordance with agreed minutes. Mr. Hurrell said the action was really for the appointment of a receiver; and it was a consent order that was asked for. Mr. Martin, who represented the Company, explained that it was a statutory one incorporated by Act of Parliament. There was a serious question arising as to whether certain of the debentures had been validly issued; and though the Company admitted that those held by the plaintiff were in order, they did not wish to make any admission in regard to others. A receiver had been appointed; but the order was not in proper form, having regard to the fact that the Company was a statutory one. He asked that the order should be discharged and another made, appointing a receiver in the proper form to receive the net earnings arising from the undertaking. After some discussion as to the form of the order, his Lordship entered judgment for plaintiff, and made the order as desired.

### Winding-Up of the Kitson Empire Lighting Company.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Warrington had before him the case of *Higgs v. Kitson Empire Lighting Company*. It was a motion by Mr. Hunt, on behalf of the plaintiff, suing for himself and the other debenture holders of the Company, for the appointment of a receiver and manager. He said the Company had issued debentures to the amount of £10,000, of which plaintiff held £1000; and the application was based on the ground of jeopardy. The debentures were due in September, 1918; but there was a provision in the trust deed under which they became immediately due if the Company were carrying on business at a loss. He had evidence to show that the concern was hopelessly insolvent, and that it had been working at a heavy loss since it started in July, 1908. A petition had been presented, and resolutions had been passed for voluntary winding-up. The report of the Auditors showed that the undertaking was in a critical condition, and that there was no possibility of obtaining further capital. Mr. Holmes, for the Company, said he could not oppose the application, though he was not in a position to consent to an immediate judgment, as there was a possibility of a scheme of arrangement being carried out. Mr. Hunt said the Company carried on business at Stamford; and as Mr. Grey, a wholesale ironmonger, had been appointed Receiver at the instance of the debenture holders, he asked that this gentleman should be appointed Receiver and Manager. His Lordship complied with the request, but directed that Mr. Grey should not continue to act beyond the last Friday in Easter sittings without a further order.

### The Ownership of Money in Gas-Meters.

The question as to the legal title to money put into a penny-in-the-slot gas-meter cropped up again last Wednesday before Mr. Biron, at the Old Street Police Court. A woman named Louisa Wylie, married, and living in Hulley Place, Hoxton, was charged on remand with having stolen, between the 11th and 18th of January, various sums, amounting to 14s. 10d., the property of the Gaslight and Coke Company. The only evidence given was that of Archibald Hughes, a collector for the Company, and the constable who took the prisoner into custody, and to whom she admitted having had the money. The evidence of the collector showed that according to the meter index the amount named in the charge should have been in the cash-box, but was not. The meter was rented in the name of the prisoner's husband, as the tenant of the house; but it served the needs of two supplies. The prisoner said the money was put in by her or her husband, and when she took it—on two or three occasions—she was "hard up." Mr. Biron raised the question as to whom the money belonged to. Possession had not passed to the Gas Company by its being dropped into the meter; and this construction was borne out by the Act of Parliament, which made the tenant liable for the gas consumed. Mr. Humphreys, solicitor, reminded his Worship that the renting of penny-in-the-slot meters was the subject of special contracts with the tenants, which made them liable. Mr. Biron said they were, civilly—that was to say, only by County Court process; while under the Gas Act the Company could go to the Police Court and get summary judgment. He added that the husband of the woman was liable. Mr. Humphreys said the Company hoped to recover the amount. Mr. Biron intimated that he did not feel called upon to decide that the prisoner had stolen the money of the Gas Company, though she had been given into custody for it by their representative. He proposed to deal with her in another way, in the interests of her home and her husband. He ordered her to be put under probation for twelve months, one of the conditions being that she abstained from drink for this time. If she broke the order, she would be brought to the Court and sent to prison.

**Extension of Incandescent Gas Lighting in Battersea.**—The Highways Committee of the Battersea Borough Council have accepted an offer from the Gaslight and Coke Company to convert 62 gas-burners in the several depôts from flat-flame to incandescent lighting free of charge, and to maintain the burners for 2s. per year each. The Health Committee have accepted a similar offer from the Company with regard to 16 gas-burners in the chalets by Chelsea Bridge.

## MISCELLANEOUS NEWS.

### ILLUMINATING POWER AND TESTING AT SHEFFIELD.

#### Gas Company's Application for a Provisional Order.

An inquiry with regard to the application of the Sheffield United Gaslight Company for a Provisional Order to enable them, among other things, to reduce the candle power of the gas supplied by them and to adopt for testing the "Metropolitan" No. 2 burner, was held by the Hon. T. H. W. PELHAM at the offices of the Board of Trade last Tuesday.

Mr. G. M. FREEMAN, K.C., appeared for the Company; the Corporation being represented by Mr. COURTHOPE-MUNROE.

Mr. FREEMAN stated that the Gas Company asked for power to carry out two or three minor improvements. Their first object was to bring the illuminating power of their gas and the testing up to modern lines—in other words, to be able to supply 14-candle instead of 16½-candle gas, according to their present requirements, and to use the modern burner which was prescribed almost everywhere now. The Company also desired to be able to offer their debentures by tender, as well as by auction, to which they were now limited; and to hold their meetings annually, instead of half yearly. Explaining that a certain number of people did not care to attend sales by auction, though they would be perfectly prepared to tender, he said the Company found when they last offered their stock that they did not get as high a price as they should have obtained, nor sell all that was offered. Seeing that the concern was paying the maximum dividend, this alteration would be absolutely to the benefit of the public. The only part of the application to which there was any opposition was the proposed reduction of the candle power and the alteration of the test. He could not quite understand the reason for the objection of the Sheffield Corporation. During the last few years, the question of the reduction of the illuminating power of gas supplied had been before the Board of Trade time after time. The whole matter was fought out by the South Metropolitan Company under the management of the late Sir George Livesey; and he thought if there was one proposition which was established, it was that 14-candle power gas, with the incandescent burners now used, effected an absolute saving, and that anything beyond this quality was waste, which made the gas more expensive without any corresponding benefit to the consumer. In no modern case in which application for 14-candle power was made had the Board refused it; and there were between fifty and sixty such instances. As regarded the testing alteration, he did not think the Corporation could seriously dispute that improvement. The Company proposed to adopt the No. 2 "Metropolitan" argand; and this change would prove very beneficial to the consumer.

Mr. Hanbury Thomas, now a Director of the Company, before that General Manager for 25 years, was the first witness in support of the application. The Company had, he stated, 95,000 customers; and they supplied 3,500,000,000 cubic feet of gas annually. They furnished the Corporation with the public lighting of the city, with the exception of a few electric lamps in one or two of the principal streets. The Corporation, who were the owners of the electricity undertaking, provided their own lighting in these instances. The Company also supplied customers largely for power, and for cooking and heating. To the general consumer, the price was 1s. 4d. per 1000 cubic feet; but larger consumers obtained a reduction after they had used 500,000 cubic feet (about £33 worth per annum); and larger consumers still, requiring over 6,000,000 cubic feet, obtained their gas at 1s. per 1000 feet. The public lamps of Sheffield were all supplied at the latter rate. The average price of the gas sold by the Company was slightly under 1s. 3d. per 1000 feet.

Mr. FREEMAN: I think your price compares very favourably with that of your neighbours?

Witness: It does.

Why do you wish to be allowed to reduce your standard from 16½ to 14 candle power?—One reason is that we believe an enriched gas is not so useful to the general body of consumers.

In other words, the consumers would get better value for their money?—I may say we do not propose to go down to 14 candles all at once. All we propose to do is to leave off enrichment; and this will probably make 1-candle power difference. I cannot say for certain, because we have not yet supplied unenriched gas; but we use a very good class of coal, and have no reason to anticipate a reduction of more than a candle power to begin with. But as time goes on, and improvements in gas making come forward, we want to be in a position to take advantage of them; and we think that if lower quality gas is sufficiently good for a number of other places in the kingdom, it is good enough for Sheffield.

You are aware of the enormous difference made by the incandescent burner?—Yes; an enormous difference.

You know that, for a great number of places, 14-candle power has been given by the Board of Trade?—It is the standard generally given nowadays—in fact, in every case; and we desire to fall into line.

As you are paying your maximum dividend, every benefit arising from the reduction of the candle power of the gas will go to the consumer, not to the Company?—Not a penny will go to the shareholder. The whole of it will go to the consumer.

So that this Provisional Order really is applied for, not for financial advantage for yourselves, but out of public spirit?—Yes.

Witness, in reply to the Hon. T. H. W. PELHAM, said the maximum dividend of the Company was 10 per cent.; and they had been paying this for years. At the same time, at every opportunity they had reduced the price of gas to the consumers.

Mr. FREEMAN: We may take it that it is an exceptionally low price?

Witness: Yes; very exceptionally low.

You know of cases of your neighbours who have reduced their gas to 14 candles, and it has proved very beneficial?—Decidedly. It is a far more useful gas now than 16½-candle gas for every purpose—not only for incandescent lighting, but for engines, fires, and manufacturing purposes.



The No. 2 "Metropolitan" argand burner is the same that has been adopted in all recent cases?—Yes.

Mr. FREEMAN: You think it would be to the advantage of all concerned that you should be able to offer your stock by tender?—Decidedly. It is what is done in every other case. It is to the advantage of the consumers that we should obtain as big a premium as possible, because the premium bears no dividend.

Mr. COURTHOPE-MUNROE (in cross-examination): You know that the Corporation are not acting toward you in any sense in a hostile way in regard to this inquiry; but they want to see exactly how matters "pan out" under the Company's proposals.

Witness: I have tried already to explain that, and although it may not be hostility, it is putting us to very considerable expense.

Do you suggest that the Company's sole reason in asking for this Order is to put it in the way you did—that as it is good enough for other places to have the "Metropolitan" burner and 14-candle power gas, you ought to have it too?—Decidedly. I go further and say it ought to be so over the whole kingdom.

It is not because you really want it?—Yes, because we want to be progressive. We have always been; and we want to continue to be.

You do not hope to get any personal benefit for the Company. It is simply to come into line?—Can you show me any benefit for the Company?

It is really simply a desire to come into line?—And to progress.

You know, do you not, that there are three Bills in Parliament this session which affect something like 47 companies scattered throughout the country; and all these are simply asking Parliament to give them the improved burner. They are saying: "We are content to leave our candle power as it is (in some cases higher than yours, in some cases lower). All we ask is for the 'Metropolitan' burner, which gives a more true test."—That is so; but if these companies were coming separately, they would ask for the 14-candle power. I know people connected with most of these companies.

Why should the Sheffield Company not fall into line with these 47 companies? You agree that all these are content with their present candle power, provided they obtain the improved test?—I do not agree that they are content; but they do not all want to come to Parliament separately at once. It is a very costly thing.

Do you agree that the effect of substituting the "Metropolitan" burner for the old No. 1 argand makes a difference of about 2½-candle power?—No; about 2-candle power.

So that, by the adoption of the burner alone, you would be able to bring your gas down from 16½ to 14½ candles?—Yes.

Do you suggest that you can manufacture direct from coal 14-candle power gas?—We do not intend to try.

Supposing you were to manufacture gas from coal without any dilution, it would be more than 14-candle power?—A good deal.

Do you intend to produce diluted gas?—No; we do not.

Then why are you asking to cut down your candle power?—We want to fall into line with all the other companies who have obtained the reduction. We believe every company will get it in time. It is only a question of opportunity to make the application.

But you are cutting down the gas by your new burner from 16½ to 14½ candles, and you never intend to make diluted gas?—I do not say never. We wish to be in a position to take advantage of any improved methods of manufacture that we can. We may get more gas out of the coal in time.

Supposing you do make diluted gas, the person who uses it has, in order to get the same light and heat, to buy more gas?—No, we should not be so foolish as that. We have no monopoly in the supply of light, or heat, or power; and we are not going to be so foolish as to reduce the quality of the material we sell to such an extent that it would not be advantageous to our customers to use it. If we do, we shall lose our business.

That sounds very well. But supposing a person must have gas, having got it laid on, and it being the only thing he can work with, you are the only persons supplying it; and if you give a diluted gas which has not the same illuminating or calorific power, the only way he can make up the difference is by burning more?—But you are supposing a thing that I do not think can happen.

On this supposition, that would be the position?—If you suppose all sorts of things, all of the things might happen.

It is quite true that your Company is one of the most successful in the North of England, that your price is very low, and that you have paid the maximum dividend for many years. You are in the happy position of having an unappropriated profit which you carry forward—the 1908 figures were £81,000, almost another 10 per cent. reserve fund?—It is £75,000 now. For the last two years we have had to draw on the surplus profits, because we have not made our dividends. When we last reduced our price, we knew that we should have to draw upon our surplus profits. But for the surplus, we should have had to charge more for gas. The fact that the Company sell gas at such a low price, and that these profits have accumulated, shows that the Company has been well managed, and in the interests of the consumers.

You cannot point to any other company with anything like the same carry-forward?—I cannot point to any other company selling gas at this price.

I agree. You are abnormal in both cases. You say the gas under the new condition of things would be more useful to the consumer?—That I am sure of.

Do you suggest that as regards people who use flat-flame burners?—No; but there is no necessity to have flat-flame burners nowadays. Consumers save money by having incandescent ones. Comparatively very few indeed of the Company's 95,000 consumers use flat-flame burners; but I cannot give any figure.

Do you know the Corporation have 1462 flat-flame burners?—No. The sooner they change them into incandescent burners, the better it will be for them.

Mr. COURTHOPE-MUNROE: You cannot deny that it will be harmful to users of these flat-flame burners?—I do not think they will notice any difference.

Mr. COURTHOPE-MUNROE observed that the Company's Order did not contain any provision similar to that which was included by the

Gaslight and Coke Company—that if the powers asked for were obtained, the promoters would provide new burners free of cost.

Witness replied that this was not a large matter. It might apply if they were going to cut down the quality of the gas to 14 candles; but they were only stopping enrichment—representing a difference of about 1-candle power.

Mr. COURTHOPE-MUNROE: You are asking to be put in the same position as the Gaslight and Coke Company. Can you defend that provision not being in?—If it were a question whether we should have the powers or not, we should be willing to supply the burners. But I am told by several companies that they have laid in a stock of burners, and they have never been applied for—not being found necessary.

In the Gaslight and Coke Company's Act there was also a calorific standard. You do not include that?—It was put in experimentally there.

There are a great many people in Sheffield who burn gas to heat their tools?—A great many. That is one of our objects in wishing to reduce the candle power—that we can save them very considerable cost.

Mr. COURTHOPE-MUNROE said he was told by experts that to cut down the Company's gas to 14-candle power would mean a loss of 12 per cent. in heat.

Witness replied that he could not say if this figure was correct, as the Sheffield Company had never tried. The result of obtaining this power would, however, be the same in their case as with other companies.

Mr. COURTHOPE-MUNROE: Is it not very desirable that in Sheffield the gas should have a high calorific value?

Witness: It is desirable that it should have a good calorific value.

The only way the operative could get extra heat for his tool, supposing your gas is deficient, is to use additional gas?—No; I should think he would go to another fuel.

At Liverpool the present candle power is 22·40, at Scarborough 16·20, at Ormskirk 16·50, and at Shrewsbury 16·48. If these Companies are content to stick to their candle power in the Bills now before Parliament, why should Sheffield want their candle power reduced?—I should prefer to give you cases like Leeds and Manchester. Those mentioned are all small and not trading places, except Liverpool.

But Liverpool is; and they are content for their candle power to remain as it is?—No; they are not. I know Liverpool; and they will be coming for a reduction some time.

Re-examined by Mr. FREEMAN, witness said that a great number of places that had reduced their candle power were comparable with Sheffield. The result of reducing the candle power had worked beneficially in these places. He read the following letter he had received from the Rotherham Gas Committee: "Since we obtained authority in 1902 for a reduction from 16 to 14 candles, we have not experienced any difficulty whatever with our customers. We commenced by gradually reducing it from 16½ to 15½ candles; and this standard we maintain." There was the same experience, witness added, at Leeds. In 1905, they supplied gas of 18·40 candle power; in 1906, 18·20 candles; and in 1909, 15·49 candles.

Mr. Charles Carpenter was called and said that the Bill presented by the Gaslight and Coke Company was strongly contested by the London County Council and others before the Parliamentary Committee; but the result was that the reduction in candle power was granted. It was prophesied by the experts for the London County Council and other opposing bodies that the consumption of gas would increase very considerably—16 per cent. was mentioned. Their actual experience, however, was that the increase was not above the normal—1 to 1½ per cent.—although they reduced the quality first to 15 and then to 14 candles. They did not get the increased consumption which theoretically should have come about in proportion of 16 to 14.

Mr. FREEMAN: Is the sole result of the reduction, in your experience, an economical treatment instead of a wasting treatment?

Witness: Yes; every penny of saving would go to the consumers. The only advantage to the Company would be that the powers would consolidate it and make its footing more secure than now—if that were possible.

From experience of the South Metropolitan Company, do you say it would be to the public advantage?—There is no doubt about it whatever. That was thrashed out most completely when we set the example which has been followed by many other companies.

It has been suggested, on behalf of the Corporation, that there would be a loss of calorific value?—There is a slight loss of calorific value, about 2 per cent. The proportion is 147 or 148 to 150 or 151.

Replying to further questions by Counsel for the Corporation, witness disagreed with the opinion expressed that there would be a loss of 12 per cent. with the new burner. He might go up to 4 per cent., but not more.

Mr. H. E. Jones said he regarded the proposals of the Gas Company as distinctly to the advantage of Sheffield. Fourteen candles was about the illuminating power which predominated in the kingdom; and generally manufacturers had adapted their appliances to it. There was not a proportionate extra heating power in the higher quality gas; and unless they had special fittings, part of the power was wasted.

Mr. FREEMAN: Then you do not agree that men who want to heat their tools would find much difference?

Witness: No, because with 16-candle power gas they would probably find that there was a waste in carbon. The loss of calorific power would be about 4 or 5 per cent. at the outside.

Mr. J. F. Bell, the Engineer and Manager of the Derby Gas Company, said their experience of 14-candle power gas in a place similar to Sheffield was a large increase in consumers and no complaints.

In reply to Mr. COURTHOPE-MUNROE, witness said 14½ candles was the lowest they had got to. They had been doing 15 candles, and their average was about 16 candles.

Mr. COURTHOPE-MUNROE said the Corporation considered the Company were asking too much when so many other companies were at present merely applying to Parliament for power to use the new burner. The Company were really only asking for the power to reduce the quality of their gas because they seemed to have got it into their heads that they were under some moral obligation to fall into line with other concerns. The Corporation had a real fear that if the Company were given the powers asked for, it would really mean a drop of 5 or 6 candles,



and this would be bad for Sheffield, which stood in rather a peculiar position as regarded wanting gas of a certain calorific value. If both points for which the Company asked were conceded, they contended that the gas would be deprived of so much of its heating power that the operatives would not be able to heat their tools as they had been accustomed to, without being compelled to use a larger amount of gas than at present. The people of Sheffield said—no doubt, because the price of gas was abnormally low—they preferred to retain the calorific value of their gas rather than obtain any possible financial benefit. Pointing out that if the Bills before Parliament, by which 47 companies were seeking power only for the new test burner, became law the Board of Trade would have two sets of precedents, and it would be a question as to which they would in future act on, Counsel contended that this was an inopportune moment to give the Sheffield Gas Company both the things desired as against these other 47 companies. The Company's consumers had a strong objection to the proposed reduction. He commented on the fact that the proposed Order left out the three points in the Gaslight and Coke Company's Act—viz., free burners, a calorific test, and price; the latter, of course, not applying in this instance. The sole reason apparently for the Company's double-barrelled request was to "come into line," and if the Board of Trade considered those whom the Corporation represented had fair ground for believing they would be harmed in the way indicated, he asked that the Provisional Order should be allowed to go forward simply providing for the alteration of the burner.

Mr. William Newbigging stated that the two things asked for would affect the consumer adversely. The present prescribed illuminating power was 16½ candles. Under the Order, it was proposed to cut it down to 14 candles. Thus, so far as illuminating power was concerned, it was obvious that there was a reduction of 2½ candles. But over and above this, if they adopted the "Metropolitan" argand No. 2 burner in place of the "London" argand No. 1, there would be a further reduction equal to from 3 to 3½ candles.

Mr. COURTHOPE-MUNROE: Then there will be a total reduction, in your view, of 6 candles?

Witness: Yes.

Have you formed any opinion as to what this means in loss of calorific value?—From a great many experiments we have made in the North of England, we find that the average reduction of heat value is from 2 to 5 per cent. per candle. In the case of Sheffield, where they only supply what I call a straight coal gas, I would put the reduction at 2 per cent. per candle; so that, on 6 candles, there would be a reduction of 12 per cent.

Do you think there is practical importance in trying to retain this calorific value?—I do. The Company themselves state in their answer to the objection of the Corporation that they are trying to develop the use of gas for the heating of furnaces. For this purpose, the heat or calorific value of gas is all important. In a good many processes for which gas is used, the actual price is a minor matter compared with its heating value. The Company could not give a reduction in price equivalent to the loss the consumer would suffer by the drop of heating power—in the time of the men employed, &c. The consumer would have to suffer the injustice of being deprived of the present heat value. It was easy to say he must turn to some other fuel; but he could not—he was confined to the supply of gas from the Company.

To get the same heat, he would have to burn more gas. Of the 58 companies who had obtained both these powers, there were not more than two or three who had availed themselves of the power to come down to 14 candles; so, as far as practical experience went, there was nothing to judge from.

In cross-examination, witness said that the reduction from 16 to 14 candles was not only not in the interests of the consumer, but he would go further and say it was not in the interests of the Company.

Mr. FREEMAN: Can you conceive any reason why the Company should introduce any alteration which would reduce their earning capacity?

Witness: I do not think they will do that. I do not think they will act on the powers if they are granted to them.

In that case, how will those for whom you appear be hurt?—We shall not be. If the Company will give an undertaking that they will not act on the powers granted, we shall be perfectly satisfied.

Don't you know the position? We have no intention of immediately doing so; but we desire to take advantage of the developments of science as they arise?—In that case, I think you are getting ahead of science. Why not wait until this discovery has been made, and then come to Parliament?

This concluded the evidence. The decision of the Board of Trade will be announced later.

**Suicides by Gas at Bradford.**—Walter Hebb, a prominent swimming official at Bradford, committed suicide last week at his workshop, by inhaling gas from an india-rubber tube attached to the gas-bracket. It was stated that he had lately been drinking heavily, and had got into financial difficulties. On Wednesday, Harry Youman was found in his house at Manningham dead, with one end of a rubber pipe in his mouth, and the other end attached to a gas-bracket.

**Fall in Auer Gas-Light Shares.**—According to a special communication to the "Financial News," sent from Berlin last Thursday, the shares of the Auer Incandescent Gas-Light Company have of late sharply declined. Our contemporary's correspondent said: "The depression was provoked by the news of the proposed increase of the Company's capital, which the Directors proposed to double. These proposals not having, however, met with approval of the public, the Directors withdrew them, and thus provoked another important fall of the prices of the shares. After these events the market became steady; but suddenly the shares were again readily offered all round. The reason is reported to be as follows: The Auer Company are manufacturing, as a speciality, the Osram glow lamp. The competition which exists in the German light industry has given rise to a reduction of prices of glow lamps from 3 to 2 marks; and shareholders in the Auer Company were afraid the Company would be obliged to reduce their prices for Osram lamps. It appears that it is just this branch of their industry from which the Company earn good profits."

## COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The Secretary (Mr. H. D. Ellis) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

### COAL MINES (EIGHT HOURS) BILL—PORT OF LONDON CHARGES.

The CHAIRMAN, in moving their adoption, said: The half year with which the report and accounts deal, has been a very satisfactory one, so far as the inner working of the Company is concerned; but it is not quite so satisfactory as regards outside circumstances which affect our business. I do not think we have ever had more favourable accounts to present to you at any time since I have known the Company; for almost every item in the accounts speaks of progress, prosperity, economy effected, and improvements in manufacture achieved. The outside circumstances to which I refer are two. First, the Mines Regulation (Eight Hours) Act, which came into force in the North on Jan. 1 last, and which has resulted in a good deal of disturbance and dissatisfaction among the colliers. They find that the restriction of their hours of labour will in all probability lead to diminished earnings, and in some cases to the loss of their Saturday half-holiday; and, not unnaturally, they object strongly to both. The colliery proprietors also find that the output from their mines is in danger of being diminished; and their efforts to make up this loss, as you know, almost ended in a strike. The result to us has been an interruption of the supplies of coal, which has caused us considerable anxiety and some loss. We are not out of our difficulties even now. At any rate, the effect of the Act seems to be that the men will lose in their wages, the owners in diminished output and increased cost of getting coal, and the country at large will have a tax imposed upon it in a permanent increase in the price of coal. These were exactly the results that were pointed out to the Home Secretary when we attended before him in deputation to protest against the Bill at the beginning of last year; and it did not require any amount of abnormal wisdom to make such a prophecy. The other rather disquieting circumstance is the Port of London Authority's proposal to impose heavier dues on goods coming into and through the Port of London. It was contemplated, when the Authority was constituted, that a rate of ½d. per ton of coal would be amply sufficient. Now they have issued a schedule of charges with a maximum rate of 3d. per ton on coal. To our Company ½d. per ton would have meant about £420 a year; 3d. per ton would mean £2500. And I should like to point out to you that we, as a Company, will not derive any benefit whatever from anything the Port of London Authority are likely to do; and therefore this extra charge on the profits would bring us no return in any shape. We are taking steps to oppose the schedule of rates so far as it affects us, at the inquiry which is being held (I think it begins to-day) before Lord St. Aldwyn. Apart from these two special circumstances, the general outlook in our district is a favourable one. Trade is surely, if slowly, reviving. Our bad debts, which are a certain sign of the state of business in our district, are smaller than they were last year, and less than usual. I think, too, that the contract for building a *Dreadnought* in our neighbourhood ought to add to the general prosperity.

### RECORDS IN THE ACCOUNT.

Turning to the accounts, I think you will agree with me that the story we have to tell you is altogether a pleasant one. The proceeds of the sale of gas for the first time in the history of the Company exceed £200,000 in the half year; and the gross profit, also for the first time in the history of the Company, exceeds £70,000. I trust that both of these records are but stepping-stones to increased prosperity, and harbingers of greater success.

### ISSUE OF NEW STOCK.

During the half year, it will be noticed, we issued £20,000 of 4 per cent. capital stock to our employees and consumers. This we were enabled to do under the terms of our Act, which does not allow us to give any preference to the proprietors in the issuing of new capital, as we formerly had power to do. But the Act does allow us to give a small preference to consumers and employees. Most of this stock was taken for the purpose of the profit-sharing scheme; and so it will be held in future by the employees of the Company. You will notice that we received premiums amounting to £1400 in respect of the issue.

### THE CAPITAL ACCOUNT.

Our expenditure on capital account amounted to £9691, all of which went for additional distributing plant. We added to our connections 2585 new stoves, 241 ordinary meters, and 3322 prepayment meters. Our consumers, you will see from the accounts, now number 98,485; so that when we have the pleasure of meeting you next time the number ought to be more than 100,000. Of these 98,000 consumers, 24,000 are ordinary and 74,000 are coin-meter consumers. I am glad to be able to tell you the proportion of our capital expenditure to our sale of gas has again fallen. It is now only £449 per million cubic feet of gas sold; and if you deduct the cost of our ships, for the purpose of comparison with other companies, it is only £437 per million.

### THE CAUSES OF GOOD RESULTS.

The good results of the half year are due to three causes. First of all, the saving in the cost of coal and oil; secondly, the improved methods of manufacture; and, thirdly, the larger receipts from the sale of gas. Our coal and oil cost less by £11,579; and our make of gas has risen to 11,582 cubic feet per ton, which is very satisfactory, and reflects the greatest credit on our Chief Engineer and the Engineers at our stations. Our carbonizing wages have fallen by £2726, which is 16½ per cent. of what they were in the corresponding half of last year. This does not necessarily mean that we are spending less money on wages, because the increase in the number of our outdoor employees more than makes up for it. But it does mean that there are fewer men engaged in the exhausting toil of the retort-house, and more finding profitable employment in other departments. We have sold during the half year 51 million cubic feet of gas more than in the corresponding half of



1908. This represents in money £5808, and is equivalent to  $3\frac{1}{2}$  per cent. increase in the sale of gas. Most of it took place through the coin-meters; but one gratifying feature of the half year (and I am pleased to note it) was that we had an increase for the first time for many half years in the sale of gas through ordinary meters. For some years past our increase has been due to the number of coin meters we fix. You may be interested to know that the Gaslight and Coke Company had an increase of  $4\frac{1}{2}$  per cent. on their gas sales; and the South Metropolitan Company, just over 4 per cent.

#### FINANCIAL SUMMING UP—A PROSPECTIVE REDUCTION IN PRICE.

To sum up briefly the financial results of the half year, the proceeds from the sale of gas and the rental of meters and stoves are more by £7471; and residuals, chiefly owing to the lower price for coke, brought us in £4822 less. Coal and oil have given us a saving of £11,579; and we spent more than last year on wear and tear. Altogether, the result is a profit of £70,598. This time last year, the profit was only £63,845—that is to say, we have an increased profit of £6753. Turning to the net revenue account, the interest on borrowed capital amounts to £8832. The dividends at the same rate as the preceding half year—the dividends at the full statutory rates—will absorb £53,085, or, together, £61,917. We shall then have a surplus profit for the half year of £8681. We brought forward from last half year £23,058. We add to this the surplus of £8681, and carry forward into the new half year £31,739. That is, you see, more than the equivalent of three months' dividend. The surplus profit amounts to 1d. on the price of gas; and I think I may prophesy that, if we make favourable coal contracts when we come to renew them shortly, we may hope to be able to announce a reduction in the price of gas, which means an increase in your authorized dividend, and in the bonus paid to employees.

#### THE INCREASED VALUE AND STABILITY OF GAS STOCKS.

It will be observed from the accounts that we have written down the investments which represent our reserve fund and insurance fund to their market value on Dec. 31 last. This cost us £6897. In pursuance of our Acts, our insurance fund is wholly, and our reserve fund partly, invested in trustee securities. As you are doubtless aware, this class of security has depreciated ever since the South African War. I think perhaps there are three causes for the depreciation of trustee securities. First there was the large amount created to pay for the cost of the war and to finance the Irish Land Purchase Act of 1903. The second cause is the large increase in the standard of comfort and luxury all over the country, which made people dissatisfied with the small return yielded by this class of security. The third cause is that Colonial Government securities are now authorized investments for trustees. Banks and other institutions which are compelled to invest in these securities, and to hold large sums of them, have suffered a loss—I was going to say of hundreds of thousands of pounds, but I should be nearer the mark if I said millions of pounds. We have suffered to the extent of £6897. I cannot help reflecting, as I am dealing with this subject, upon the comparative steadiness of gas stocks for investment. As I was thinking over this matter the other night, my mind went back seventy years. I am a large holder, I am sorry to say only as trustee, of stock of this Company which was purchased about the year 1840 by my grandfather. As I look at that stock, I see there has been an enormous increase in its value. As trustee under my father's will, I am a holder of stock purchased between 1865 and 1875; and I find again there has been a large increase in value. The bulk of the stock I hold in my own right was bought about the year 1888; and, looking at that, I find it has more than maintained—it has even increased—its value. And all these years we have been receiving a steady 5 per cent. or thereabouts on our investment. I merely allude to this as an illustration to show what a good investment gas stocks have been; and the best of it is that at the present time the prospect is as good as, or even better than, it has been at any time since 1840.

#### CONGRATULATION.

In conclusion, let me congratulate the Engineer and those who work with and under him on the good results of their efforts. By modernizing our plant and improving our methods of manufacture, they have succeeded in cheapening the cost of production, and so added to the earning power of the Company. I hope our Engineer will shortly have the satisfaction—the greatest satisfaction a gas engineer can have—of recommending the Directors to make a reduction in the price of gas. We have made very satisfactory arrangements for purchasing our oil supply for next year; and if we can make equally satisfactory ones for the purchase of coals, I think we may look forward to a prosperous half year.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter) seconded the motion. He would only add one remark to what the Chairman had said, and that was with regard to the Mines Regulation (Eight Hours) Act. He believed that, in addition to the discontent that had been caused by the working of the Act as stated by the Chairman, there was additional discontent in that the Act had disarranged all the domestic economy of every miners' home in regard to hours of meals and that sort of thing; and this had made the wives and mothers very discontented. This only showed him the absolute folly of attempting to regulate the labour market by Act of Parliament.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the rates per annum of £5 4s. per cent. on the 4 per cent. stock and of £5 per cent. on the  $3\frac{1}{2}$  per cent. stock, both less income-tax.

Moved by the CHAIRMAN, and seconded by Mr. H. E. JONES, the retiring Directors (Messrs. H. W. Gell and J. G. Pilcher) were re-elected; and on the proposition of Mr. PEARCE, seconded by Mr. F. JONES, the retiring Auditor (Mr. S. W. Savage) was re-appointed.

Submitted by Mr. M'NAUGHT, and seconded by Mr. JOHNSON, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the compliment; and then, in eulogistic terms, he proposed a vote of thanks to the chief officers and employees, to one and all of whom, he said, the proprietors owed a deep debt of gratitude for their successful work. The Directors had not only the hearty goodwill of their staff, but also their enthusiastic desire for the

well-being of the Company. The work was done well and willingly. The accounts spoke more eloquently than he could do of how the work was done.

The DEPUTY-CHAIRMAN seconded the motion; and it was cordially agreed to.

Mr. ELLIS, in replying for himself and the clerical staff, made an interesting statement regarding one point to which the Chairman had referred—that was as to the acquisition of stock by the employees during the half year. He observed that recently the great Gaslight and Coke Company had adopted a profit-sharing scheme, as had also the Tottenham, the Croydon, and other Companies in the neighbourhood of London and elsewhere. This showed that the scheme of co-partnership (or profit-sharing, as they of the Commercial Company preferred to call it) was extending very rapidly. It was going forward by leaps and bounds. The new issue of stock to which the Chairman had referred was offered to the employees; and he had the gratification of telling the proprietors that no fewer than 534 allotments included 190 men who did not hold a pennyworth of stock before. The result was that a very large proportion of the proprietary were employees of the Company. There were upwards of 3200 stock accounts in the Company, and 27 per cent. of them were those of employees. This showed how very large an interest the men had in the business, and how their interests were wrapped up with those of the Company; also that they had an object in doing the best they could for the Company. It proved, if anything could, the absolute soundness and success of the profit-sharing scheme which the Company introduced nine years ago. With an increase in the proprietary by 258 in the half year, they were growing into a large Company indeed.

Mr. STANLEY H. JONES replied on behalf of himself, the engineering staff, and the workmen. In the course of his remarks, he said that in the past half year they had established records; and he thought he was not too sanguine in saying they would be exceeded in future.

#### READING GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday, at the Offices, Friar Street, Reading—Mr. H. B. BLANDY, J.P., the Deputy-Chairman, presiding, in the absence, through ill-health, of Mr. J. Okey Taylor, J.P., the Chairman.

The SECRETARY and ACCOUNTANT (Mr. A. Canning Williams) having read the notice convening the meeting, the report and accounts were presented. In the former, the Directors stated that the steady progress referred to in the last report had been maintained. The sale of gas had increased by 14,092,800 cubic feet; the number of consumers had risen by 822; and 1175 gas cookers and fires had been added to the number on hire. The accounts accompanying the report showed that the income for the year was £100,609, and the expenditure £84,444; leaving a balance of £16,165 to go to the profit and loss account. The sum available for distribution was £24,827; and the Directors recommended the payment of dividends for the past six months at the rate of 5 per cent. per annum on the preference shares and ordinary stock—interim dividends at this rate having been declared in September last for the first half of the year.

The DEPUTY-CHAIRMAN, when moving the adoption of the report, expressed regret at the absence of the Chairman. The report referred to the steady progress made in the Company's business during the past twelve months, though in some respects it had been an uneventful year. They were able to make a further reduction of 1d. per 1000 cubic feet in the price of gas at the end of the March quarter. It might strike some of them that this was a small concession to make; but when they took into account the quantity of gas the Company sold, they would see that 1d. per 1000 cubic feet reduction amounted to a big sum during the year. The price of gas in Reading was now only 2s. 6d. per 1000 cubic feet, while in the outlying districts it was a little more. This was only fair when it was remembered that they were a Reading Company; and this being so, they were bound to make a higher charge to consumers of gas outside the borough. When the borough was enlarged a few years ago—*i.e.*, in 1887—the Company were willing to grant the residents in the enlarged portions the same advantages in regard to the price of gas that were enjoyed by the residents in Reading; and if a further enlargement of the borough should take place, the Company had fully resolved to act upon this precedent. There had been an increase of 14 million cubic feet in the quantity of gas sold, and they had 822 new consumers as compared with last year. Notwithstanding the reduction in price, the revenue from the sale of gas had been greater. The maintenance charges were higher, due to the cost of the extending business, and the balance of profit was £1245 less than the previous year. But at the same time they were able to pay all they were allowed to pay in the way of dividend. He should like to refer to the great increase that had taken place in the number of their slot consumers during the past few years. About ten years ago the shareholders were continually asking why the Company did not adopt the slot system. They could not do so at the time, because they had not the money, and had nearly come to the end of their borrowing powers. But in 1902 their Act of Parliament empowered them to raise fresh capital; and with this they were able to institute the slot system. At the present time they had nearly 9000 penny-in-the-slot meters in use, and about 1700 shilling-in-the-slot meters; and they had fresh applications every day. In connection with this system, 73,000 visits were paid to houses by the Company's collectors during the past year, and £21,000 was collected in pennies. This was an example of how small coins became big amounts. The Directors were considering how best to increase the use of incandescent burners among their prepayment consumers, the majority of whom already had incandescent burners, one type of which—the inverted burner—had become very popular during the last few years. It gave a very much greater light with a smaller consumption of gas than was the case with the old flat-flame burner. Passing on to refer to the unsettled state of affairs in the coal industry, the Deputy-Chairman remarked that the Eight Hours Act was causing a good deal of trouble; and the probability was that it might increase the price of coal, and so affect them as a Gas Company. If this should be the case and the



price of coal increased, the shareholders might rely upon it that the Directors would do all in their power to keep the price of gas as low as possible. In conclusion, he must acknowledge how very much they were indebted to their staff for the way in which the work of the Company was being carried on. The Engineer (Mr. Douglas H. Helps) and Secretary had done excellent work; and the Company had also every reason to be satisfied with the work of the members of the staff under their guidance.

Mr. T. E. HEWETT, in seconding the motion, endorsed the remarks made by the Deputy-Chairman as to the efficiency of the staff. He said the Company were particularly fortunate in having such gentlemen as their Engineer and Secretary; and he believed they had the loyal support of all the employees of the Company. It was satisfactory to note that the earnings for the past year, including the interest on stocks, were sufficient to pay full dividends with a margin of £1468.

The motion was carried unanimously.

On the motion of Mr. DRYLAND HASLAM, seconded by Mr. R. WILDER, the best thanks of the proprietors were given to the Chairman and Directors, for their able services in the Company's interest; both mover and seconder expressing regret at the absence—a very rare occurrence—of the Chairman from the meeting.

A vote of thanks having been unanimously accorded to the officers and staff,

Mr. HELPS, in returning thanks, said both the staff and the men took great interest in their work, and were working loyally in the Company's interests. He might add that the plant was in excellent condition. One great thing which struck him in connection with the working of a gas company now was that whereas twenty years ago for every man engaged on the district there were about ten men employed on the works, to-day it was quite the reverse. This was an indication that the Company were looking after the consumers, as, indeed, they had to do in view of their competitors. He had had some 27 years' experience in gas-works, and when one remembered that the increase in the consumption of gas in the district of a single gas company last year was equal to the whole of the gas consumed in a place like Reading, he thought this was a pretty clear indication that the gas industry at the present time was certainly very much alive and prosperous.

The SECRETARY also replied, and assured the proprietors that all the members of the staff worked loyally and well, and did their very utmost in the interests of the Company.

The ordinary meeting closed with a vote of thanks to Mr. Blandy.

#### The Standard Burner Bill.

A Special Meeting was then held, when the approval of the proprietors was asked for the promotion of the Gas Companies (Standard Burner) Bill.

The DEPUTY-CHAIRMAN, in proposing the necessary resolution, again expressed regret at the absence of the Chairman, who, he said, would have been much better able than he was to explain the object for which the meeting was called. However, he (the speaker) would read some notes which the Chairman had made with reference to the matter, and would afterwards ask the Engineer to explain the position. He then read the following notes:

The restrictions imposed upon gas companies in former days are no longer justified, seeing that they do not now hold a monopoly to supply light, &c. Such restrictions are highly injurious to companies possessing a large number of consumers. These consumers demand a good gas at the lowest possible price; and it is to the Company's interest to supply a gas suited to the various purposes for which gas is now used.

For years past the Company have made special efforts to provide consumers with appliances of the best description, and consumers have been able to obtain a very high standard of illuminating power from the burners which have been supplied to them. The Company's policy has been to give every encouragement to improvements as they have been developed; and this policy has brought about the present position with regard to the standard burner.

The Company's desire is to secure the most modern appliances for the credit of the Company and the engineering staff, and for the benefit of the consumers. The pursuit of this has led the Directors to the course they have now taken. The Corporation were made acquainted with the Company's intention very shortly after it was arrived at; and if, instead of devoting their time to seeking cause for opposition, they had sought an interview with the Directors, or had taken the trouble to ascertain, from those places where this burner has been in operation, whether it affected the gas consumers prejudicially, the result might have been a saving of public money. The Bill must now go forward, and be dealt with in due course by a Parliamentary Committee; and you may depend that these burdensome restrictions will be removed from gas companies.

They had received a copy of the petition which the Reading Corporation had presented against the Bill, setting forth the position the Council intended to take up. They made a number of suggestions which one would be inclined to smile at, were it not for the fact that it was rather serious to have the opposition of the Corporation of the borough. It was perfectly ridiculous to say that the Company wished to supply a bad article. What they had to do was to make their customers thoroughly satisfied with the quality and price of the commodity supplied. It seemed to be very undesirable that there should be different methods for testing the illuminating power of the gas throughout the country. The Company wished to have uniformity; and in order to do this, they had joined with a number of other companies so as to secure the new standard test-burner. He asked the Engineer to briefly explain the difference between the old and the proposed burner.

Mr. HELPS complied with the request, and said that to put obstacles in the way of the Company using the new burner was like insisting upon a 2-foot rule being used in Reading and a different rule in another town. He added, with all due deference, that the opposition was based upon something written many years ago, describing tests which were not carried out on scientific lines; and if the people who opposed the Bill had known what had happened since then, there would not, he thought, have been any opposition to the use of the burner, which had already been prescribed for use by more than 70 gas undertakings.

Mr. T. E. HEWETT seconded the resolution, and it was carried unanimously.

The meeting then closed.

#### WANDSWORTH AND PUTNEY GASLIGHT COMPANY.

##### Lowest Price of Gas in London and Suburbs—Fruit of Past Policy.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Offices, Fairfield Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said it was a common saying at certain gatherings of a felicitous character that "it was the proudest moment of one's life." Without exaggeration, he thought he might use these words in his position as Chairman that day, because the report informed the proprietors that the Directors had been able to announce a reduction in the price of gas to 1s. 10d. per 1000 cubic feet from Christmas last. This in itself constituted the greatest pride and pleasure that any Board of Directors of a Gas Company could have. He would even face the proprietors without a dividend for such a piece of intelligence as that [Laughter]; but he was happy to say there was no fear of such a lamentable conclusion to their labours. The pride the Directors felt with regard to the position of being able to place the price of gas in the district at the low rate of 1s. 10d. (which was quite a record for London) was a matter in which their officers could also share, because it could not have been accomplished without their assistance. He was dwelling upon this inasmuch as the rest of the report was merely the usual history of continued unpretending, modest prosperity, coming from the hard work of the officers, and affording the present satisfaction and self-congratulation that the Directors felt, and especially felt he was sure by their colleague and former officer, who for many years worked in this undertaking and made these returns and the price of gas possible—Mr. Harry Freeman. This sort of thing was not done very easily; and it was not done shortly in a year or two. It meant many years' pursuit of a consistent and thorough policy—a policy carried out by capable, energetic, and careful hands; a policy initiated in part by gentlemen who could not that day share in their congratulations and felicitations, because they had been gathered to their fathers. But Mr. Freeman, who came into the service of the Company about 1869, became the chief officer of the Company when it was administered by two Directors who had left their mark on the history of the district, and especially upon the Company. He referred to the late Dr. T. S. Howell and the late Mr. Robert Jones (his own honoured father), who sat at Dr. Howell's right hand for many years, and who, by his technical skill, furthered the policy of strict economy in capital, and in the operations of every kind. As Mr. Freeman remembered, they were gentlemen who took no excuses of any sort whatever. They wanted the best possible from their officers; and the best was not too good for them. He had mentioned this because it was a very significant—a very proud—thing that this little Company (which was a very small concern compared with its gigantic neighbours) should be able to work so as to give the district Parliament had entrusted to it such a substantial benefit as gas at the present low price. The reduction of 1d. in the charge for gas represented to the consumers something like £2400 in the half year, or nearly £5000 a year. The consumers had a similar reduction last year; so that 2d. reduction in a whole year would give something like £10,000, by which the district benefited. That such a price was now possible was due to the fact that approximations to it were possible in the past—in other words, the present low price was due to the fact that low prices were possible in the past. This also was the reason why the dividends, if calculated upon the actual capital subscribed in the first instance, were handsome beyond (as Dr. Johnston would have said) "the dreams of avarice." He was not ashamed of the dividends. They were vindicated by the low price. Many years ago, he suggested to the Chairman of the Company he then served—the Commercial—that the day might be seen in London when a price of 18d. per 1000 feet of gas would be sufficient. The Chairman looked upon him with astonishment. But he (Mr. Jones) did not then look upon it, and much less did he do so now, as being so far away. It was indeed possible to now realize such an amount of business in the supply of fuel and power to engines that they already proximated that price. The price of 1s. 10d. was not the lowest charged by the Company. They gave discounts to people who used their gas for trade purposes and power; and this brought the price down to nearly 18d. The possibilities opened up to gas companies in the supply of gaseous fuel were great. There was no such thing as power without fuel, and this was where gas beat electricity. Gas was a fuel—an original source of power and heat. Electricity was only a method of communicating heat, which must be obtained from a furnace or waterfall or any other source of power, and then be communicated to the various services it professed to fulfil. Proceeding to the balance-sheet, he said the sale of gas had increased last half year by 5·8 per cent. This was rather better than the average increase in the Metropolis. The gross receipts were £1108 more, in face of the reduction of price by 1d. last year, which showed they had recovered from this concession. Residual products had not been selling quite so well; but there was only a small falling off in the receipts. Coal and oil cost something less, but not much. The Board viewed with great satisfaction the reports of the ending of the miners' disturbance over the precious Mines Regulation (Eight Hours) Act, which the gas companies did their best to prevent the Government forcing upon a lot of operatives who could get as much liberty as they liked without an Act of Parliament. They were glad to see the trouble was almost at an end, and that things were simmering down again. The profit for the six months was £1768 more than it was in the corresponding half of last year; it having then been £13,900, and now, in round figures, was £15,600. The cream to the proprietors (the low price was the cream to the Directors) was that this profit was more than sufficient to pay the statutory dividends applicable to the price of gas charged last year (1s. 11d.), and leave a balance of £1494 to carry forward. He would not go through the various items of the accounts. The main feature was that this profit had not been arrived at without amply providing for the upkeep of works and plant, repairs and renewal of mains, service-pipes, meters and stoves, and automatic meters and fittings. Upon all these, they



had spent the full amount to which they were entitled. Taking one illustration—works and plant—they had spent in this direction £11,950, whereas, in the corresponding period of the previous year, they spent £10,429; so that they had, in the past half year, spent £1500 more. When they saw this was done, proprietors in gas companies might know perfectly well that the profit was a genuine one, because of all the items that might be starved in order to show a profit, this was the one that a poor, unscrupulous individual who was hard-pressed might resort to. He concluded by formally moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell) seconded the motion, which was unanimously carried.

The CHAIRMAN proposed the declaration of dividends at the rates per annum of £8 2s. 6d. on the "A" consolidated stock, £6 12s. 6d. per cent. on the "B" stock, and £5 13s. 9d. per cent. on the "C" ordinary stock. These dividends, he remarked, were 2s. 6d. more on the "A" and "B" stocks, and 1s. 9d. more on the "C" stock, than in the corresponding half of 1908.

The DEPUTY-CHAIRMAN seconded the motion; and it was unanimously agreed to.

Moved by the CHAIRMAN, and seconded by Mr. H. S. FREEMAN, the retiring Directors (Mr. E. R. Ransome and Mr. J. B. Howell) were re-elected; and on the proposition of Mr. J. C. POTTER, seconded by Mr. J. C. BADCOCK, C.B., the retiring Auditor (Mr. Frank H. Jones) was re-appointed.

#### Standard Burner Bill—Attitude of the Board.

A Special Meeting was then held for the purpose of considering, and, if thought fit, approving of the Standard Burner Bill, in the promotion of which the Company are joining.

The CHAIRMAN explained that, in the promotion of this Bill, the Company were merely a sort of partner. They found a number of companies were considering the question of adopting the best-found testing burner—a burner which, after being exhaustively tested by the scientific authorities who advise the Board of Trade upon gas matters, had been adopted for the Metropolis, and in all Gas Acts and Provisional Orders for some years past, a burner which (invented by the Engineer and now Chairman of one of the London Gas Companies, Mr. Charles Carpenter) had the merit that it did what no burner previously adopted by Parliament for testing gas accomplished, and that was it enabled them to ascertain not only that the illuminating power of the gas was right, but right exactly. That was to say, it not only tested correctly the 14-candle or 20-candle gas, as the case might be, that was prescribed in an Act of Parliament, but, when by any misfortune or accident the gas fell (say) somewhat below the prescribed illuminating power, or, on the other hand, if the gas, by some fortuitous circumstances, rose above the 14 candles, this burner would give the exact value of the deficiency or of the excess, whereas all burners that had been formerly in use for this purpose had the great drawback that they failed to test the gas accurately directly it became of a different constitution. Previous burners had a chimney which smoked painfully when there was the slightest excess of quality in the gas, and which made a dreadful mess of the testing when the gas was a slight degree below the quality they had to produce. The consequence was penalties were made to attach to any deficiency when the burner exaggerated the deficiency; and, on the other hand, the burner did not give the true value of any excess that, on another day, might be held to counterbalance the deficiency on the prior test. For the elucidation of the matter to the proprietors, he had been using homely language and explanation. He was sorry to say that since this group of companies got together, through an Association who had done him the honour of putting him in their chair (the Gas Companies' Protection Association), the innocent proposition to make this good burner the standard for these companies had raised much opposition; and a number of petitions had been formulated against the Bill which actually made his hair stand on end when he looked at them. He had been under the impression the companies were doing a comparatively innocent thing; but the local authorities seemed to think otherwise. With regard to the Wandsworth Company, the burner they had was nearly as good as the new one; and their conduct was so regular, and they did not often have variations in the quality of their gas, that the Directors could hardly be said to be anxious to participate at all. But out of loyalty and sympathy, and in order to assist in getting on a level footing in the matter of testing in the gas industry, they had thought it desirable the Company should go in with the others. But now many of the local authorities concerned had lodged these petitions. The Wandsworth Borough Council, who had always worked on the best of terms with the Company—they were an enlightened Council, they appreciated the reductions made by the Company in the price of gas, and they were extremely fair and easy to get on with, understanding the Company's aims and willing to back them up in them—were not, he noticed, going to ally themselves with this common attack, which would ultimately make him fear that, as Chairman of the Gas Companies' Protection Association, he was going to be burned at the stake for his malefactions. He had only to say with regard to the Bill that the proprietors would trust the Directors to this extent—that directly there was any fear of the Authority exciting themselves too much in this small matter, they would propose to make a present of the whole matter to them, and say: "We had no idea we were going to raise your tempers and apprehensions to this extent, and so we will make a present to you of the whole matter, and drop it altogether." He thought he could tell the proprietors that would be the spirit in which the Directors would deal with the question if it came to the point of a Parliamentary Committee suggesting whether, as there were so many enemies, it would not be better to concede something to them. They really could not afford to have the price of gas forcibly altered, or tests or penalties attached to various things, or other burdens placed upon them. That was the position the Directors would take up in this matter; but at the same time he must ask the proprietors to give them authority to participate in prosecuting the Bill. He therefore moved—

That this meeting having considered the Bill now pending in Parliament, intitled "A Bill to provide in the case of certain gas companies for the adoption of the Metropolitan argand burner No. 2 as a standard burner,

in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them and for other purposes," hereby approves the same, subject to such additions, alterations, and amendments as Parliament may see fit to make therein.

And, added the Chairman, subject to the fact that the Directors would, if there were any attempt to make too many alterations, draw back, and have things left as at present.

#### CO-PARTNERSHIP.

A PROPRIETOR reminded the Chairman that, at the last meeting, he had mentioned the subject of co-partnership, but had not said anything on this occasion.

The CHAIRMAN thanked the proprietor for reminding him of the subject. They had, he said, been treating their men on certain liberal terms, which did not exactly correspond to profit-sharing. But the Board had drawn up a scheme; and it would be ripe to submit to the men within a few days. At the last moment, one of the Directors, who was a very careful, searching, and thoughtful investigator of these matters, suggested that certain conditions of the scheme were a little too loosely drawn. He (the Chairman) had looked into the question, and agreed with his colleague's view. This was the reason he was not able that day to present to the proprietors an exact and completed scheme. They were, however, prosecuting the matter; and in a week or two, the scheme would be quite ready. It would treat the men liberally. It would start with a standard price approximately that they were now charging. So long as their employees enabled them to charge a low price for gas, the scheme would be as profitable to them as the best of the schemes that had been put into operation by the companies round about them. The Board had not lost sight of the matter, and they were well aware of its value.

A vote of thanks, embracing the Chairman and Directors, the Secretary (Mr. C. W. Braine), the Engineer (Mr. H. O. Carr), their staffs, and the workmen generally, concluded the meeting.

### GAS COMPANIES AND THE PORT OF LONDON RATES.

#### Board of Trade Inquiry.

At the Westminster Palace Hotel, last Thursday, Viscount ST. ALDWYN opened an inquiry, on behalf of the Board of Trade, in regard to the Draft Provisional Order embodying the schedules of maximum port rates for goods which has been prepared by the Port of London Authority in accordance with section 13 of the Port of London Act, 1908. There was a very large attendance of counsel, agents, and parties interested; no fewer than 223 objections having been presented.

In the course of the proceedings, which had reference exclusively to procedure,

Mr. FREEMAN, K.C., who appeared for various Gas Companies, including the South Metropolitan and Commercial, asked that the objections should be tabulated and grouped by the promoters, and furnished to the parties, as had been done in several previous inquiries.

This request was supported by other counsel; and on the suggestion of the Chairman,

Mr. J. D. FITZGERALD, K.C., who appeared for the Port of London Authority, undertook to do what he could in the matter, in consultation with his learned friends, before the next meeting.

Mr. FREEMAN also asked whether the schedules represented suggestions of the Port Authority, or were only the provisional opinion of the Board of Trade as to what they should be. If they were merely suggestions which did not commend themselves to the Board of Trade, the parties might be spending a long time framing maximum rates which were never seriously intended to be enforced.

Mr. CLODE, on behalf of the Board of Trade, said that, in the ordinary course, they were, no doubt, responsible for the Provisional Order; but they had felt all along that the burden of proof rested upon the Port Authority. At this stage of the proceedings, therefore, and seeing that hereafter they would have to settle the form of the Order and the specification promoted in Parliament, they did not come to the inquiry as partisans, but rather adopted an indifferent attitude, and would watch the proceedings, not coming into the arena on behalf of one side or the other. When the inquiry had been held and the report issued, the Board would have to make up their minds upon the form of the Order to be adopted, both as to its provisions and the schedules. It would be for them to take upon themselves the responsibility.

The inquiry was then adjourned.

It was announced that the sittings would extend over Monday, Tuesday, Thursday, and Friday this week, and the same days next week; and further hearings may be necessary.

#### London County Council and the Standard Burner Bill.

At to-day's meeting of the London County Council, the Parliamentary Committee will report that they have had this Bill under consideration; and they add: The Wandsworth Metropolitan Borough Council have expressed the opinion that an amendment should be sought in the Bill to provide that in future the gas supplied by the Wandsworth and Putney Gas Company (one of the promoters of the Bill) should be tested by the Council instead of by the Borough Council. The Public Control Committee support the view of the Borough Council, and have asked that the necessary steps be taken to secure the insertion of the amendment in the Bill. The present law provides that testing-places shall be maintained by the Borough Council, and the fittings and apparatus by the Company. The Public Control Committee are of opinion that this arrangement should not be disturbed in any new legislation, and that the Council should bear only the expenses of testing and control. The total cost to the Council of testing under this arrangement—if daily tests were made—would, it is understood, not exceed £208 a year. The Committee recommend that an amendment be sought in the Bill to provide that the gas supplied by the Wandsworth Company should in future be tested by the Council instead of by the Wandsworth Council.



## PROVINCIAL GAS AND WATER COMPANIES.

## Gas.

## Suggested Extensions at Barnstaple.

Two points of a gratifying character were commented upon at the recent annual meeting of the Barnstaple Gas Company—an increased make of gas per ton of coal carbonized, and a larger consumption. Mr. C. E. Roberts Chanter, who occupied the chair, said the revenue for the year was £10,084, which was £264 more than in the previous year, principally due to increase in the private lighting. From public lighting the revenue was £50 less than in the previous year. The expenditure—£7980—showed an increase due to a large outlay on relaying mains. The coal bill was £200 less, owing to the satisfactory way in which the Directors were able to place contracts. As they had made more gas and carbonized less coal than in the previous year, the working results were most satisfactory. The number of consumers increased from 1840 to 1924 and the number of stoves on hire from 852 to 902. Though they had experienced the loss of a large consumer and of a considerable portion of the revenue from the public lamps, and had the competition of the electric light, it was gratifying to find a larger output than during the year 1908. Their satisfactory position was largely due to the Manager and Secretary (Mr. F. L. Schofield); and the Directors wished to congratulate him. The report and balance-sheet were adopted, and the dividends recommended declared; making for the year 10 per cent. on the "A" and 7 per cent. on the "B" shares. Mr. A. H. Copp asked if the Directors had taken into consideration the question of extending the mains to places outside the present area of supply. The Chairman replied that, in view of the probability of the Barnstaple Water Company's mains being extended to Instow, the Directors had under consideration the possibility of taking the gas-mains to Bickington and Fremington; there being a growing demand in this direction.

## Large Half-Year's Increase at Bromley.

At the half-yearly meeting of the Bromley and Crays Gas Company last Tuesday, the Directors reported that the make of gas in the six months ended the 31st of December showed an increase of 7,322,000 cubic feet, or nearly 3½ per cent., compared with that in the second half of 1908. They stated that all the works rendered necessary by the decision to concentrate the manufacture of gas for the whole of the amalgamated district at the Bromley works (as mentioned in their report a year ago) had been completed, and were giving every satisfaction in operation; reflecting much credit on the various Contractors and upon the Chief Engineer (Mr. William Woodward), who had directed the work. Since the 1st of January last, when the manufacturing plant at the Cray works was shut down, all the Company's district had been supplied from Bromley; and it already appeared as if the economies predicted as likely to result from this policy were in a fair way to be realized. The Directors had decided, subject to the approval of the meeting, to pay to the Secretary (Mr. H. W. Amos), by way of gift, a sum of 50 guineas in recognition of special services rendered by him in the process of the amalgamation of the two Companies. The accounts accompanying the report showed that the revenue for the half year was £43,348, and the expenditure £32,553; leaving £10,795 to go to the profit and loss account, the balance on which available for distribution was £11,660. The Directors recommended the declaration of dividends under the sliding-scale at the rates of 6 per cent. per annum on the "A" ordinary stock, 4½ per cent. per annum on the "B" ordinary stock, and 5½ per cent. per annum on the "C" ordinary stock (all less income-tax). These would absorb £9261, and leave a balance of £2399 to carry forward. In the absence of Mr. Alexander Dickson, the Chairman of the Company, in South Africa, the Deputy-Chairman (Mr. B. H. Latter) presided. In moving the adoption of the report, he referred at length to the alterations made in the manufacturing plant, and to the adoption of apparatus for the production of carburetted water gas. He pointed out that the construction of fresh works, even of the magnitude of their own, required considerable foresight in their planning and assiduous supervision in their erection on the part of the responsible official; and in these respects the Directors would commend to them the excellent work put in by the Chief Engineer, who had faced a heavy task with characteristic courage, watchfulness, and ingenuity, and had completed it with what promised to be a full measure of success. The chief Contractors also—Messrs. Humphreys and Glasgow—might be commended for the thorough, conscientious, and punctual performance of their contract. Having briefly referred to the proposed gratuity to the Secretary, he turned to the accounts, and thought the shareholders might congratulate themselves upon having had a successful half year. As to the future, it was dangerous to "prophesy smooth things," in view of the troubles arising out of the Eight Hours Act; but he thought they might look forward with a fair amount of assurance to the coming year. The report was adopted and the dividends recommended were declared. The thanks of the meeting were warmly accorded to Mr. Latter for presiding; and he, in replying, spoke of the excellent work of Mr. Woodward, Mr. Amos, and the staff. Mr. Woodward and Mr. Amos replied.

## Disturbing Elements but Good Working at Chichester.

The accounts presented at the half-yearly meeting of the Chichester Gas Company last Friday showed a sum of £2274 available for distribution; and the Directors recommended dividends for the past six months at the rates of 10 and 7 per cent. per annum on the several stocks, less income-tax. In their report they mentioned that the Company had had to meet the competition of the Electric Light Company established in the city, which had resulted in a slight decrease in the consumption of gas. The Engineer (Mr. T. Ebenezer Pye, F.C.S.) reported that the works and plant were in a thoroughly efficient condition. In the absence, through illness, of the Chairman of the Company (Mr. Alfred Lass), Mr. W. A. Walker, of Worthing, presided; and, in moving the adoption of the report and accounts, he stated that in the past half year there had been a slight decrease per ton in the cost of coal carbonized compared with the corresponding period of 1908, but that an increased sale of gas per ton had been realized. He gave the following particulars in regard to the working: Gas made, 12,050

cubic feet per ton; gas sold, 11,007 cubic feet per ton; coke produced, 12½ cwt. per ton; coke used for fuel, 21·81 per cent. of the make; tar made, 11½ gallons per ton; and sulphate of ammonia made, 21·48 cwt. per 100 tons of coal. Of the total quantity of gas made, 91·34 per cent. was sold, 1·75 per cent. was used on the works, and 6·91 per cent. in the offices and show-room and unaccounted for. The income and growth of the business had been somewhat affected by a decrease to the extent of 868,000 cubic feet in the quantity of gas sold, and a fall in the prices realized for coke and other residuals. These disturbing elements had been caused by the introduction of incandescent lighting in place of the flat-flame burners, the general depression in trade, and the competition by the Electric Light Company. In this connection, he emphasized the economic value of inverted incandescent burners, the cost of which was, he said, so small as to be beyond the reach of competition. The profit realized on the half-year's trading (£1827) was more than sufficient to pay interest and dividends. The Chairman concluded by referring to some installations of lighting and heating which the Company had carried out at the Cathedral and other places. The report was adopted, and the dividends recommended were declared. A vote of thanks having been passed to the Chairman for presiding, Mr. Walker, in responding, cordially thanked, on behalf of the Board, the Engineer, the Secretary (Mr. Victor V. Vick), and the other members of the staff and the employees for their excellent and efficient services during the half year. Mr. Walker stated that the working results which had been submitted to the proprietors would compare favourably with those of any up-to-date gas undertaking in the country, not only of the same size, but of much larger capacity—and he was speaking from forty years' practical experience in the gas industry. Mr. Pye, in acknowledging the vote, emphasized the determination of the staff to do their utmost in the service of the Company and of the public of Chichester. He said the popularity of gas in the city would continue to increase if only the customers would take the management of the Company into their confidence. Mr. Vick also thanked the meeting, and testified to the pleasure the staff experience in the service of the Company.

## A Disappointing Season at Felixstowe.

Presiding at the recent annual meeting of the Felixstowe Gas Company, Mr. Samuel Alexander said the past year had been a disappointing one to all seaside places; and the effect of the year coming upon the previous bad year, had led to their sale of gas being disappointing. They had nearly maintained the make and sale of gas compared with the previous year; but the steady progress of the last few years had now received a check which they trusted during the coming twelve months would be rectified. They hoped this year to see another considerable increase in the consumption of gas. Though the make and sale had not been so much, the cost of production had been only slightly less; and their leakage during the last year had been the lowest since the Company was established. The number of customers had steadily increased, until now there were 1276 on the books, which was more than double the number they had ten years ago. The principal item in the balance-sheet was the heavy increase that they had incurred with regard to the extension of the works. The works were established 22 or 23 years ago, and had become almost obsolete; and it was necessary that they should rebuild and remodel them on up-to-date principles. This had cost money; but the result would be very satisfactory in future years. One of the most gratifying things he had to bring to their notice was the request from the Council to light the new pavilion with gas. It was most successfully done; and the Company and their Manager (Mr. F. Paternoster) had been complimented on the success of this installation. The lighting of the pavilion cost the Council less money than it cost them the previous year to light the band-stand alone with electricity. Therefore they were not only providing an excellent light, but a cheaper illuminant than the Council had had before. [An illustrated description of the pavilion gas lighting will be found in the "JOURNAL" for June 29 last, p. 961.] It was stated in the report that the revenue account, after applying £337 (about 1 per cent. on the capital) to the renewal account, showed a profit of £1958, from which amount provision had been made for interest on debentures, dividends on preference stock, and income-tax. It was the Directors' intention to extinguish the balance of the renewal account by a similar sum annually. The necessity of appropriating the sum mentioned to the renewal account compelled the Board to recommend a somewhat reduced dividend; and they proposed to declare a final payment for the year at the rate of 9 per cent. on the "A" ordinary stock, and of £6 6s. per cent. on the "B" ordinary stock—making a total distribution of 8½ per cent. and £5 19s. per cent. respectively, both less income-tax, and leaving a balance of £957 to the credit of the profit and loss account. This distribution, added to that of the two previous years, made an average return of 9½ per cent. on the original stock for the past three years. At a subsequent extraordinary meeting, a resolution was passed authorizing the raising of further capital.

## Slot-Meter Consumption and High-Pressure Lighting at Ipswich.

The accounts presented at the annual general meeting of the Ipswich Gas Company on Monday last week showed a balance, after payment of the interim dividend, of £12,038; and the Directors, in their report, recommended that a further dividend, at the full statutory rates, should be paid, less income-tax. There would then be a balance of £5908 to carry forward. The Chairman (Sir Daniel F. Goddard, J.P., M.P.), in moving the adoption of the report, expressed his pleasure in coming before the shareholders with his brother Directors and recording another prosperous year in the undertaking. There was very little in the accounts that called for remark, as they might almost be regarded as normal; and he thought they were very satisfactory. The item in the revenue account of £12,068 for maintenance was an unusually large sum, and was due to the fact that they had been compelled to rebuild the old retort-house, which had been in existence 32 years. Referring to the general subject of the business, the Chairman said there were in Ipswich about 18,000 dwelling-houses, and of these 15,000 were being supplied with gas, which was a very large proportion. It was due to the introduction of the slot-meter, as there were 11,000 consumers on the prepayment system. It was a good line of business which they liked to encourage, because about half of these



consumers used stoves. It had so increased of late that one-third of the gas in the town was consumed through slot-meters. Another part of the business which had improved very much, and for which the expenditure of capital was partly responsible, was the high-pressure lighting. Mr. Jolliffe (their Secretary and Engineer) laid it before the Board, and urged its adoption, and they consented to a high-pressure main being laid. So successful was this method of lighting, that they had determined to extend it. Messrs. Ransomes, Sims, and Jefferies were the first to adopt the high-pressure system; and they found it so satisfactory that they had extended it to several parts of their works. The Directors hoped soon to have 70 of the public lamps lit on this system, under which they were able to give 60-candle light from every cubic foot of gas, whereas the ordinary incandescent burner gave only 17 candles. Thus the lighting of the town had been greatly improved without adding to the cost. The Chairman concluded with a few remarks on the Company's superannuation and sick funds, which he said should prove of great value to their workmen. Mr. W. Alexander, in seconding the motion, remarked that the Chairman had omitted to mention that the private lighting rental had increased by £2000. The report was adopted, and dividends at the rates of 13, 10½, and 10 per cent. per annum were declared. An extraordinary meeting was then held at which sanction was given to the association of the Company with other gas companies in the promotion of the Gas Companies (Standard Burner) Bill; and the proceedings closed with votes of thanks to Mr. Jolliffe, the staff, and the Chairman.

#### A Record Sale per Ton at Longwood.

In moving the adoption of the report and accounts at the annual meeting of the Longwood Gas Company, the Chairman (Mr. Robert Thornton, J.P.) remarked that the leakage during the past year had been rather higher; but this he attributed largely to the heavier road traffic, and the increased vibration to which the mains were now subjected. He stated that the quantity of coal carbonized had been 10,950 tons, from which a make of gas equal to 10,401 cubic feet per ton had been obtained. This spoke well for the new regenerative settings that were installed eighteen months ago. The report (which was adopted) stated that the alterations in the carbonizing plant last year had resulted in the more economical production of gas. The sales of gas showed a slight increase; and considering the industrial conditions, this was regarded as satisfactory. The number of lighting and heating appliances on hire at the end of the year amounted to 1994; while the Company had 5600 meters in use. A dividend at the rate of 3 per cent. on the consolidated ordinary stock was declared, making, with the interim dividend, 5 per cent. for the year. It was pointed out by one speaker that the gas sold per ton of coal, notwithstanding the greater leakage, was considerably higher than in any previous year. The Chairman was thanked for his services; and, in responding, he proposed a similar vote to the Engineer, Secretary, and Manager (Mr. J. H. Brearley) and the staff. Their Manager had, he said, devoted himself heartily to their service. He was a man of no mean ability, and held a high standing in the gas profession. The Directors had the utmost confidence in him. In acknowledgment, Mr. Brearley paid a high tribute to the junior officials of the undertaking.

#### Newmarket and the Standard Burner Bill.

The Directors of the Newmarket Gas Company, in the report which was adopted at the annual meeting last week, stated that the net balance of profit earned during 1909 was £4376; and a balance had been brought forward from the previous year of £2649. Deducting the debenture interest, a sum of £6863 remained to the credit of the profit and loss account; and it was recommended that this should be appropriated as follows: A dividend at the rate of 6½ per cent., £3672; to insurance fund, £600; balance carried forward, £2591. The Company had, in co-operation with 48 other gas companies, deposited a Bill in Parliament for the purpose of authorizing the new "Metropolitan" argand burner No. 2 as the standard burner for the official testing of the illuminating power of the gas. This was the burner prescribed in the Model Bill by Parliament. The Chairman (Mr. R. Stephenson, J.P., D.L.) pointed out that the £600 which they were carrying to the insurance fund this year would make the fund £1970. The fund must be brought up to £3000; but this he thought it would take two or three years to accomplish, since they would have next year to renew some retorts. Then, perhaps, in another two or three years they hoped to be able to take another 2d. off the price of gas, which would enable them to pay a further ½ per cent. dividend. At the conclusion of the ordinary meeting, a special meeting was held, at which a resolution was carried approving of the Standard Burner Bill.

#### A Favourable Balance-Sheet at South Shields.

The Chairman (Dr. J. F. Armstrong, J.P.), in moving the adoption of the report and accounts at the annual meeting of the South Shields Gas Company, remarked that the balance-sheet was one of the most favourable ever issued by the Company. Referring to improvements carried out during the year, he said that at Jarrow they had done little else than repair and replace worn-out retorts to enable gas to be produced in the old way. During the year the Board had completed negotiations for the Shields works to have direct railway communication with the North-Eastern Railway for all materials other than coal. The railway communication necessitated a certain amount of plant being installed for the lifting of coke from the low-level coke-yards, and delivering into trucks on the high-level sidings; and the Board decided to instal a complete coke-handling plant for the removal of the hot coke from the Shields inclined retort-house, and delivering it into stock in the yard, and breaking, screening, and storing it in elevated hoppers for the loading of carts, thereby reducing the manual labour hitherto required. Favourable coal contracts were made by the Directors going into the market a little earlier than usual; and, as a matter of fact, the price of gas coal had been higher ever since. The putting into operation of the Mines Eight Hours Act had been a source of anxiety to the Board for some months; and, in anticipation of probable trouble and stoppages at some of the collieries, heavy stocks of coal at contract prices were accumulated last autumn, both at the South Shields and Jarrow works. This course had obviated, so far, the necessity of purchasing any coal at the present enhanced prices;

but if this forethought had not been exercised, the year's coal bill would have suffered. Having regard to the state of trade last year, particularly in shipbuilding, on which the district so much depended, the smallness of the decrease in gas bills was agreeably surprising. As a matter of fact, the whole of the decreased consumption took place in Jarrow. The total income for the year was £89,717, against £91,419 for 1908, a decrease of 1·86 per cent. The saving under the heading of coal, oil, &c., was £3573. The decrease in the expenditure was £1521; the total being £68,114, as compared with £69,635. It would be noted that the carry-forward was increased from £7675 to £8325, and at the end of 1909 amounted to about the equivalent of a half-year's dividend. The report was adopted; and dividends were declared on the consolidated and new stock of the Company of 4 per cent. for the half year (which, with the interim dividend, made 8 per cent. for the year), and of 2½ per cent. for the half year on the ordinary stock (making, with the interim dividend, 5½ per cent. for the year).

#### A Satisfactory Increase at Tynemouth.

Addressing the shareholders at the forty-fourth annual meeting of the Tynemouth Gas Company, the Chairman (Mr. J. B. Williamson, J.P.) said that, both as regarded the manufacturing and the financial results, 1909 had been in every way an encouraging year; and there could be no doubt that the low price of 2s. per 1000 cubic feet at which the gas had been sold had materially helped to increase the consumption. The make of gas was 24½ million cubic feet over that of the preceding year, representing an increase of slightly over 5 per cent. The price of coal had been fairly favourable. Coal had cost £2929 less than in the previous year; and while this was partly due to the lower price paid per ton, it was largely owing to the better results obtained in the retort-house. Though the make of gas had increased by 24½ million cubic feet, only 324 tons more coal had been used. The old retort-house was finally closed-down about a year ago; and since then the whole of the gas had been produced in the new retort-house, with the result that they had obtained 11,430 cubic feet of gas per ton of coal carbonized—an increased yield of 468 cubic feet over the previous year. The coke sold per ton of coal was 10·91 cwt., against 10·19 cwt. Sulphate and tar both showed a slightly increased yield per ton of coal. The gas made, the gas sold, and the coke sold per ton of coal carbonized were all records over the best results of any previous year, and were all due to improved plant and conditions of working. The total revenue for the year was £73,402, and the expenditure £61,041—leaving a balance of profit of £12,361. Adding £7718, the preceding year's balance, gave £20,080 to be dealt with. The maximum dividends on the preference and ordinary stock absorbed £11,209. Then they proposed to add £1500 to the reserve fund, and carry forward to next year £7371. During 1909, the number of new customers added was 582, making a total on Dec. 31 of 19,614. Of these, 11,980 were penny-in-the-slot customers. The slot-consumers had 5648 cooking stoves in use, equal to nearly half the number of slot consumers; and the ordinary consumers had 2977 stoves of various sizes. In addition, there were now quite a large number of heating-stoves, radiators, water-heaters, &c., in use. The total revenue from gas was £49,805; and of this sum over £20,000 was collected from the slot-meters. The report was adopted.

#### Water.

#### A Progressive Company.

Presiding at the half-yearly meeting of the Colne Valley Water Company on Feb. 15, the Chairman (Mr. C. E. Keyser) stated that the total water-rates for the half year to Dec. 31 was £22,665, as compared with £23,172 for the corresponding period of 1908, or a decrease of £507. The decrease for the first six months of the year was £286; so that the total for the year was £794. This was due to the fact that this was the first year they had been charging under the new scale of rating. While the Company had lost a considerable amount under the new scale, it was satisfactory that it worked out to such a small deficit as they were able to show on the gross receipts. The total number of new supplies added was 554; and the estimated annual water-rental was £1295—being a total for the whole of 1909 of 1085 additional supplies, with an estimated water-rental of £2538. For the three previous years the corresponding figures were: 1906, 939 supplies; estimated rental, £2640. 1907, 1082 supplies; estimated rental, £2921. 1908, 995 supplies; estimated rental, £2516. Of course, all these amounts were calculated on the old scale of charges. There were now over 18,000 connections with the Company's mains; and the population supplied was above 100,000. These figures were just about double what they were ten years ago. The increase in expenditure was only £333, as compared with the corresponding period of 1908, notwithstanding that £207 was paid for gratuities to the staff in commemoration of the first payment on account of back-dividends. The new softening reservoir and lime-tanks were practically completed and brought into use this month. These would greatly facilitate the softening of the water, and effect a considerable saving in working expenditure. The remainder of the capital authorized to be issued having been raised, the proprietors were to be asked to authorize a further £25,000, to be issued as required. It was not anticipated that the Company would want it for a year or so. The actual price received for the last issue of stock was £168 4s. 6d. per cent. The Stock Exchange quotations for the Company's stock had risen considerably the last few weeks. The original stock had advanced 13½ per cent., and was quoted at 270·75. The "B" stock—the old 7 per cent.—had risen 13 per cent., and was now quoted at 184·86. The "C" stock had risen 14 per cent., and was now quoted at 250·55. The item of rates was getting a very severe one; amounting now to something like one-eighth of the gross receipts. He moved the adoption of the report and accounts. Mr. A. Helsham-Jones seconded the motion. Mr. W. B. Bryan congratulated the Directors and officials on the fact that the working expenses were less than 40 per cent. of the gross revenue. In the case of companies who obtained their water by pumping, if the working receipts were anywhere in the neighbourhood of 40·44 per cent. of the gross revenue he considered it very good. The Chairman remarked that it might interest Mr. Bryan to know that in 1908 the percentage of working expenses to gross income, when they were getting higher rates for the water, was 35·70. Mr. Bryan: I believe you have beaten everybody. The motion was carried unanimously. Authorization was given to the payment of the full statutory



dividends at the rates of 10 and 7 per cent. per annum, on the several classes of ordinary stock, and, in addition, a payment of 1 per cent. actual on account of back-dividends. The retiring Directors and Auditor were re-elected, and then an extraordinary meeting was held, at which the Directors were empowered to issue further capital in accordance with the remarks of the Chairman.

#### Depression in Trade at Newcastle.

The sixty-fifth annual report of the Directors of the Newcastle and Gateshead Water Company was adopted at the meeting last Tuesday. It stated that the gross receipts for the year to Feb. 1 amounted to £188,097; and the expenditure on working, including management and maintenance, was £45,289. This left a balance of profit of £142,808, to which had to be added the sum of £2820 brought forward—making a total of £145,628. The interest and dividends recommended would leave a balance of £1617 to be carried forward. The domestic rental showed the satisfactory increase of £3663 over the previous year; but, on the other hand, there was a reduction of £2413 in the revenue derived from trade supplies and miscellaneous receipts, owing to the restricted consumption of water by manufacturers during last season—chiefly due to the prolonged depression in trade, the recovery from which was as yet very partial. The increasing use of electric instead of steam power, also, necessarily diminished to some extent the use of water for manufacturing purposes. The trade outlook now appeared more hopeful on the Tyne; but at the present moment progress was being, in many cases, retarded by the disputes in the coal trade in Northumberland and Durham. The total population now being supplied was estimated at about 570,000. This number included the urban districts of Blaydon and Ryton, which prior to last year were supplied by their respective Councils. Notwithstanding the necessary additional expenses incidental to the above change, the expenditure on revenue account would have shown a satisfactory decrease on the year, but for the fact that the amount paid in rates again neutralized the saving effected. Apart from extensions of street and service-pipes, the capital expenditure amounted to £11,513. The expenditure on capital account would in future be greatly restricted, in view of the very satisfactory position which the Company had now attained with regard to their resources to meet future requirements of the district. The Chairman (Mr. W. D. Cruddas, J.P., D.L.) pointed out that the decrease of £2413 in the revenue for water for trade purposes arose through the consumption having been 82 million gallons less than in the previous year. Dividends were declared at the rate of 5 per cent. per annum on the preference stock; at the rate of 8 per cent. per annum for the half year on the original stock, making (with that paid in August last) 7½ per cent. for the year; and at the rate of £5 12s. per cent. per annum for the half year on ordinary stocks under the Acts of 1876 and 1898, making £5 1s. 6d. per cent. for the year.

#### Increase in Rates and Taxes in South Staffordshire.

The opinion was expressed by Alderman C. G. Beale, in presiding over the half-yearly meeting of the South Staffordshire Water Company, that the proprietors could not in any great sense congratulate themselves on the past six months' operations, because on both sides of the account the results were far from being satisfactory. In fact, the report was much the worst that the Directors had put before the shareholders. The revenue from domestic supplies had increased by £940, but that from water for trade purposes had fallen off by £914. Trade had undoubtedly been bad; but he was afraid the Company had lost two three large customers who had adopted electrical power, or some other means which had enabled them to dispense with a great deal of water they had previously taken. Rates and taxes showed an increase; and they were going to be very much more. There had been a re-assessment in part of their district; and next half year there would be an additional charge. At present, they were paying more than 10 per cent. of their gross receipts in rates. The report (which was adopted) stated that the number of houses laid on during the half year ending Dec. 31 was 1208, making the total supplied 138,178. The gross amount of water-rates was £72,981, as against £72,955 in the corresponding period of the previous year. The Directors had transferred the sum of £2000 to the depreciation fund, thus raising it to £33,753. After providing for interest on debenture stock and dividend on the preference stock, the amount remaining for division (including £8056, the balance brought forward) was £29,023; and the Directors recommended the declaration of a dividend for the six months on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax. The amount of this dividend being £20,894, there would remain £8129 to the credit of the next half year.

#### Truro Water Company's Past Difficulties.

In his speech at the half-yearly meeting of the Truro Water Company, Mr. A. C. Williams, the Chairman, referred to the trouble experienced last summer with reference to the question of the purity of the water. Analyses had been made, some showing good and some bad results. The Directors had maintained that the water was contaminated in the mains owing to the old ball hydrants in the streets; and he was glad to say that the City Council were now replacing them by spindle hydrants. Trouble had also arisen with reference to the pollution of the stream. The Directors had done what they could to remedy this; and they believed that improvements might be carried out which would prevent the possibility of any contamination in the future. Owing to the dry weather experienced, the supply of water was short during some of the summer months; but the domestic supplies were not curtailed. With regard to the balance-sheet, the income from domestic and meter supplies well held its own; but they had a larger expenditure on rates and taxes. The balance for the half year was £892; and the total amount to the credit of the profit and loss account was £2019. After payment of a dividend of 5 per cent., there would be £1619 to carry forward. Mr. Danbuz, in seconding the motion for the adoption of the report, said that although the quantity of water pumped during the half year was 5 million gallons less than in the corresponding half of 1908, there was no diminution in the supplies for domestic purposes. The motion was carried, and the dividend recommended declared.

## GAS EXPLOSION AT MANCHESTER.

### A Bridge Damaged.

A bridge which spans the River Medlock in Mill Street, Manchester, was the scene, in the early hours of last Wednesday morning, of an explosion of gas which caused considerable havoc. A great rent was made in the roadway; about 30 feet of a wall by the gates leading into Phillips Park was blown into the river; the bridge itself was rendered impassable; and the supply of electricity to the district and for the tramway service was interfered with for nearly two days.

It is a very old bridge; and under the surface of the roadway were three sets of pipes, one for gas, another for water, and the third containing the electric cables. On Tuesday, workmen had been engaged repairing the roadway; and it is surmised that the gas-main was injured on being reached. When work was suspended for the night, some of the workmen detected a slight smell of escaping gas; and the fracture must have increased as the hours went by. At any rate, about half-past one on the Wednesday morning, there was a loud explosion; the escaping gas having become ignited by some means—probably from the flame of the night-watchman's lamp, though this was some considerable distance from the bared gas main. There was no one about at the time; and the night-watchman was not injured.

The gas from the broken main was allowed to burn until the pipe could be plugged between the place of fracture and the Bradford Road Gas-Works, distant 300 yards from the scene of the explosion. Some people visiting the place early, could not understand why the gas was allowed to burn, and not turned off. Had any other action been adopted, there might have been a second and much more serious explosion, owing to the mixture of air and gas in the main. After the pipe had been plugged at some distance from the fracture, the gas remaining in it soon burned itself out, and all danger of a second explosion was averted. At almost all bridges within the Manchester gas supply area there are valves on each side of the structure, so that the gas may be turned off when anything happens; but this bridge in Mill Street, being a very old one, has not got these valves.

## GAS AND ELECTRIC LIGHTING AT BISHOP'S STORTFORD.

The Urban District Council of Bishop's Stortford recently had a long sitting at which the question of the lighting of the town was fully considered. Mr. J. L. Glasscock, the Chairman, presided.

The first matter was the presentation of a report by the Electric Lighting Committee, in which they stated that the Clerk (Mr. T. Swatheridge) had had an interview with one of the officials of the Board of Trade with reference to the position of the Council in regard to their Electric Lighting Order, and that he had been informed that the Council had absolutely no power to transfer it to anyone. It was for them to carry it out, or it would be revoked. He was also informed that if there was any intention on the part of the Council to proceed with the Order, they should lodge a petition against the Amalgamation Bill promoted by the Gas Company. The Clerk explained that if the Order was revoked, the electric lighting would be entirely in the hands of the Gas Company if their Bill passed; and therefore he expressed surprise that the Council had not deposited a petition against it. After some conversation, the report was adopted.

The Council then considered in committee the report of the deputation appointed a few weeks ago to wait upon the Clerk to the County Council (Mr. C. E. Longmore) with regard to opposing the Gas Company's Bill. On resuming, the Chairman reported that it had been decided to petition against the Bill so far as the electricity clauses and the ratio of prices to be charged in the inner and outer area were concerned. He moved that the action of the Committee be confirmed. The motion was carried *nem. dis.*; and the Chairman was empowered to affix the seal of the Council to the petition.

Mr. Carruthers then moved—"That this Council, having considered the report of Messrs. May and Hawes [the Council's Consulting Engineers], do hereby resolve that steps be taken to lay an installation of electric lighting, &c., in the district of Bishop's Stortford, on the lines indicated in the report." He said there were, among others, three main questions which demanded their serious consideration. "First, was there a need and demand for electric light and power; secondly, if there was, who were the best to supply the demand, a private Company or the Local Authority; and, thirdly, if there was a demand, and the Municipality was in the best position to supply it, then was there a prospect of its proving a financial success?" He offered a few remarks on all of these questions, and concluded by saying the scheme which had been submitted to the Council had been carefully prepared, and involved but a comparatively small capital expenditure. The present was a most favourable time for the establishment of an electricity supply undertaking, as it was well known that market prices were extremely low, and that plant, mains, and apparatus of the highest quality could be purchased on most favourable terms.

The motion having been seconded, Mr. Holland said he should vote against the resolution, simply on the ground that he believed the best interests of the town would be served by the Council going on the lines followed for the last few years, and doing the best they could with very careful regard to their expenditure. He was convinced that lighting by electricity would, instead of resulting in a success, as predicted by Mr. Carruthers, probably show a very serious loss, which might extend over several years. He did not think the Council should speculate with the ratepayers' money. Mr. Gee said he should not vote on the motion, though he entirely agreed with Mr. Holland. Mr. Sworder also opposed the motion on the ground that the Council had no figures before them to show that the electric lighting scheme could be made to pay. The Vice-Chairman (Mr. H. Kent), in a humorous speech, dealt with the remarks of the preceding speakers, and concluded by expressing the opinion that if the resolution was carried, as he had no doubt it would be, a Committee should be formed for the purpose of seeing the Engineers, going into details



thoroughly, and ascertaining what could be done to show the Council were at work. Mr. Pryer, while giving Mr. Carruthers credit for the able way in which he had brought the subject forward, said it was clear to him that the scheme would be a burden for some years. Mr. Fowler, on the other hand, thought that, though it might not pay at the outset, it would eventually be a great help to the town. The Chairman, in closing the discussion, said the question was whether or not the electric light could be made to pay in Bishop's Stortford; and the speech of the mover of the resolution was singularly devoid of any argument which would lead the Council to believe that it would. Nothing that had been said had convinced him that electric lighting was going to be a paying concern for a good many years; and on this ground alone he should vote against the motion. He should be glad to see the electric light introduced by a company, but not an installation by the Council. Mr. Carruthers, in reply, acknowledged that there might be a loss on the first year, but expressed the belief that in the second they would be able to meet all demands and show a profit. The motion was then put and carried by seven votes to four. The installation scheme was consequently adopted.

### ELECTRIC LIGHTING IN MARYLEBONE.

#### London County Council with "Great Reluctance" Sanction a Loan.

At the Meeting of the London County Council last Tuesday, the Finance Committee presented the following report on an application made by the Marylebone Borough Council for sanction to the borrowing of £24,000, repayable on the annuity system in 25 years, for providing and laying electricity mains in about 24 miles of streets in which it is proposed to supply current to 1385 street-lamps.

The Borough Council, in applying for sanction, intimated that it proposed that certain of the work should be carried out by the unemployed, and that if the work were carried out in the ordinary way the cost would be £20,900 instead of £24,000. We are advised that the amount of £20,900 is reasonable; and, in accordance with the Council's practice, the sanction, if given, should be limited to this amount.

The Borough Council state that the laying of the proposed mains will, in addition to providing current for street lighting, enable them to supply private consumers in a large district where they believe there will be an increasing demand for electricity; and, further, that unless the work is carried out they will not be able to fulfil their statutory obligations to supply. The Council are also of opinion that the proposed work will result in improved lighting in the streets in question, and are satisfied that the electricity undertaking will considerably benefit, and that the substitution of electricity for gas in the street-lamps will not involve any additional charge on the general rates for lighting.

We are advised that the streets concerned appear to be sufficiently lighted by the present gas-lamps; and we are of opinion that the scheme is of a somewhat speculative nature, inasmuch as, apart from the receipts from street lighting, the revenue the electricity undertaking will derive from this large extension of mains is not likely to yield a substantial sum, and that it is inadvisable that, in the present position of the undertaking, the Borough Council should incur so heavy a capital outlay, having regard to the fact that the supply of current to these street-lamps will decrease *pro tanto* the ability of the undertaking to meet further demands for remunerative private supply, and so hasten the time when further capital expenditure on electricity generating plant will have to be incurred.

The Borough Council consider it desirable, in the interest of the borough and of the electricity undertaking, that the scheme should be carried out; and as we are unable to say, from the information placed before us, that the electric lighting of the streets will involve any additional charge on the rates, or will prove to be unremunerative so far as the electricity undertaking is concerned, we suggest, though with great reluctance, that the application should be granted.

### LIABILITY FOR DEFECTIVE MAINS.

#### The Metropolitan Water Board and Compensation.

At the Meeting of the Metropolitan Water Board last Friday, the report from the Law and Parliamentary Committee on the subject of compensation claims in respect of burst mains, some extracts from which were given in the "JOURNAL" for the 1st ult. (p. 313), was considered at some length by the Board sitting in committee. The Committee referred to pointed out that the Board were not liable for any damage which might arise from a burst main, unless the person aggrieved could prove that they had been guilty of negligence. It had been the practice of the Works and Stores Committee to direct the Engineer, without admitting liability, to settle a large number of these compensation claims by *ex gratia* payments, and without consideration of the question of the Board's negligence. The Law and Parliamentary Committee thought that, in order to secure uniformity of decision, these claims should be dealt with by them. The Board passed the following resolution: "That the Board affirms the principle on which claims and appeals for compensation in respect of damage caused by the bursting of their mains have been dealt with hitherto, and approves of their being dealt with on the respective merits of each particular case on an equitable basis, but without prejudice to the Board's right to deny legal liability, and refers it to a Special Committee to settle all claims, subject to a report to the Board; and that the Special Committee consist of the Chairman and Vice-Chairman of the Board, the Chairman and Vice-Chairman of the Works and Stores Committee, and the Chairman and Vice-Chairman of the Law and Parliamentary Committee."

**Reduction in Price at Tunbridge Wells.**—The Tunbridge Wells Gas Company announce a reduction of 1d. per 1000 cubic feet in the price of gas, as from the commencement of the present quarter. This makes the charge to consumers in the borough 2s. 7d. per 1000 cubic feet.

### STAND-BY WATER SUPPLY FOR AN ASYLUM.

#### Operation of the Metropolitan Board's Charges Act.

At the Meeting of the London County Council last Tuesday, the Asylums Committee presented a long report on the subject of negotiations which have been going on between them and the Metropolitan Water Board with the view of a stand-by supply of water being obtained for use in Bexley Asylum in case of emergency, such as the outbreak of fire or the temporary failure of the supply from the Asylum well. The whole of the requirements of the building have hitherto, for some ten years, been satisfied from the well; but the Committee have decided that an auxiliary source of water is necessary. At first the Board claimed to have the right, under their Charges Act of 1907, to charge on the rateable value of the Asylum. The annual cost on this basis would come to about £770; but as no water would be used except in case of emergency, the Asylum Sub-Committee did not feel justified in paying this amount. After some negotiation, the Board submitted the following proposal: "To afford a sealed stand-by combined supply for domestic and non-domestic purposes, to be used only in the emergency of the temporary failure or insufficiency of the independent private supply. (a) When the seal is unbroken, a minimum quarterly sum of 5-16ths per cent. of the rateable value of the premises, *plus* meter-rent; and (b) when the seal is broken, at the rate of 5 per cent. per annum on the rateable value for the time the seal is broken, *plus* meter-rent. Water can be taken, by measure, to the value of the rental paid, and any excess must be paid for by measure. The present assessment of the Asylum is about £15,350; so that the foregoing proposal would involve a minimum quarterly payment of (say) £48—i.e., £192 a year; or, if water were used during any quarter, at the rate of about £192 a quarter for the remainder of that quarter after the date of breaking the seal." The Committee, after careful consideration of all the circumstances, recommended the Council to accept this offer. The agreement under which the building was originally supplied was entered into with the Kent Water Company, and was taken over by the Board. It was terminated on the 31st of January last; and the Committee gave instructions for the preparation of a new one on the basis stated above.

### NOTES FROM SCOTLAND.

#### From Our Own Correspondent.

Saturday.

At a meeting of the Falkirk Town Council on Monday, the Gas-Works Committee reported that the workmen in the gas-works had made the following demands: Holidays, seven days in each year, with pay; wages, benchmen and boilermen, 6d. extra per shift; labourers, 6d. per hour; time-and-a-quarter for overtime, time-and-a-half for Sunday. The Committee were of opinion that the wages and conditions of the shift men compared favourably with those which obtained in the other works, and that therefore they could not recommend the Town Council to agree to the men's demands. As regarded the other employees, the Committee instructed the Manager to get further information from other gas-works, and to report to them at their next meeting. With regard to holidays, the Committee recommended that the shiftmen get one day, with pay, for every two months' service on shift work. Bailie Bogle, the Convener of the Committee, speaking in the Council, said he had received a letter from the Gas Manager, which had been sent to him by a number of the employees, the fitters stating that no one had been empowered to speak for them, and that they were perfectly well satisfied with present conditions. Mr. Muirhead moved that the Committee meet a deputation from the Gas Workers' Union and their officials to put the men's grievances before them. The amendment was not seconded, and the minutes were adopted. This is the first-fruit of a movement on the part of the Gas Workers and General Labourers' Union to organize the workers in the Falkirk district.

During the week, a further four of the series of lectures upon air purification, arranged for by the Glasgow Corporation Gas Committee, were delivered. Mr. James M'Ghee, the Superintendent of the Works Department of the Gas Department, spoke on Tuesday evening, in the Mechanics' Hall in Canning Street, on "Coal Gas and How to Obtain the Best Value from it;" Mr. W. M. Mason, of the Gas Office, on Wednesday evening, spoke in Parkhead Hall upon "Modern Necessities: Gas for Light and Heat;" Mr. M'Ghee again lectured on Thursday evening, in Maryhill Hall; and Mr. S. B. Langlands also lectured for the second time, in the Assembly Rooms in Brown Street, on Friday evening.

A special meeting of the Corporation of Greenock was held on Tuesday, at which, among other matters, a proposed extension at the gas-works was considered. Mr. MacCulloch reported that, at a meeting of the Provosts' Committee that day, the question of the extensions at the Inchgreen Gas-Works was under consideration, and that it had been unanimously agreed that a Sub-Committee named should visit the gas-works and report. Provost M'Millan, in moving the adoption of the minute, said that the Provosts' Committee had to deal with the finances of the various departments, and in this matter they were only following the usual course. Bailie Taylor, the Convener of the Gas Committee, in seconding, said that the decision had been arrived at after very full consideration; and by taking this step, rather than rushing the thing through, no objection could be raised afterwards, if it were resolved to proceed with the work. The minute was unanimously adopted.

A public meeting of the inhabitants of Ferryden was recently held, to consider a proposal to light the locality which has been made by the Montrose Gaslight Company. Two of the Directors of the Company and the Manager—Mr. A. Mackay—attended the meeting. The public lighting, it was explained, would cost from £16 to £20 a year, and, to commence with, would probably entail a rate of 3d. in the pound. The Directors were thanked for their attendance; and a Committee was appointed to ascertain the views of the householders upon the subject, and to report to a future meeting of householders.

The annual reunion of Peterhead Corporation gas-works employees was held on Thursday evening. Bailie Birnie, the Convener of the



Gas Committee, presided. In the course of his remarks, he said that the increase in the gas manufactured during the current year had been well maintained. The yearly expansion in business had been most remarkable—due largely to gas cookers and fires—and showed how readily a community took advantage of a really useful innovation. Like everything else, the gas-works had been subjected to endless criticism; but they had benefited by it very much. A municipal election would be hardly worth having without the gas-works critic. At the same time, many overlooked the fact that the institution was their own property, and was being conducted wholly for their own benefit. The profit was returned to the community in some way. It could not always follow that surplus revenue meant a consequent reduction in the price of gas. The gas-works paid to the municipal and poor rates the large sum of £634, which, to this extent, saved the pockets of the other ratepayers. Of their employees, he said that everyone seemed to fit his own particular department, making a harmonious whole which was doing good work for the community. He wished to refer more particularly to the services of their Manager—Mr. W. Ritchie—whose one aim was the advancement of the works. Few were gifted with the administrative abilities of Mr. Ritchie; and he felt compelled to give a well-deserved meed of praise to their able and painstaking servant. The entertainment—a tea, concert, and dance—was very successful.

A colliery company having offered to the Town Council to light the dock at Dysart with electricity, at a cost of £26 per annum, the Dysart Gaslight Company have come forward with a competitive scheme, in which they offer to erect lamps with four incandescent gas-burners in each. Two of these would be kept always going at night, and when shipping work was being done, the whole four would be lighted. A lively discussion is expected in the Town Council over the rival schemes.

The Aberdeen Corporation Gas Committee on Wednesday had before them an application by Messrs. John Milne and Co., of Dyce, for a supply of gas to their works; and it was agreed to give a supply, provided a guarantee for three years was given that the quantity of gas consumed in each year would equal 20 per cent. of the cost of the work, which is estimated at £70.

Mr. Chrystal, it is stated, surprised some of his colleagues in the Perth Town Council recently, when he submitted for their consideration some figures showing the cost to the rates of the public lighting in the city, as compared with other towns. Public lighting in Perth, he stated, cost £4310, which was equal to 5½d. in the pound. Compared with other towns, this was, he considered, enormously high; the rate in Dundee being only 2·37d., in Glasgow 2·27d., in Paisley 2·32d., in Aberdeen 3·36d., and in Edinburgh 3·29d.

Mr. S. Perks, the Chairman of the Gas Committee, has informed the Rhyl Urban District Council that, as from this month, all Sunday labour at the gas-works would cease until August. This satisfactory position has been rendered attainable by improved plant which has recently been installed in the works.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Feb. 26.

### Sulphate of Ammonia.

There has been a very firm tone in the market all the week till towards the close, when prices receded 1s. 3d. per ton from the highest point reached. For the first three or four days, the demand continued quite keen, though naturally last week's pace could not be maintained; but February requirements having been covered, there is no longer the same eagerness to purchase. The quotations now are £12 per ton f.o.b. Hull, £12 1s. 3d. per ton f.o.b. Liverpool, and £12 3s. 9d. per ton f.o.b. Leith. It is reported that business has been done at £11 15s. per ton f.o.b. Leith for July-December delivery; but buyers for the most part are not tempted to operate at this figure.

### Nitrate of Soda.

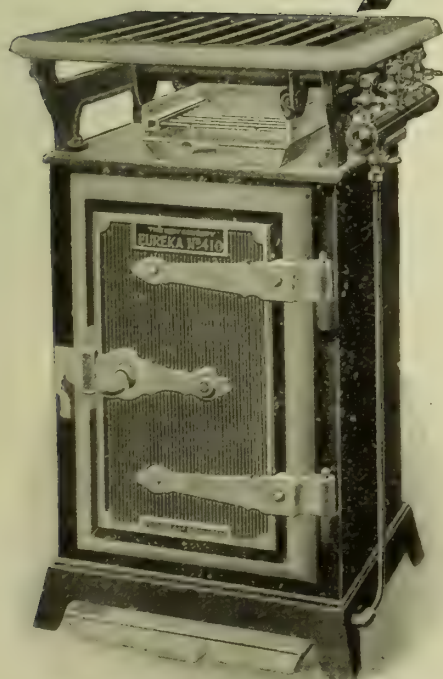
This article is rather slow of sale, but values remain unchanged at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality, on spot.

LONDON, Feb. 28.

### Tar Products.

The markets for tar products have been steady throughout the past week, though there has been no increase in price. In Belgium, there is a difficulty to do business; while the majority of South Wales manufacturers decline to purchase until they have placed their fuel orders. More business has, however, been done in the Bay ports of France and in the North of France at fairly good figures. Creosote remains unchanged. London manufacturers are fairly firm in their ideas of price. The Midlands are decidedly well sold; and in the North, oil is still selling at reasonable figures. Benzol is steady, and business is reported to have been done on the east coast at 7d., delivery to the end of the year. Fifty-ninety per cent. benzol is firm; and toluol is in good demand. Solvent naphtha is decidedly scarce, and in London especially so. Carbollic acid is quiet. Continental consumers are still offering 1s. per gallon for 60's. Crystals are dull, and liquid carbollic is firm. In anthracene, there is little doing. Tar is improving in value.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. ex works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. to 31s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7½d.; North, 7d.; 50-90 per cent., casks included, London and North, 7½d. to 8d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 2½d. to 1s. 3½d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. Carbollic acid, 60 per cent., east and west coasts, 1s. 0½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s.,



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#### Sulphate of Ammonia.

The market is firm, and very good prices are being paid for next month's delivery. To-day the principal Gas Companies quote £11 15s. to £11 17s. 6d.; and ordinary makes upon Beckton terms are £11 17s. 6d. In Hull, the quotation is £11 17s. 6d. to £11 18s. 9d.; and in Liverpool, £11 17s. 6d. to £12 is asked. In Leith, £12 to £12 2s. 6d. is quoted; and in Middlesbrough, £12.

### COAL TRADE REPORTS.

#### Northern Coal Trade.

There is now a fuller demand for coal with the better supply that is obtainable; and thus the prices do not show much change. In steam coals, best Northumbrians are from 10s. 6d. to 10s. 9d. per ton f.o.b.; for second-class steams, the quotation is from 10s.; and for steam smalls, from 5s. 6d. to 6s. 6d. The production is good for the season. There are still, however, one or two steam coal collieries idle, thus lessening the output, though the absence of the demand from navigations that are closed renders that idleness of small moment. In the gas coal trade, there is a steady demand, though it is less than it was, and is now fairly well met. Durham gas coals vary from 10s. 3d. to 11s. per ton f.o.b., according to quality, for the usual sorts; while for "Wear specials," the quotation is about 11s. 6d. to 11s. 9d., there being still a little scarcity in this class. A few small contracts for gas coal have been entered into. The Rotterdam contract is also in the market; but this is expected to go again to Germany. The feature in the gas coal trade is the demand to replace stocks at gas-works, both home and foreign, which were depleted to some extent in the early weeks of the year, when deliveries for Durham almost ceased. Coke is firm; and good gas coke is about 14s. per ton f.o.b. in the Tyne.

#### Scotch Coal Trade.

Trade remains unchanged. Outputs are moving off fairly well. Shipping trade is not so brisk; and prices for foreign delivery are, if anything, easier. Small sorts find a ready market. The prices now quoted are: Ell, 9s. 9d. to 10s. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 274,743 tons—a decrease of 34,632 tons upon the preceding week, and of 38,183 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,906,733 tons—an increase of 352,631 tons upon the corresponding period.

**Cheaper Gas for Maldon.**—At the annual meeting of the Maldon Gas Company, it was stated that the past year's working had been so satisfactory that the Directors had decided, notwithstanding the prospect of a rise in the cost of coal, to reduce the price of gas from July next to 3s. 6d. net per 1000 cubic feet to ordinary consumers.

### Competitive Installations of Gas and Electric Lighting.

The Works Committee of the Westminster City Council lately considered a letter received from the Westminster Electric Supply Corporation, Limited, stating that they had noticed that the Council had arranged to put in an experimental installation of improved lighting in Victoria Street, presumably with gas, and asking to be allowed to put up a similar installation of the electric light. It will consist of twelve metallic filament lamps erected at the west end of the street, and four flame arc lamps at the east end. In view of the fact that the contracts with the Gas Company for low-pressure gas lighting terminate on the 31st of the present month, the Committee accepted the offer, subject to the Corporation bearing the whole cost. The Committee also considered a proposal from the St. James's and Pall Mall Electric Light Company, Limited, to erect an experimental installation of flame arc lamps in Sackville Street, Piccadilly, which is now lighted by incandescent gas-lamps, provided the Council would bear one-half the cost. The Committee agreed to the Company's proposal, subject to their bearing the whole cost of the installation. Should it be proposed to displace any gas-lamps, the Committee's acceptance in each case is subject to the Council having power, under their contracts with the Gas Company, to put gas-lamps out of use.

**The New Gasholder Tank at Manchester.**—The large gasholder tank at the Bradford Road works of the Manchester Corporation having been completed, it has been tested with water to its full height, and found to be absolutely tight. After the tank has been emptied, the work for the construction of the holder will be commenced. The new tank is 285 feet internal diameter, and 46 ft. 6 in. deep to the bottom of the footings; and it is to receive a four-lift gasholder of a total capacity of 10,410,000 cubic feet.

**An Unjust Restriction at Manchester.**—The Gas Committee of the Manchester Corporation have entered a protest against the action of the Electricity Department officials in demanding from occupants of new property in the Chorlton-cum-Hardy district an agreement that, in the event of cables being laid, they will not use any other illuminant than electricity. The matter is likely to be brought before the notice of the City Council; the Gas Committee holding that it is an unjust restriction for the Electricity Department to impose.

**A Cumberland Water Scheme.**—After long deliberation, the Wigton Rural District Council have settled upon a scheme whereby the villages of Brough Hill, Bolton-Low-Houses, Bolton-New-Houses, and several intermediate hamlets, will be provided with water from the supply of the Aspatria, Silloth, and District Joint Water Board, whose trunk main line will be tapped at Mealsgate. This scheme, though estimated to cost slightly more, was accepted in preference to another proposal to obtain a supply from the Wigton Urban District Council's main, which runs close by some of the rural localities that need water.

"A.  
B.  
C."

## Maintenance!

The attitude of progressive Gas Undertakings in hiring out SOLELY our "A.B.C." Gas Fires is forcible proof of the value of Interchangeability of Parts. In this series, cost of maintenance is reduced to an absolute minimum: **one set of parts** only is necessary for any size of "A.B.C." Fires; and, what is equally important, the HIGH EFFICIENCY of these fires has won GOLDEN OPINIONS.

The Richmond Gas  
Stove and Meter  
Co., Ltd.

15 Sizes — 5 Designs.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.



### Falsifying Contractors' Time-Sheets.

At the City Court, Town Hall, Leeds, last Tuesday, W. Bindley, a foreman in the employ of Messrs. Clayton, Son, and Co., Limited, was charged with falsifying the time-sheets and endeavouring to defraud the Company. From the evidence of Mr. Baines, the Secretary of the Company, it appeared that Bindley was foreman erector on a contract which Messrs. Clayton had at Sutton-in-Ashfield; and it was part of his duty to send in to the Company weekly time-sheets to enable them to pay the wages of the persons employed on the contract. In sending in the sheets for the week ending the 10th ult., he made an entry in the name of A. Lane for £1 5s. On this being checked, it turned out that no person of this name had been employed on the contract during that week. Bindley was taxed with the matter, and admitted that the entry had been falsely made. On being charged, he pleaded guilty, and made an explanation that he had paid several small items out of his own pocket during the contract. It was pointed out by the Solicitor for the prosecution (Mr. P. D. Thomas) that this was no excuse, as it was prisoner's duty to acquaint the Company weekly of his out-of-pocket payments, when he would be recouped, and that the rules endorsed on the back of the time-sheets strictly required that this should be done. Mr. Thomas stated that the prosecutors felt compelled, in their own interests and for the benefit of contractors generally, to bring up the prisoner; and seeing that publicity would be given to the case, they would be satisfied if the accused were dealt with under the First Offenders' Act. The Bench adopted this suggestion, and bound the prisoner over in the sum of £5 to come up for judgment if called upon; informing him that he had every reason to be thankful for the attitude the prosecutors had taken up in the matter.

**Barnet District Gas and Water Company.**—At the half-yearly general meeting of this Company yesterday, the accounts presented showed a balance standing to the credit of the profit and loss account of £28,088, out of which the Directors recommended the declaration of a dividend, less income-tax, at the rate of  $7\frac{1}{2}$  per cent. per annum on the "A" and "C" stocks,  $6\frac{1}{2}$  per cent. per annum on the "B" stock, and  $5\frac{1}{2}$  per cent. per annum on the "D" gas and water stocks.

**Gloucester and the Standard Burner Bill.**—The Town Clerk reported at a meeting of the Gloucester City Council last Wednesday that, as the result of a conference between members of the Council and the Directors of the Gas Company, he had received a letter from the Secretary of the Gas Company stating that, having regard to what had been said, and the friendly relations which had hitherto existed between the two bodies, the Directors had decided to withdraw from the Gas Companies Standard Burner Bill. The Streets Committee expressed their satisfaction at the matter being so arranged; and Mr. Estcourt congratulated the Council on the very satisfactory result of the conference. The Council had intimated before the conference that opposition would be offered to the Bill.

**Prospective Rise in Rates in Leeds.**—Speaking at the annual dinner of the Leeds and District Chamber of Trades, Alderman Wilson said he thought they would all admit that the rates must go up. It was not a pleasant announcement; but he believed it was a true one. He knew of an extra 2d. which would have to be put upon the rates; and, so far, he did not know of a single farthing in the way of extra revenue. All the estimates, it seemed, were calling for considerable increases; and they could have neither cheaper gas nor cheaper electricity. As a matter of fact, they were not getting from either gas or electricity profits in relief of the rates in proportion to the heavy capital expenditure the undertakings entailed. They "cut their cloth" too finely; they wanted more profits, rather than less. The Chamber must be very contented indeed if the prices were not put up.

**Paignton Water Supply.**—A report on the water-works, by Mr. C. J. Hawkins, was submitted to the Paignton District Council last week. With regard to the question of distribution, it stated that the method of supplying Paignton, Brixham, Teignmouth, and Ipplepen seemed to be satisfactory to all parties as regarded proportion; but in reference to quantity, probably both Teignmouth and Brixham would like more. As the spring water was very hard, it had been found desirable to discharge a quantity of the water from Holne Moor into the filtered-water reservoirs, to reduce the hardness. The average daily quantity supplied to Paignton from these works was about 240,000 gallons, of which nearly one-third was Holne Moor water. From the consumers' point of view, the distribution of the water seemed to be fairly satisfactory; but a stricter supervision of fittings, house-to-house inspection, and other detail work, must be done before a satisfactory state of things could exist.

**Penistone Gas Purchase Question.**—The proposal of the Penistone Urban District Council to seek parliamentary authority to purchase the works of the local Gas Company is not regarded with unmixed feelings by the ratepayers. A special meeting of the Council was held on Monday of last week, when the matter was discussed at great length; a number of ratepayers being present to watch the proceedings. Messrs. Cammell, Laird, and Co., proprietors of the Yorkshire Steel and Iron Works at Penistone, wrote stating that if a Bill were brought forward to empower the Council to purchase the gas undertaking, they would oppose it; and the Great Central Railway Company gave a similar notification. A resolution passed at a meeting of the Penistone and District Ratepayers' Association was also read condemning the proposed purchase; and there was a petition signed by 317 persons who strongly opposed the purchase until the ratepayers had been asked to decide the question. Mr. F. Crawshaw, the Chairman of the Gas Committee, moved a resolution that the Council make application in the next session of Parliament for an Act enabling them to purchase the gas undertaking, and empowering them to manufacture and supply gas. After two amendments had been rejected, a resolution was carried adjourning the meeting. In the meantime, a meeting of ratepayers is to be held; and this will be attended by Mr. Newbigging, of Manchester, who advised the Council on the matter.

## BLAND BURNERS

FIXED ALL OVER THE TOWN.



*A Gas Manager writes:*

The "Bland" Burners I have fixed are giving the Consumers the greatest satisfaction, and I shall have little trouble in fixing them all over my town.

THE BLAND LIGHT  
SYNDICATE, LIMITED,  
LONDON and  
MANCHESTER.



The Finance Committee of the Cardiff Corporation have decided to expedite the work of converting the whole of the flat-flame gas-burners in the city into incandescent lights, so that it may be completed by next winter. The change, where it has already been effected, has been welcomed by the ratepayers.

The London Vertical Retort Syndicate, Limited, has been registered with a capital of £2000, in £10 shares, to acquire from Messrs. T. M. Thom and H. Pryor the benefit of certain inventions relating to improvements in the manufacture of lime and carbonic acid gas, and in retort-furnaces for the manufacture of gas.

By an explosion in a trench at the new water-works which the Bolton Corporation are carrying out at Egerton, William M'Laughlin and Daniel M'Kay were seriously injured, and had to be taken to the Bolton Infirmary, where the former succumbed to his injuries. Another man was slightly injured. All the men belonged to Glasgow; the Contractors for the work being Messrs. Best and Son, of that city. It is surmised that an unfired cartridge was among the rock blown out; and when the men commenced to remove the rock and other *débris*, M'Laughlin must have struck the cartridge with his pick.

We have received from Messrs. Clapham Bros., of Keighley, a neat section of Clapham's patent "Eclipse" special rubber joint, arranged for use as a paper-weight, and also intended as a reminder "of what is acknowledged to be the best and most secure form of jointing yet introduced for the covers of luteless purifiers (Green's type)." An accompanying circular-letter explains that the rubber is a mixture, manufactured for the firm only, to withstand the action of the various crude gases. The patent steel clip ensures a permanent joint between the rubber and covers, and affords a lateral support to the rubber, and allows it to move freely when the pressure is applied. Messrs. Clapham Bros. have already sold 30,600 feet of the joint; and 15,000 rapid automatic fasteners have been supplied.

The annual *soirée* in connection with the Sick and Benevolent Society of the Burslem Corporation Gas-Works took place last Thursday, and was largely attended. About 150 sat down to tea; and the subsequent proceedings were presided over by the Chairman of the Gas Committee (Mr. T. Mitchell). Mr. P. G. Boulton (Secretary of the Society) presented the annual report, which showed the sum of £92 as contributions towards the sick fund, and £48 paid as sick benefit. The amount available for dividend was £38. The benevolent fund showed £4 as income; and to the hospital fund the contributions came to £8 4s. Mr. Edward Jones, the Corporation Gas Engineer, who is the President of the Society, stated that during the time it had been in existence they had been able to disburse £300 from the sick fund. The benevolent fund was a pet scheme of his own; and he was proud of the good it had accomplished by sending men to the seaside to recuperate. During the evening a programme consisting of songs and recitations was gone through, and every provision made for the enjoyment of the guests.

The annual dinner provided by the Directors of the Shanklin Gas Company for the office staff and workmen took place in the Board-room a few days ago, and was largely attended. The Engineer and Secretary (Mr. F. C. Taylor) presided; and the Chairman and Deputy-Chairman (Messrs. F. Cooper and R. Young) were present. The toasts of "Success to the Company," "The Chairman and Directors," and "Mr. and Mrs. Taylor and Family," were cordially honoured; special thanks being accorded to Mr. and Mrs. Taylor for their work in the arrangements for the dinner. An extensive programme of music was carried out; and a very pleasant evening was spent.

A large gathering of the members of the Burton Branch (No. 1) of the Amalgamated Society of Gas Workers, Brickmakers, and General Labourers took place last Wednesday, on the occasion of the annual dinner and social evening. In the absence of Alderman T. E. Lowe, the Chairman of the Gas Committee, Alderman J. S. Rowland presided, and was supported by Mr. H. George (President of the Association), Mr. R. S. Ramsden (Assistant Gas Manager), Mr. H. Simpson (General Secretary of the Association), and Mr. W. Goodhead (Secretary of the Burton Branch). The Chairman proposed "The Gas Workers," and recommended everyone to join the Society; remarking that the new way of dealing with difficulties was infinitely better than by the obsolete and ugly method of strikes. Mr. George responded. Mr. Hickinbottom proposed "The Management of the Burton Corporation Gas-Works," and spoke of the satisfactory relations subsisting between the men and the Manager, who, he said, did his best to remove difficulties, and did his duty to ratepayers and employees alike. Mr. Ramsden returned thanks, and assured the company that as long as he had the management of the gas-works he would be always willing to meet amicably level-headed men.

The claim made by the Sunderland Corporation against Messrs. Laing and Sons, a local shipbuilding concern, which went into voluntary liquidation with a view to reconstruction, has been unsuccessful. The Corporation sought to be admitted as creditors; but the Liquidator rejected their proof—a decision which, on appeal, has been upheld by Mr. Justice Neville. The Council's contention was that prior to June, 1907, an agreement, incorporated in certain letters, was entered into between the parties, by which the Company were to take a supply of electricity from the Council for fifteen years. Under the agreement, the Company were to pay a minimum rate of £1500; this being really in the nature of payment for plant which the Council had erected at a cost of £21,000. A claim by the Council for £4955 for electricity actually supplied had been admitted; but the Council held that they were entitled to the further sum for breach of contract. There was no agreement under seal; but it was contended that a part performance by the Company of the agreement was sufficient to waive this objection. The Council received notice from the Company that they were going to suspend payment. They then demanded security, which the Company did not find; and the Council cut off the supply. For the Company, it was submitted that there was no contract; and even if there were, the breach was by the Council in cutting off the supply.

## What about the Hot Water?

Shall your Consumers still be dependent on the Coal Fire?

### MAUGHAN GEYSERS

Will give a Hot Bath in a few minutes at a cost of  $\frac{3d.}{4}$

### The "GACYLOTE" Cylinder

Will supply the whole House, with great economy.

### The "HOLBORN" Circulator

Can be attached to existing Pipes.

May we send you our suggestions for supplying these to your Consumers on lines successfully adapted by other Gas Undertakings.

STOUR STREET, SPRING HILL,  
BIRMINGHAM.

129, HIGH HOLBORN,  
LONDON.



## WANTED, FOR SALE, CONTRACT, &amp;c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

## Situations, &amp;c., Vacant.

GAS ENGINEER AND MANAGER, Congleton Gas Department. Applications by March 10.  
MANAGER, No. 5198.  
MANAGING FOREMAN (METER TRADE), No. 5193.

## Situations Wanted.

ASSISTANT, &c. No. 597.  
ASSISTANT-MANAGER OR HEAD FOREMAN (COKE-OVENS), No. 5187.  
SECRETARY, MANAGER, OR ACCOUNTANT, No. 5115.

## Capital Wanted. No. 5195.

## Old "Journals" Wanted. No. 5183.

## Plant, &amp;c. (Second Hand), for Disposal.

AIR GAS PLANT, No. 5195.  
EXHAUSTERS AND STEAM ENGINES, Smethwick Gas Department.  
SATURATOR, No. 5194.

## Plant (Second-Hand) Wanted.

CAST-IRON TANK, British Coalite Company. Tenders by March 4.  
TOWER SCRUBBER, No. 5190.

## Business for Disposal.

ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY.

## Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY, March 17.  
GASLIGHT AND COKE COMPANY, March 15.  
HORNSEY GAS COMPANY, March 22.  
MITCHAM AND WIMLETON GAS COMPANY, March 15.  
ROMFORD GAS AND COKE COMPANY, March 15.  
SEVENOAKS WATER COMPANY, March 15.  
SOUTH AFRICAN LIGHTING ASSOCIATION, No. 5199.  
WANDSWORTH AND PUTNEY GAS COMPANY, March 15.

## TENDERS FOR

## Benzol.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

## Coke.

LEIGH-ON-SEA GAS DEPARTMENT.

## Cookers.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

## Fire-Clay Goods, &amp;c.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
STOCKPORT GAS DEPARTMENT. Tenders by March 15.

## General Stores—

(Brass and Meter Fittings, Bolts and Nuts, Barrows, Iron and Steel, Ironmongery, Lead and Lead Pipe, Oils, Tallow, Paints, Tools, Drysaltery, Lime, Brushes, Taps, Glass, &c., &c.)

DARLINGTON GAS DEPARTMENT. Tenders by March 16.  
HEBURN BRIDGE AND MYTHOLMOYD GAS BOARD.  
Tenders by March 5.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
STOCKPORT GAS DEPARTMENT. Tenders by March 15.

## Incandescent Goods, Lamps, &amp;c.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

## Meters.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
STOCKPORT GAS DEPARTMENT. Tenders by March 15.

## Pipes, &amp;c.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
STOCKPORT GAS DEPARTMENT. Tenders by March 15.

## Sulphuric Acid.

PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.  
RAMSGATE GAS DEPARTMENT. Tenders by March 8.

## Tar and Liquor.

EXETER GASLIGHT COMPANY. Tenders by March 7.  
PONTYPRIDD GAS DEPARTMENT. Tenders by March 7.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 562.

Issue	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,474,000	Stk.	Oct. 14	5	Alliance & Dublin Ord.	86-88	..	5 13 8	4,940,000	Stk.	Nov. 11	8	Imperial Continental	175-177	..	4 10 5
310,000	Stk.	Jan. 13	7	Do. 4 p.c. Deb.	98-100	..	4 0 0	1,235,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	62-94	..	3 14 5
200,000	5	Oct. 28	6 1/2	Bombay, Ltd.	6-6 1/2	..	5 4 0	195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
40,000	5	..	6 1/2	Do. New, £4 paid.	48-48 1/2	..	5 6 8	561,000	Stk.	..	10	Liverpool United A.	227-229	..	4 7 4
50,000	10	Feb. 25	15	Bourne- 10 p.c.	29-30 1/2	..	5 0 0	718,100	"	"	7	Do. B.	16-16 1/2	..	4 2 10
311,810	10	"	7	mouth Gas } B 7 p.c.	162-162 1/2	..	4 3 7	306,083	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
75,000	10	"	5	and Water } Pref. 6 p.c.	15-15 1/2	..	3 17 5	75,000	5	Nov. 26	6	Malta & Mediterranean.	42-5	..	6 0 0
380,000	Stk.	"	12 1/2	Brentford Consolidated	250-253 1/2	..	4 18 10	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	59-102	..	4 18 0
300,000	"	"	5 1/2	Do. New	187-189 1/2	..	5 0 6	250,000	100	"	4 1/2	Melbourne } 4 1/2 p.c. Deb.	100-102	..	4 8 3
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3 1/2	Monte Video, Ltd.	122-124	..	5 5 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	1,775,892	Stk.	July 29	4 1/2	Nawc'tle & G'tesh'd Con	91-93	..	4 0 8
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218-221	..	4 19 7	529,435	Stk.	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	137-140	..	5 5 8
246,320	"	"	8	Do. A Ord. Stk.	154-157	..	5 1 1	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	137-140	..	5 5 8
460,000	20	Oct. 14	10	British	424-434	..	4 11 11	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	137-140	..	5 14 4
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	116-118 1/2	..	5 1 8	60,000	5	Sep. 10	8	Ottoman, Ltd.	64-68	..	6 5 6
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	87-89 1/2	..	5 1 2	31,800	53	Feb. 25	13	Portsea Island A.	134-136 1/2	..	5 1 0
82,278	"	"	5 1/2	Do. C 5 p.c.	103-105 1/2	..	5 4 9	60,000	50	"	13	Do. B.	126-128 1/2	..	5 1 7
55,000	"	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	50	"	12	Do. C.	119-121	..	4 19 2
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	143-151 1/2	..	4 11 10	114,800	50	"	10	Do. D and E.	100-102 1/2	..	4 18 0
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	Oct. 28	7	Primitiva Ord.	72-74	..	4 8 11
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	796,983	5	Jan. 27	5	Do. 5 p.c. Pref.	54-56	..	4 8 11
100,000	10	"	—	Do. 4 1/2 p.c. Pref.	52-54 1/2	..	—	483,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98-100	..	4 0 0
50,000	50	Nov. 11	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 6	1,000,000	10	Oct. 14	8	River Plate Ord.	173-181 1/2	..	4 7 8
100,000	Stk.	Dec. 29	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	80-82	..	5 9 9	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	90-101	..	3 19 3
157,153	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108 1/2-110 1/2	..	4 10 6	250,000	10	Sep. 29	8	San Paulo, Ltd.	142-151 1/2	..	5 4 11
1,513,280	Stk.	Feb. 25	5 1/2	Commercial 4 p.c. Stk.	105-108 1/2	..	4 16 4	62,500	10	"	6	Do. 6 p.c. Pref.	112-124	..	4 18 0
560,000	"	"	5	Do. 3 1/2 p.c. do.	103-105 1/2	..	4 15 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50-51	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	95-97	..	5 3 1	209,984	"	"	10	Do. B.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 0	523,500	"	"	10	Do. C.	233-235	..	4 5 1
492,270	Stk.	"	4	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	South African.	122-124	..	7 16 11
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5 1/2	South Met., 4 p.c. Ord.	120-122	..	4 9 7
145,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	98-100	..	5 0 0	1,829,445	Jan. 13	3	Do. 3 p.c. Deb.	82-84	..	3 11 4	
486,090	10	Jan. 27	12	European, Ltd.	243-243 1/2	..	4 17 0	209,822	Stk.	Aug. 26	8	South Shields Con. Stk.	161-162	..	4 18 9
354,060	10	"	12	Do. £7 ios. paid.	184-184 1/2	..	4 16 0	605,000	Stk.	Feb. 25	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122 1/2	..	4 12 9
15,141,545	Stk.	Feb. 10	4 1/2	Gas 4 p.c. Ord.	104 1/2-105 1/2	..	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	119-121 1/2	..	4 2 8
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	87-89	..	3 18 8	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
3,792,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
4,193,975	"	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	95-97	..	5 3 1	453,940	"	"	5 1/2	and B 3 1/2 p.c.	111-113	..	4 15 2
82,500	"	"	6 1/2	Do. do. 5 p.c.	119-121	..	5 7 5	149,470	"	Dec. 29	4	Edmonton } 4 p.c. Deb.	98-100	..	4 0 0
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	174-18	..	6 2 3	182,380	10	Dec. 29	8	Tuscan, Ltd.	91-93 1/2	..	8 4 2
131,070	Stk.	Sep. 10	6 1/2	Ilford A and C	145-147	..	4 8 5	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,780	"	"	5	Do. B	108-110	..	4 10 11	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	114-116	..	4 6 2
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	Feb. 25	6 1/2	Wands- } B 3 1/2 p.c.	139-141 1/2	..	4 14 0
								79,416	"	Dec. 29	3	worth } 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

† Next dividend will be at this rate.

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For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

## SPENT OXIDE PURCHASED IN ANY DISTRICT.

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SPECIALLY prepared for the Manu-  
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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

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**GAS PLANT for Sale—We can always**  
offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.  
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**SPECIALLY prepared for Sulphate of**  
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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
WORKS, HANDSWORTH, BIRMINGHAM.

**"GAZINE" (Registered in England and**  
Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.  
It is also used for the enrichment of Gas.  
Manufactured and supplied by C. BOURNE, Wort Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.  
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K. & A. WATER-GAS COMPANY, LTD.

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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Sheeting.  
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## THE very best Patent Grids for Holding

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WESTBURY, WILTS.

## FIDDES-ALDRIDGE

## SIMULTANEOUS Discharging-Charger.

The one Machine which Discharges and Charges at One Stroke.

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Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

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## MEADE-KING, ROBINSON, &amp; CO.

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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## GAS ENGINEERS.

## WANTED, several Gentlemen having

Influence in the Gas Industry to JOIN SYNDICATE being promoted for Further Developing Valuable Patents which are already on the Market and paying Excellent Profits. Minimum Qualification, £500.

Apply, by letter, to No. 5196, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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## BOROUGH OF CONGLETON.

## WANTED, a Gas Engineer and

Manager for the Congleton Corporation Gas-Works.

Candidates must have a Practical Knowledge of the Manufacture and Distribution of Gas, and be able to Prepare Plans, Estimates, and Specifications of New Works.

The person Appointed must Devote the Whole of his Time to the Duties and be able to Keep the Books Appertaining to the Management.

Canvassing, either directly or indirectly, will disqualify.

Commencing Salary, £165 per Year.

Applications, marked "Gas Manager," stating Age, Experience, and accompanied by Copies of Three dated Testimonials, to be sent not later than the 10th of March, 1910, to EDWARD A. PLANT, Town Clerk CONGLETON.



# TRINIDAD OILFIELDS, LTD.

(Incorporated under the Companies (Consolidation) Act, 1908.)

A Prospectus has been filed with the Registrar of Joint Stock Companies, which states, amongst other things, that the Subscription List is now open, and closes on or before Wednesday, the 2nd day of March, 1910.

The Minimum Subscription on which the Directors may proceed to allotment is 175,000 Shares.

**AUTHORIZED CAPITAL - - £300,000**

**DIVIDED INTO 300,000 SHARES OF £1 EACH - - - £300,000.**

**Issue of 260,000 Shares of £1 each - - - £260,000**

OF WHICH

85,000 Shares are to be allotted to the Vendors as hereinafter provided	-	-	-	-	-	-	-	-	-	£85,000
175,000 Shares are now offered for Subscription at £1 each	-	-	-	-	-	-	-	-	-	£175,000
<b>260,000</b>										<b>£260,000</b>

**PAYABLE:**

**2s. 6d. per Share on Application, 5s. per Share on Allotment, and the Balance as and when required, in calls not exceeding 5s. per Share, at intervals of not less than Two Months.**

#### Directors.

CORBET WOODALL, M.Inst.C.E., Palace Chambers, Westminster (Governor of the Gaslight and Coke Co.).  
HON. THOS. COCHRANE, Crawford Priory, Springfield, Fife (Director of the Nobel Dynamite Trust Co., Ltd.).  
ALEXANDER DUCKHAM, F.C.S., Phoenix Wharf, Millwall, E. (of Alexander Duckham and Co., Ltd., Oil and Chemical Manufacturers).  
SIR JAMES PENDER, BART., Donhead House, Salisbury (Director of the Metropolitan Electric Supply Co., Ltd.).  
H. C. B. UNDERDOWN, 9, Gracechurch Street, E.C., Merchant (Director of Direct United States Cable Co., Ltd.).

#### Solicitors.

For the Company: MESSRS. MACKRELL, MATON, GODLEE & QUINCEY,  
21, Cannon Street, London, E.C.

For the Vendors: MESSRS. MACANDREW, WRIGHT & MURRAY, W.S.,  
9, Albyn Place, Edinburgh.

#### Brokers.

MESSRS. FOSTER & BRAITHWAITE, 27, Austia Friars, London, E.C.

MESSRS. KERR, ANDERSONS & MACLEOD, 149, West George Street, Glasgow.

#### Bankers.

THE LONDON CITY AND MIDLAND BANK, LTD.,  
Threadneedle Street, E.C., and Branches,  
THE ROYAL BANK OF SCOTLAND,  
Edinburgh, Glasgow and London, and Branches.

#### Auditors.

MESSRS. DELOITTE, PLENDER, GRIFFITHS & CO.,  
5, London Wall Buildings, E.C.

#### Consulting Engineers.

MESSRS. THOMPSON & HUNTER, 3, Lombard Street, London, E.C.

#### Secretary and Temporary Offices.

R. G. LONGCROFT, F.C.A., LL.B., 41, Bishopsgate Street Within, E.C.

This Company is formed for the purpose of acquiring from the Vendors (The Trinidad Petroleum Company, Limited, of 41, Bishopsgate Street Within, London, E.C.) their oil and other mineral rights in and over lands situated in the Guapo and La Brea Districts in the Island of Trinidad, aggregating 3791 acres, made up as under: Crown Lands, 3200 acres; Adventure Estate, 273 acres; La Fortune Estate, 318 acres; total, 3791 acres.

The Vendors have obtained from the Trinidad Government a lease of the crude oil, bituminous minerals (including asphalt), and natural gas in the Crown Lands before mentioned, for a term of 21 years from the 1st July, 1909, with a right of renewal thereof on the expiration of that period for a further term of 21 years.

The Vendors have further acquired in perpetuity and on favourable terms all the oil and mineral rights in the Adventure Estate, and have also the right to take portions of the surface of the estate, extending to about 60 acres, on lease for a term of 99 years. This secures easy access to the Crown Lands included in the Government lease, and to the sea for the shipment of oil.

The Vendors have also acquired in perpetuity and on favourable terms from the registered proprietors of the La Fortune Estate (which lies immediately to the west of the Adventure Estate) the oil and other mineral rights in La Fortune and the freehold of 110 acres of the surface of this estate. A claim has been made against the last-mentioned proprietors to one undivided third share of the La Fortune Estate (which consists, as above stated, of 318 acres), and this is at present the subject of proceedings in the Trinidad Courts between the claimant and those proprietors. The Company will take the rights in this estate subject to the right of the claimant (if any), but will be entitled to the benefit of all remedies by the Vendors against the said registered proprietors under their covenants for title.

The Vendors have expended considerable sums in ascertaining and proving the existence of oil in paying quantities in the lands above mentioned, and have at the present time three wells which have struck rich sources of oil at depths of 712 feet, 672 feet, and 520 feet respectively. It will not be needful, therefore, for the Company to engage in a speculative search for oil; all that will be necessary for it to do will be to develop the discoveries of oil already made and market the product.

The favourable position which the Trinidad Oilfield occupies relatively to other well-known oilfields will be at once seen when it is stated that no part of the properties to be acquired by this Company is distant more than six miles from the sea, as compared with hundreds of miles which separate the Russian, Roumanian, and most of the American oilfields from their ports of shipment. The result of this advantage of position is that the cost of placing the oil on the seaboard will be extremely low, being estimated at 6d. per ton, as compared with 7s. and upwards ruling on other well-known oilfields.

Extracts from the Reports by Messrs. Thompson and Hunter, and also by Sir Boverton Redwood, are quoted below, and from the latter report it will be seen that the oil found in the Company's wells compares very favourably with that of other oilfields, its calorific value being specially notable.

The price to be paid by the Company to the Vendors is £153,000, payable as to £68,000 in cash, and as to £85,000 in fully paid-up shares of £1 each, the Company undertaking the obligations of the Vendors in respect of the said mineral and other rights and property. The Vendors are also entitled to the call of the 40,000 unissued Shares of the Company for two years from the 15th March, 1910, at a premium of 10s. per Share, which right has been transferred to the Underwriters in accordance with the Agreement hereinafter mentioned. The purchase price includes modern drilling plant, casing, steam engines and boilers, pumps, pipes, stores, and tools, furnished dwellings, storehouses, and a light railway, and the wells already sunk. It also includes the expenditure which has been made by the Vendors in surveying and grading a road leading from the coast into the Crown Lands, with bridges, conduits, &c.

The present issue of Shares will provide a sum of about £100,000 for working capital, which the Directors consider ample to bring the Company into a dividend-paying condition.

The demand for oil fuel for marine and railway purposes is rapidly increasing owing to its recognized advantages over coal—especially for war vessels—and in this direction a market which is practically inexhaustible is being opened up. The advantages to the British Admiralty of being able to obtain a supply of fuel oil from a British Colony comparatively free from danger of interruption is apparent, and has been recognized by the Admiralty. Consequently, in terms of the Government Lease before mentioned, the lessees are under agreement to supply oil fuel to the Admiralty, when they are in a position and requested to do so, on terms which are considered fair in all respects, such oil fuel to be delivered at the Company's shipping place at Guapo. Contracts for the supply of oil fuel to the Admiralty may therefore be confidently anticipated.

The consumption of oil fuel on Mexican and South American Railways is very largely increasing, and here again large contracts may be expected.

The Statistical Abstract of the British Colonies states that 550,000 gallons of oil and kerosene are imported annually into Trinidad. The import duty is 9d. per gallon and the nett revenue from the duty about £20,000 per annum.

The neighbouring Island of Barbados imports 400,000 gallons per annum; Jamaica, 821,929 gallons; British Guiana, 705,710 gallons; and Bermuda, 300,000 gallons. The price of fuel at all these places is very high, and owing to the short sea passage it is anticipated that no other country can compete with Trinidad for the local West Indian market.

Messrs. Thompson and Hunter, Consulting Engineers and Petroleum Experts, of 3, Lombard Street, E.C., state that the cost of production should not, in their opinion, exceed 15s. a ton, and may easily fall to 5s. if gas is employed as fuel, and all the wells can be pumped. They estimate that towards the end of the first year 3000 tons a month should be obtained, and towards the end of the second year 6000 tons a month, which at an average profit of only 15s. a ton, would yield £54,000, or sufficient to pay a very substantial dividend on the whole of the Company's share capital.

There is an ample supply of labour in the island.

Messrs. Thompson and Hunter also report as follows:—

"A well-defined anticline has been located running in an approximately East to West direction inland from the coast near Point Fortin, its course for many miles across the forest lands being indicated by exudations of semi-liquid pitch and issues of inflammable gas. On the northern side of the anticline the beds have a lower dip than on the southern, and nowhere except near the crest of the anticline do the beds exhibit any inclinations which would render drilling operations difficult. This anticline runs through the centre of the Vendors' properties."

"The strata composing the oil-bearing series have a thickness of fully 1,000 feet and consist of alternate beds of clay, sandy clays, occasional beds of hard sand and oil sands, some of which latter attain a thickness of 50 feet; many of the oil sands outcropping on the coast are heavily impregnated with petroleum, although exposed to the action of water at each tide; and the sea is frequently covered with a film of oil for miles along the coast line."

Trial wells sunk by the vendors have amply demonstrated the petroliferous character of the Guapo anticline.

A series of boreholes (aggregating in depth upwards of 1200 feet) sunk with hand drill, penetrated oil sands and yielded petroleum, which in the case of four of these wells, rose to the surface and overflowed.

The three deepest wells (sunk by machine drill), after yielding oil at various depths, struck rich sources at 712 feet, 672 feet, and 520 feet respectively.

The most satisfactory advices have been received from the manager in Trinidad since these strikes of oil. He reported that the fountains of oil from the wells rose repeatedly to the height of the derrick (about 70 feet), and that there was continued evidence of strong gas pressure. Later, when temporary storage had been provided, about 100 tons of oil were baled in four days from one of the wells without its showing any sign of decreased yield. The very moderate depth at which oil in large quantities has been struck is a most satisfactory feature. As the storage accommodation at present available is limited in capacity, the wells have hitherto been drawn upon only for the oil required by the vendors for fuel and lighting purposes and to meet local sales.

Samples of the oil obtained from the Company's wells have been submitted to Sir Boverton Redwood, D.Sc., F.R.S., and a copy of his report accompanies the prospectus.

Sir Boverton Redwood's report shows that after the removal by distillation of the petrol and illuminating oils (i.e., the more valuable volatile constituents), the residual oil, amounting to some 60 per cent., is available as a fuel oil of high flash point. He draws attention to the absence of solid hydrocarbons in commercial quantities, and also to the small percentage of sulphur, and to the consequent comparatively small cost of producing a high-class fuel oil. He states that for ordinary requirements any removal of sulphur might be unnecessary. This is of the greatest importance, as it is well known that great difficulty and expense has been encountered by several of the largest oilfields in other parts of the world in producing oil to satisfy the Admiralty's requirements, owing to the presence of solid hydrocarbons and of sulphur in excessive quantities.

A highly satisfactory feature of Sir Boverton Redwood's report is the large proportion of petrol and illuminating oils, ranging from 12½ to 14 per cent. and 25 to 27 per cent. respectively.

Professor P. Carmody, Government Analyst of Trinidad, has also reported favourably on a sample of oil drawn by the Inspector of Mines to the Trinidad Government from one of the Company's wells during sinking at a depth of 400 ft.

Full Prospectuses, upon the terms of which applications will alone be received, and Forms of Application, can be obtained at the Offices of the Company, or from the Solicitors or Brokers.



**WANTED, a Manager for 50-Million**  
Works, Experienced in Regenerator Furnaces, Slot-Work, Fittings, Maintenance, &c., and Competent to TAKE ENTIRE CONTROL.  
Apply, by letter only, to No. 5198, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**GAS Meter Works—wanted a reliable**  
MANAGING FOREMAN to Take Complete Charge of Shop. Must be Practical, a Good Disciplinarian, and able to work out Prime Costs.  
Apply, by letter, giving Salary required, and stating Experience, and Age, to No. 5193, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**"JOURNAL of Gas Lighting" wanted**  
to Purchase back numbers for May 8, May 15, and July 10, 1900, also May 19, 1903.  
Address No. 5183, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### SCRUBBER.

**WANTED by a Gas Company making**  
13 Millions, a suitable Second-Hand TOWER SCRUBBER. Must be Cheap and in Fair Condition.  
Particulars to No. 5190, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**GAS-WORKS requiring Extensions**  
should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.  
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

**FOR SALE—One 150-Burner National**  
Air-Gas Company's PLANT. Nearly New and in Good Order. Has been little used. Can be seen in London on Application.  
Address No. 5195, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**FOR SALE—One Three-Ton Leaden**  
SATURATOR, including all Pipe Connections, open Type. Suitable either for Hand Fishing or for Wilton's Ejector. Strongly built and in good Condition. Has been only little used. Can be inspected.  
Address No. 5194, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED.

##### IN VOLUNTARY LIQUIDATION.

**THIS well-known and Established**  
business of Gas Lighting Engineers and Makers of Greenall's Positive Measurement Meter, as at present carried on at the Albion Works, Otley, is now OFFERED AS A GOING CONCERN, with all Plant and Machinery, Patterns, Patents and Goodwill.  
The Works were re-arranged Five Years ago, by the Company, and are admirably adapted for their purposes, consisting of a large, very well-lighted shed, with extensive Offices, Storeroom, and Lavatories, with small Iron and Brass Foundries attached, the whole covering an area of 3000 sq. yards, and can be obtained at a moderate rental.  
Apply to the LIQUIDATOR, Albion Works, OTLEY.

#### COUNTY BOROUGH OF SMETHWICK.

(GAS DEPARTMENT.)

#### SECOND-HAND EXHAUSTERS AND STEAM-ENGINE.

**THE Gas Committee of the Corporation**  
of Smethwick have FOR SALE—  
Two Donkin EXHAUSTERS, with STEAM-ENGINES COMBINED, including Disc Valves. Nominal capacity, 40,000 and 60,000 Cubic Feet per Hour respectively; also a  
HORIZONTAL HIGH-PRESSURE STEAM-ENGINE, 14-inch bore, 20-inch stroke, to work at 80 Steam Pressure.

The plant can be seen at work at the Gas-Works, Rabone Lane, during the next two or three weeks; and any further Particulars can be obtained on Application to Mr. Vincent Hughes, Engineer, at the Gas-Works.  
Offers, endorsed "Second-Hand Plant," to be addressed to the Chairman of the Gas Committee, and sent to the undersigned.

W. J. STURGEON,  
Secretary.

Gas Department, Council House,  
Smethwick, Feb. 15, 1910.

**THE British Coalite Company, Limited,**  
3, London Wall Buildings, London, E.C., invite TENDERS for the Supply of a Covered Second-Hand CAST IRON TANK, built in sections, of from 75,000 to 125,000 Gallons Capacity.

Tenders, with detailed Specification, giving Size and Thickness of Plates, Position and Sizes of Manhole, Outlets and Inlets, and to include Free Delivery at the Company's Works, Barking, to be forwarded to the OFFICES OF THE COMPANY, 3, LONDON WALL BUILDINGS, E.C., by Friday, the 4th of March.

#### URBAN DISTRICT COUNCIL OF LEIGH-ON-SEA.

##### SALE OF COKE.

**THE Gas Committee of the above**  
Council are desirous of Disposing of about 100 Chaldrons of COKE (which Coke they are accumulating at the rate of 30 Chaldrons per week), and are prepared to receive Tenders for that purpose.  
Persons tendering must be prepared to take the Coke by Barge from the Gas-Works Wharf, Leigh-on-Sea (f.o.b.).

Tenders should be addressed to me the undersigned, and should be endorsed "Tender for Coke,"  
W. CARLYLE CROSSDELL,  
Clerk to the Council.  
Council Offices, Leigh-on-Sea.

#### HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

**THE above Board are prepared to re-**  
ceive TENDERS for the Supply of SUNDRY STORES, to be delivered in Quantities as the Gas Board may require during the next Twelve Months ending March 31, 1911.

Forms of Tender and any further Particulars may be had on Application to Mr. E. J. Wellens, Engineer and Manager.

Sealed Tenders, endorsed "Sundry Stores," and addressed to James Simpson, Esq., Chairman of the Gas Board, Gas Offices, Hebdon Bridge must be delivered by Noon on Saturday, March 5, 1910.

The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Quantity as required.

By order of the Gas Board,  
R. CRABTREE,  
Clerk.

Gas Offices, Carlton Street,  
Hebdon Bridge, Feb. 24, 1910.

#### DARLINGTON CORPORATION.

(GAS-WORKS DEPARTMENT.)

##### TENDERS FOR STORES.

**THE Gas Committee invite Tenders for**  
the Supply of the following GENERAL STORES, to be ordered in such Quantities as may be required during the period ending March 31, 1911.

- 1—Brass and Meter Fittings.
- 2—Iron and Steel.
- 3—Ironmongery.
- 4—Lead Compo. Pipe and Pig Lead.
- 5—Drysaltery.
- 6—Lubricating Oils, &c.
- 7—Oxide Paint, Red and White Lead.
- 8—Shovels, Coke Forks, &c.
- 9—Brooms, Brushes, &c.

Further Particulars and Forms of Tender may be obtained on Application to Mr. Frank P. Tarratt, Engineer and Manager, Gas-Works, Darlington.

Sealed Tenders, properly endorsed, must be addressed to the Chairman of the Gas-Works Committee, and sent in not later than Wednesday, the 16th of March, 1910.

No pledge is given that the lowest or any Tender will be accepted.

H. G. STEAVENSON,  
Town Clerk.

Darlington, Feb. 25, 1910.

#### PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

**THE above Council invite Tenders for**  
the Purchase of the Surplus COAL-GAS TAR and WATER-GAS TAR produced at their Treforest Works during the Year ending March 31, 1911.

Tenders to state the Price per Ton, or per 200 Gallons for (a) Coal-Gas Tar; (b) Water-Gas Tar.

The Tar will be delivered into the Contractor's Railway Tank Waggon at the Treforest Gas-Works Siding, Alexandra Docks and Railway Company's line.

Tenders, sealed and endorsed "Surplus Tar," must be received by the undersigned, on or before Monday, March 7, 1910.

J. COLENSO JONES,  
Clerk to the Council.

Municipal Buildings,  
Pontypridd, Feb. 19, 1910.

#### PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

**THE above Council invite Tenders for**  
the Supply of the following STORES and MATERIALS for the year ending March 31, 1911:—

- No. 1—Gas Cookers.
- No. 2—Sulphuric Acid.
- No. 5—Fire-Clay Goods, &c.
- No. 5A—Silica Fire-Clay Goods.
- No. 6—Wrought Iron Tubes and Fittings.
- No. 7—Lead and Compo. Tubing.
- No. 8—Barrows, Rake Heads, &c.
- No. 9—Oils and Benzol.
- No. 10—Brass Fittings and Sundries.
- No. 11—Slot Fittings.
- No. 12—Meters.
- No. 13—Main Taps and Locks.
- No. 15—Cast-Iron Mains and Specials.
- No. 16—Incanescent Materials.
- No. 18—Lamps and Copper.
- No. 19—Horse Feed.

Forms of Tender and Specification may be obtained, on Application, from Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd.

Tenders, on the prescribed Forms, sealed and endorsed "Tenders for Gas-Stores, No. —" (as the case may be), must be received by the undersigned on or before Monday, March 7, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,  
Clerk to the Council.

Municipal Buildings,  
Pontypridd, Feb. 10, 1910.

#### EXETER GASLIGHT COMPANY.

##### TENDERS FOR TAR.

**THE Directors of the Exeter Gaslight**  
and Coke Company invite TENDERS for such TAR as they may not desire to dispose of to persons others than Distillers, for Twelve Months from the 25th of March next, at per Ton of 20 cwt., delivered into Contractors' Tanks at the Company's Works.

Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Monday, the 7th of March next; but the Directors do not bind themselves to accept the highest or any Tender.

By order,  
WM. N. WESTLAKE,  
Secretary and Manager.

Gaslight Offices, Exeter,  
Feb. 18, 1910.

#### RAMSGATE CORPORATION.

(GAS DEPARTMENT.)

##### TENDERS FOR SULPHURIC ACID.

**THE Gas and Water Committee invite**  
TENDERS for the Supply of about 225 Tons of Best BRIMSTONE ACID (what is known as 80 per Cent. Acid with a Specific gravity of 1.42 Twaddle), to be delivered in equal monthly Quantities between the 1st of April, 1910, and the 31st of March, 1911.

Tenders to be sent in not later than Noon on Tuesday, the 8th March, 1910, addressed to the Chairman of the Gas and Water Committee, Gas-Works, Boundary Road, Ramsgate, and endorsed "Tender for Sulphuric Acid."

The Committee do not bind themselves to accept the lowest or any Tender.

Further Particulars on Application to  
WM. THOMSON,  
Engineer and Manager.

Gas and Water Offices,  
Boundary Road, Ramsgate.

#### COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

##### TENDERS FOR STORES.

**THE Gas Committee are prepared to re-**  
ceive TENDERS for the Supply of GENERAL STORES for One Year from April 1, 1910, to March 31, 1911.

- |                             |                                 |
|-----------------------------|---------------------------------|
| 1—Bolts and Nuts.           | 11—Mill Furnishing.             |
| 2—Brushes.                  | 12—Oils and Grease.             |
| 3—Brass and Meter Fittings. | 13—Tanned and Spun Yarn.        |
| 4—Cartage.                  | 14—Shovels, Pick Heads, &c.     |
| 5—Iron Castings.            | 15—Timber, English and Foreign. |
| 6—Drysaltery.               | 16—Tubing.                      |
| 7—Retorts and Fire Goods.   | 17—Wet and Dry Ordinary Meters. |
| 8—Glass and Putty.          | 18—Lime.                        |
| 9—Iron and Steel.           |                                 |
| 10—Ironmongery.             |                                 |

Forms of Tender and all further Information may be obtained on Application to the Engineer, Gas-Works, Portwood.

No Form of Tender other than that issued by the Committee will be accepted.

Sealed Tenders, endorsed "1," "2," "3," &c., as the case may be, must be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office not later than Tuesday, March 15.

No Tender will be accepted without satisfactory proof that the Firm tendering pays the Trade Union Rate of Wages and observes the Trade Union number of hours usually paid and observed in the district where the Goods are made or produced.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,  
ROBERT HYDE,  
Town Clerk.

Stockport, Feb. 25, 1910.

#### BOURNEMOUTH GAS AND WATER COMPANY.

ISSUE OF £10 SEVEN PER CENT. "B" SHARES.

MINIMUM PRICE OF ISSUE, £15 PER SHARE.

SALE BY TENDER OF 2019 £10, 7 PER CENT. "B" SHARES, in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

**NOTICE is Hereby Given, that it is the**

intention of the Directors of this Company to SELL BY TENDER 2019 "B" SHARES of £10 each, (the Dividend of which is limited to 47 per cent.) to be paid up in full on or before the 31st of May, 1910.

The Capital now offered is required by reason of the Purchase of Freehold Properties at Alderney and Longham, and for the Extension of the Company's existing Works and Plant to meet the increased demand for Gas and Water by reason of the continuous development of the District supplied by the Company.

The Dividend on the Original Shares for the Half-Year ending the 31st of December, 1909, was at the rate of 10 per Cent. per annum, with an addition at the rate of 5 per Cent. per annum under the Sliding-Scale, and on the "B" Shares at the rate of 7 per Cent. per annum. Since the 30th of June, 1904, the Dividend on the Original Shares has been at the rate of 14 per Cent. per annum, and, for the past Year, at the rate of 15 per Cent. The Net Profit earned in the Year ended the 31st of December, 1909, after deducting all charges, including Debenture and other Interest, amounted to £45,322 ls. 4d., exclusive of Interest on Reserve Investments, amounting to a further £701 8s. 2d., and after payment of Dividends to the 31st of December, 1909, the sum of £27,890 5s. 6d. remained to be carried forward to the current half-year.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth and Poole, or of the Secretary as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Thursday morning, the 17th of March, 1910.

By order, H. A. PLUMB, Secretary.  
London: 90, Cannon Street, E.C.,  
Feb. 18, 1910



### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.**

NEW ISSUE OF £12,500 THREE PER CENT. DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**ROMFORD GAS AND COKE COMPANY, LIMITED.**

NEW ISSUE OF 600 £5 "B" SHARES AND £2000 FOUR PER CENT. DEBENTURE BONDS.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of A. G. Tilley, Esq., decd., and other Owners.

**THE GASLIGHT AND COKE COMPANY,**  
£1000 CONSOLIDATED ORDINARY STOCK.  
**SEVENOAKS WATER-WORKS COMPANY,**  
£270 CONSOLIDATED STOCK.

**MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY,**  
£900 CONSOLIDATED ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

#### Alteration in date of Sale.

By order of the Directors of the  
**HORNSEY GAS COMPANY.**

NEW ISSUE OF £5000 CONSOLIDATED STOCK,  
£6500 FIVE PER CENT. PREFERENCE STOCK,  
AND  
£3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 22, at Two o'clock precisely, in Lots, instead of Tuesday, March 1, as previously announced.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

**FOR SALE—50 Ordinary Shares in the SOUTH AFRICAN LIGHTING ASSOCIATION.**  
Particulars on Application. Will accept £12 10s. each.  
Address No. 5199, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

Price 5s. 6d. Post Free.

## REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1909.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

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## GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.  
Above the Average in Weight and Quality of Coke.  
Maintains a High Standard in Residuals.

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By F. H. LEEDS, F.I.C., F.C.S.,  
Member of the Society of Public Analysts and of the  
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F.C.S., Consulting Chemist, Author of "The Chemistry  
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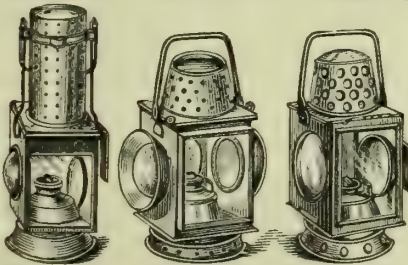
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## MIRFIELD GAS COAL.

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Sperm Value 87.85 lbs. per Ton.

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**RAVENSTHORPE, NEAR DEWSBURY.**

LONDON: 16, Park Village East, N.W.

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Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.  
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QUOTATIONS ON APPLICATION TO  
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Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planned joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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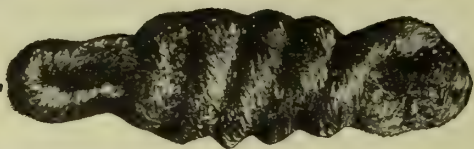
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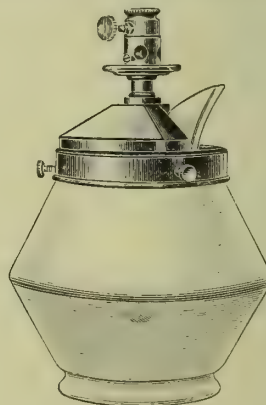
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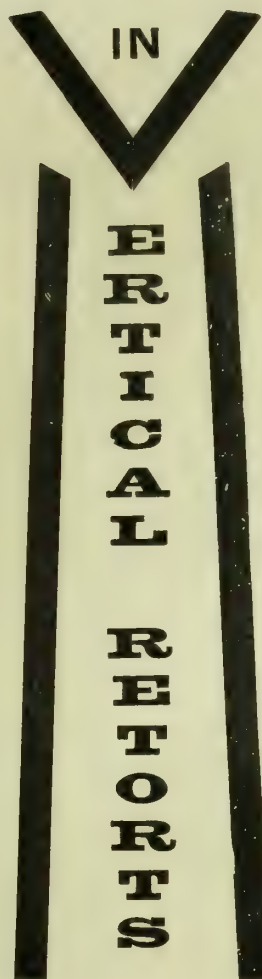
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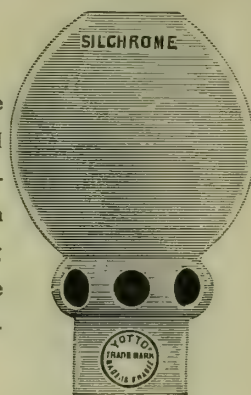
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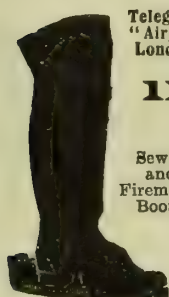
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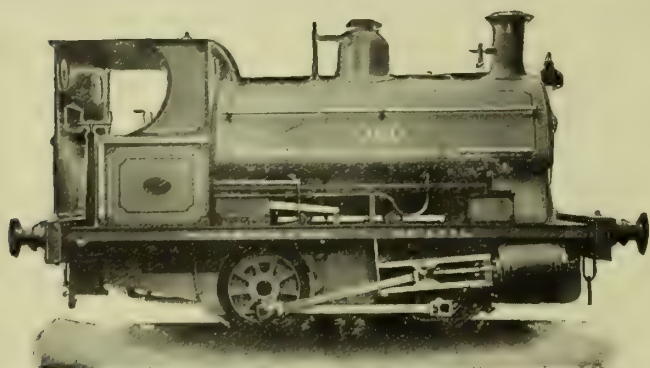
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### Inverted Arc Lamp, Fig. 623.

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1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

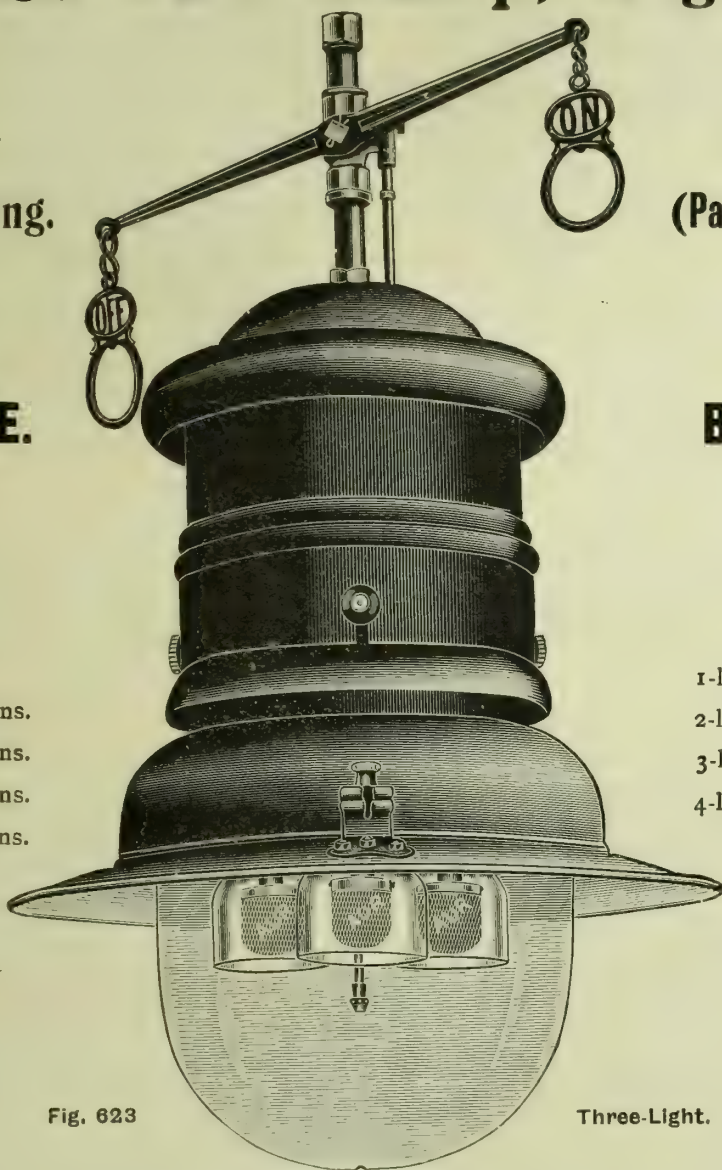


Fig. 623

Three-Light.

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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

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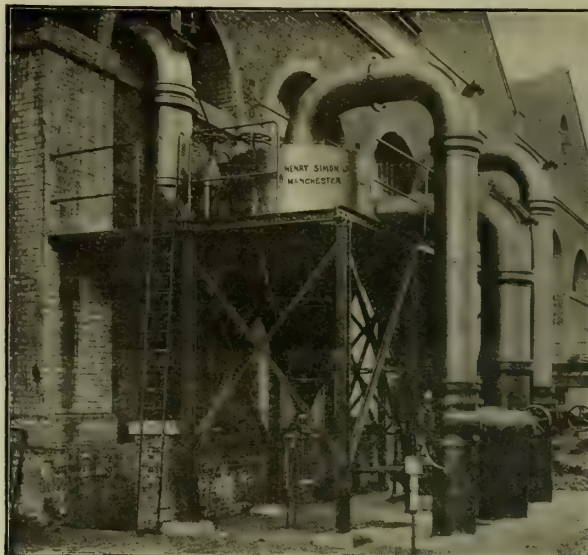
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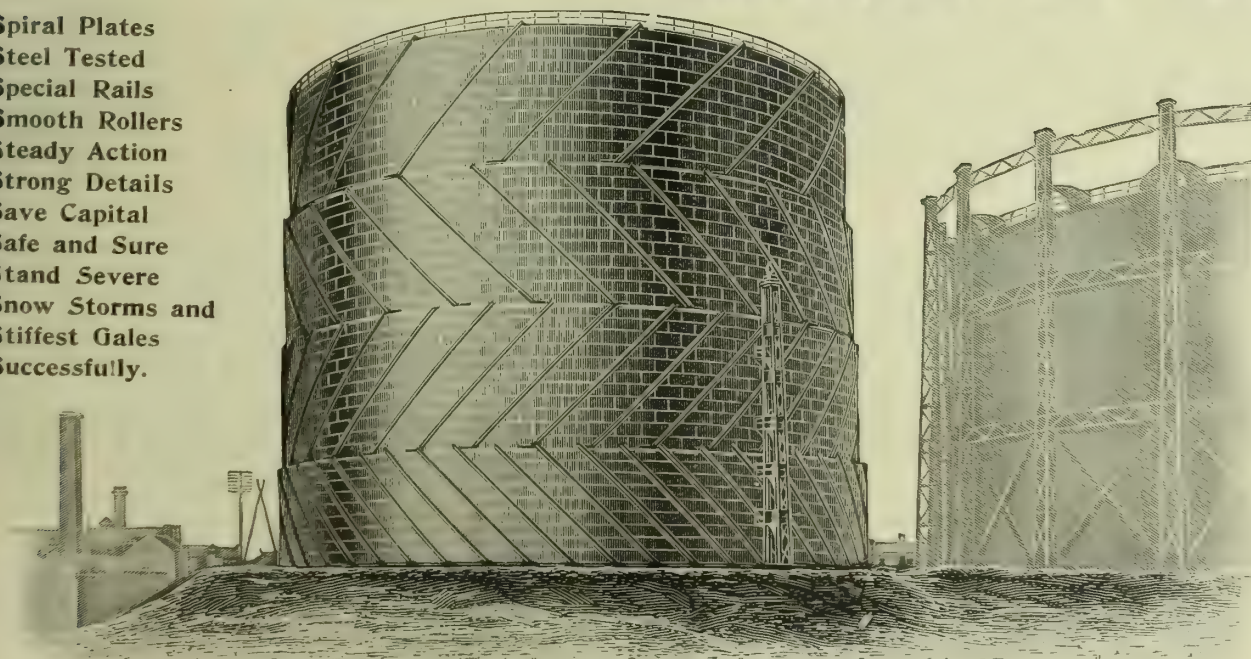




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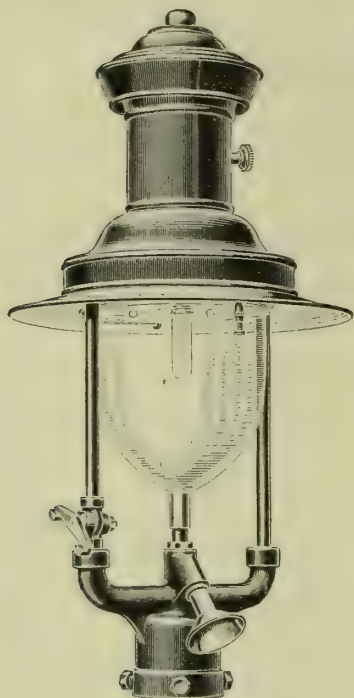


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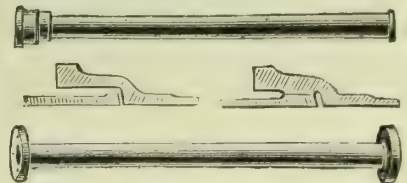
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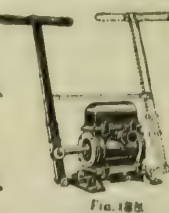
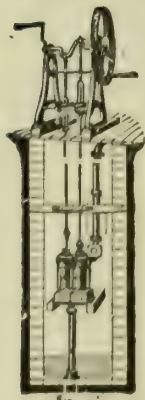
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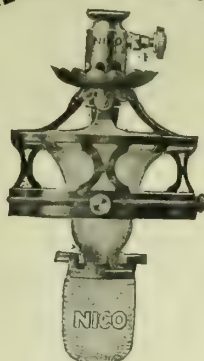
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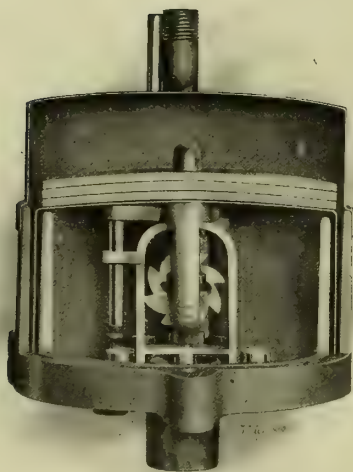
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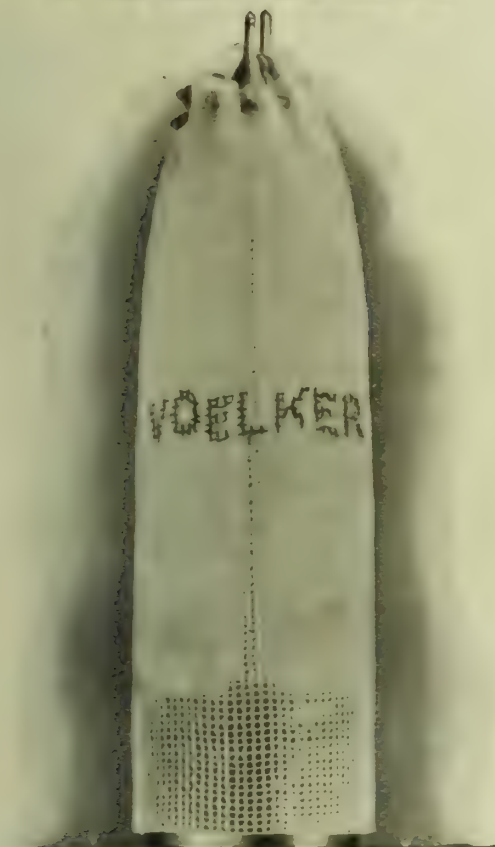
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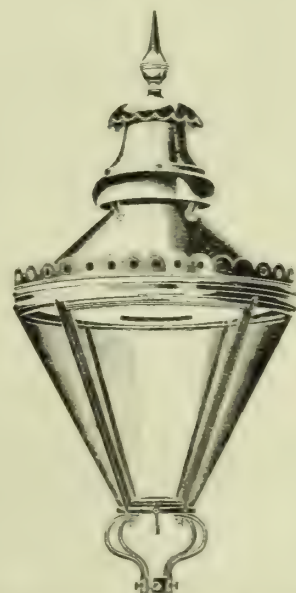
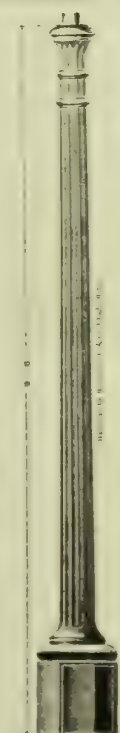
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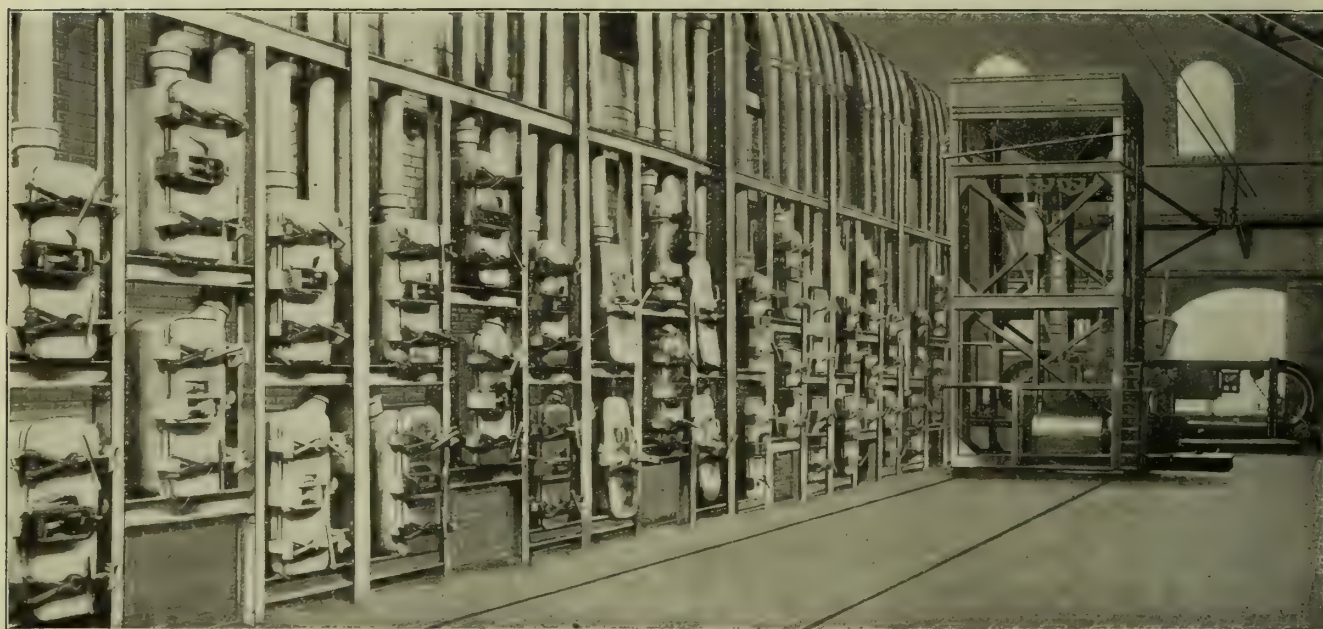
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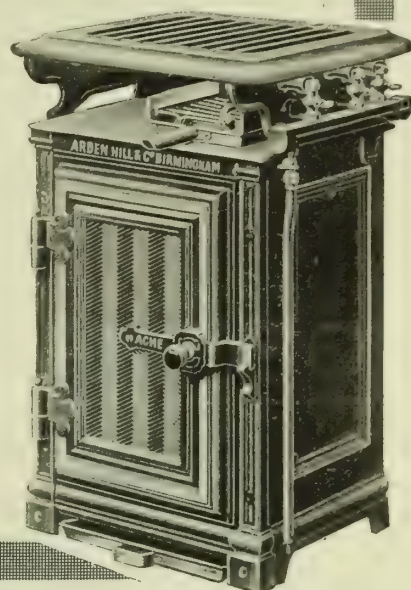
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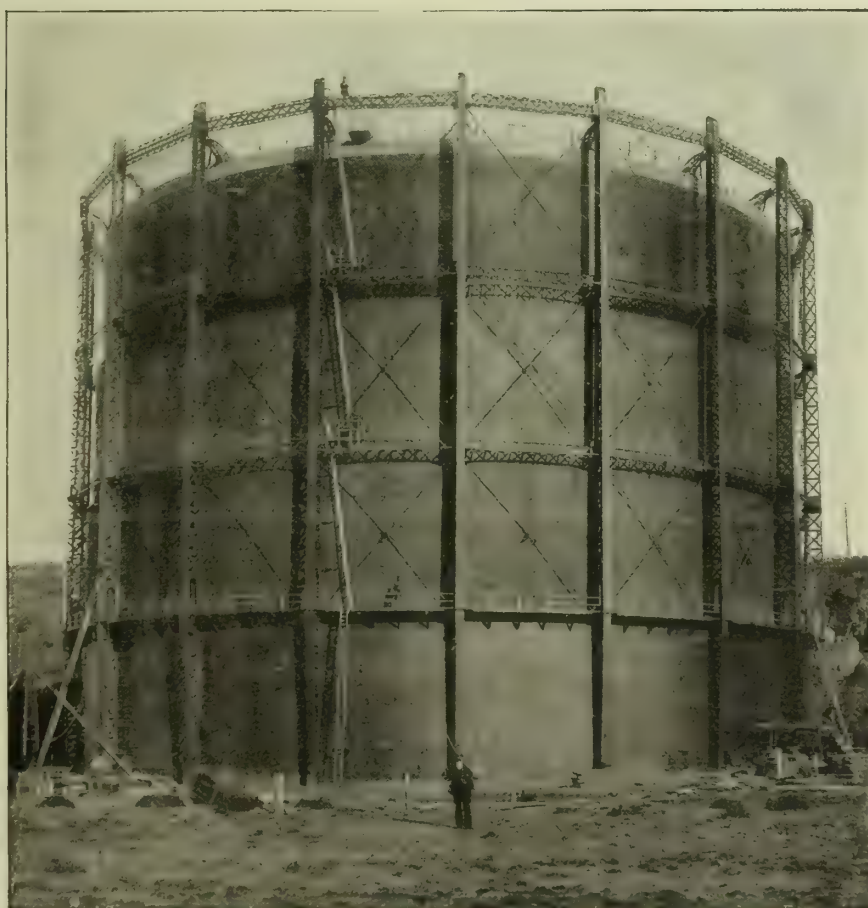
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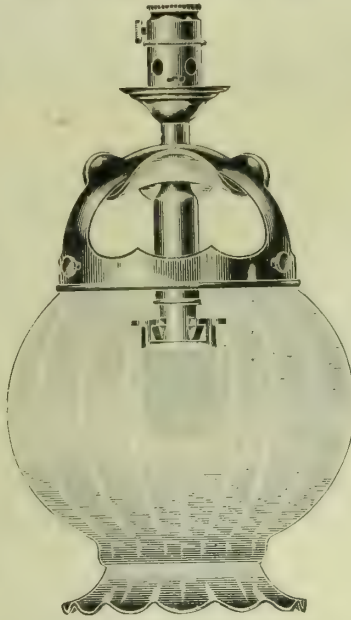


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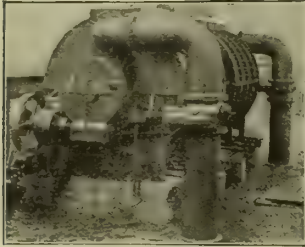
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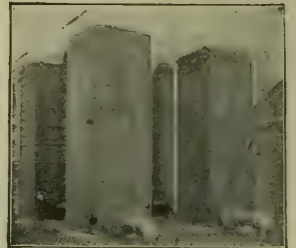
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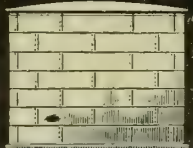




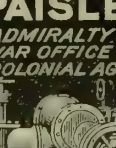
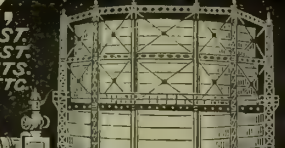


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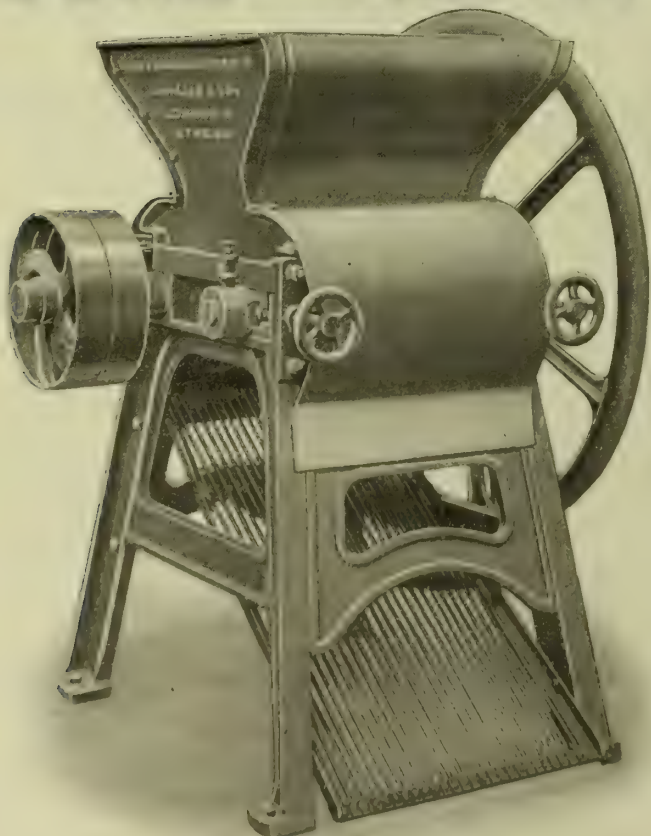
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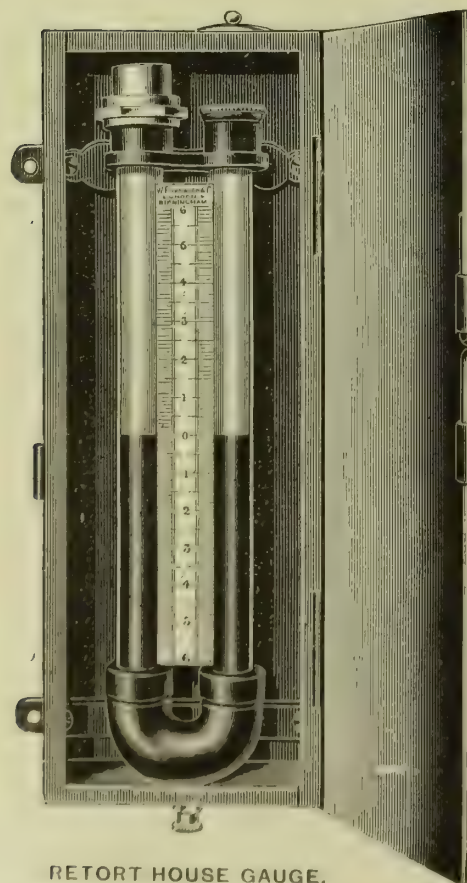
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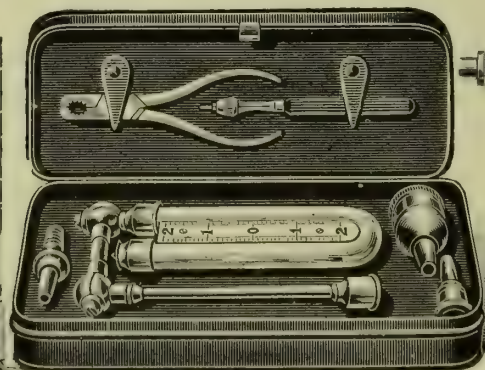
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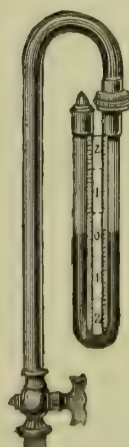


Fig. 6.

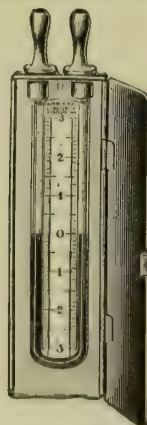
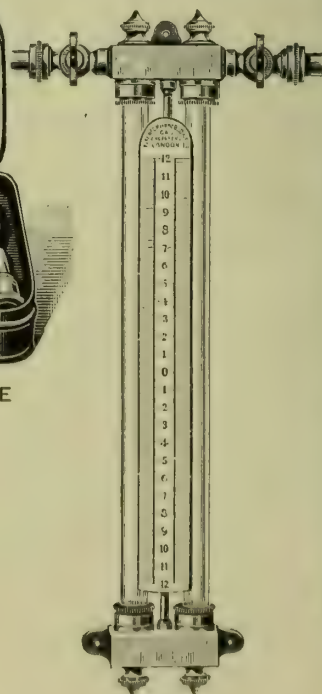
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EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2443.—TUESDAY, MARCH 8, 1910.

## EDITORIAL NOTES—GAS, &c.

### Ideals of the Past & Achievements of the Present.

IF Mr. Vincent Hughes, in setting to work upon the preparation of the address with which he inaugurated his year of office as President of the Midland Association of Gas Managers, had in view the making of our present-day inventive geniuses in the gas industry feel that in initiative they were forestalled by workers of a long-dead past, he has assuredly succeeded; for, in connection with many of the lines of activity of our times, he showed that there were workers, in the early and middle days of the industry, who evolved ideas that—crude they may have been, and possibly unworkable—were at any rate at the root of much of the current successful achievement. To dip into the past for material for his address was an excellent thought for the Engineer and Manager of the Smethwick Gas-Works; seeing that the gas-works lands adjoin the very scene of the triumph of Murdoch in providing the first means of giving to city, town, and village an organized supply of light and heat and power. From the top of the purifiers on the Smethwick Gas-Works can be seen the house where Murdoch lived and died. Mr. Hughes lives in an atmosphere of inceptive associations with the gas industry; though he himself, in his practices, is very much up-to-date. Possibly, however, the former fact accounts for his love of research into the archives of invention to ascertain the animating thoughts and aims of the industry's technical pioneers. It is not a bad exercise. It teaches us something as to how much we owe to those pioneers; and how very little credit, thoughtlessly perhaps, we have granted to them. It is, of course, natural that those things that are adjacent to us in our daily comings and goings—the great achievements of to-day—should be more impressive than the things in the line of invention of a bygone age. Compared in any way, especially in relation to effect, some of the invention of the past seems, not unnaturally, puny alongside more recent accomplishments.

Among the several things, however, of which the President's research into invention in connection with the gas industry informs us, is the fact as to how near many of the ideals and inventions in the early days of the industry (then discarded as unsuitable) were to the successes of to-day. They were embryonic; but the rudiments of many a construction or appliance that are of immense utility, productively and economically, are found in those ideals and inventions. The inventors were premature; their inventions immature. They saw what was wanted to accomplish certain things; but their knowledge was insufficient to produce the necessary measure of perfection. Knowledge has expanded—it is ever expanding—with experience; and from that ever-accumulating knowledge are developed those fresh ideas that assist to make the crudities of the past the perfections of the present. Viewed from many an inceptive standpoint in the distant past, things that, in later day, became possible and then actual, appeared to be impossible; and nothing but accrued knowledge completely altered the status from failure to success. As we look at the aspirations and the objects of the early workers whose failures are the successes of to-day, there cannot but be admiration for their prescience and sentience, and sympathy with them that the experience and knowledge of their times were checks to the fulfilment of their aims and ambitions. Mr. Hughes calls attention to some inventions for which patents were actually taken out. There is the vertical retort; and even the taper of the structure to facilitate the discharge was thought of in 1828. In 1857 it was recognized that an increased make could be obtained from the carbonization of coal in vertical retorts. Murdoch long before tried many varieties of retorts of divers shapes, set vertically, on an incline, and horizontally, as illustrated in "King's Treatise." But it is with patented work that the President deals. The idea of continuous

carbonization was the subject of patents in the middle of the last century; so was also the inclined retort. Right back to 1824, an inventor had got the notion of admitting steam into carbonizing appliances. The coalite process was in the beginning of the century frequently carried out, though not so named. Even the process of opening and closing of gas cocks and the ignition of the gas by means of electricity was so far framed in mind and outlined on paper that a patent was taken out in 1856. By the aid of a thermostatic lever, regulation of air supply was decades ago introduced in the construction of burners and ventilators. And so we pass on through the address, having brought before us the shadows of many a success of this generation.

Life is short; and the times are strenuous. But if the right men with the right ability could penetrate the masses of undeveloped invention, they might find much that is now lying dormant that could, by the application of the knowledge of our times, have the defects extirpated, and just those concomitants necessary to efficiency and perfection incorporated. There is no doubt that vast utility lies buried in much of this initial work of distant times—just as there is much treasure lying at the bottom of the sea. The combination of the initiative of the past and the knowledge of to-day would indubitably produce in many ways a rich meed of success from unsuccess—the latter because of the absence time ago of the essential knowledge that could only be gained from experience. As a matter of fact, in most inventions of to-day, there is really little of the primary order. They are more or less clever combinations and adaptations of knowledge and prior achievement. Still if the combination itself is original, if the useful result of the combination is something that excels in any way that of prior method or process, it constitutes invention; and all honour and reward to the inventor. But the inventor of to-day owes much to a long line of predecessors in invention; and to them is largely due the credit of enabling him to produce a practical whole transcending in one or more points of effectiveness that which has been done before. If Mr. Hughes' recital of some of these earlier prototypes (incomplete though they were) of present successes has done nothing else than cause us to pause and admire the intellectual geniuses in the inchoative stages of the life and work of the gas industry, and to admit as correct much of the direction they gave by their work, he has done good service. Those men laboured amid the crude surroundings of the gas industry of their time; and when this is remembered and combined with the honour of their initial (if not always successful) schemes and processes, it will help us at any rate to think less of our own achievements made in the light of experience constantly being broadened and deepened by time and intellectual expansion.

### Wanted, Grounds for Judgment as to Superiority.

THE field of modern carbonizing practice over which Mr. A. T. Harris roamed in the paper read before the Midland Association last Thursday is so vast that, when members come to discuss it at their autumn meeting, they ought to find sufficient material to provoke a discussion covering an entire sitting. The paper constitutes a masterly review of the carbonizing position within, having regard to the largeness of the subject, a narrow compass. But as the main feature of the paper is considered, what does the position really amount to? We cannot put away from ourselves the salient fact of the carbonizing situation to-day that, in respect of make per ton, the systems, including the old established ones, are tumbling over each other with results that have quantitative propinquity. And the question now is, On what ground or grounds must their superiority be judged? That is a matter which cannot be dealt with in any hasty or superficial manner, but is one that is discussable and requires deliberate treatment, and should not be lost sight of either before, or at the time, Mr. Harris's paper is on the *tapis* again. Because it is a fact that the narrow



differences in quantitative results are causing no little confusion among many gas engineers and managers whose experience is limited to the horizontal and inclined systems of working under modern conditions; and they now want to have focussed for them by engineers whose practical experience extends to other systems, those collateral and subsidiary questions (in the aggregate most important) upon which their judgment must be largely founded. On many of these points doubts and misunderstandings exist. We have Mr. Harris quoting Herr Körting's summary of the disadvantages, as he sees them, of the continuous vertical system, which summary can only be rebutted by the positive experience of the users of continuously operated retorts. Mr. Harris himself is not in a position to affirm or negative the suggestions of this high exponent of the virtues of the intermittent vertical system; but he, like others, desires to hear the other side of the story. One of the ascribed disadvantages is that the continuously worked retorts are not easy of inspection and repair; but Mr. Harris as good as suggests that the intermittent system has not much to boast about, inasmuch as he hears (again he has no other authority) that on settings being let down they are fissured to a somewhat serious degree. He also finds that the pressure is a drawback with the long drop of the full charge into the intermittently operated vertical retorts; but it may be pointed out that devices for grading the charges into large and small on opposite sides of the retort have cured the trouble in this regard, though it has introduced an additional operation. Then, on *à priori* considerations, Mr. Harris is disposed to question the adherence of the gas evolved from a charge of coal to any central pathway, though discussion has been carried to the extreme points between theorists and practical observers. The paper shows the amount of controversial matter that still awaits, if ever it can reach, final determination.

Mr. Harris's chief title to discuss the question of carbonization is the excellent work he has done with his old horizontal settings, though labouring under certain working disadvantages. It was as far back as 1907 that he proved the efficacy of the heavy charge in productive advantage; but drawing by hand and heavy charges were practices that did not recognize any relationship, and so the latter had to be abandoned. This resulted—Mr. Harris wanting the gains of the heavy charge and the full retort—in the adoption of a trial installation of Love's system of setting retorts at an angle of 45°. There were infantile troubles in respect of heating the setting and of pressure in the bottom tiers of retorts. In regard to heating, the defects were cured by the removal of the central retort and the enlargement of the combustion chamber. The trouble as to pressure varied with the character of the coal and the density of the charge in the retorts; and, in the latter respect, the difficulty was found to vary as between the top and bottom tiers, to the disadvantage of the latter—showing that the increased length of fall had something to do with the objectionable effect. Here again an improvement in the charging-shoot, in order to give greater control over the charge, resulted in a considerable modification of the difficulties. But such experiences are almost inseparable from a new system. They are discovered only to be, by the engineer, permanently corrected or reduced to negligible quantity. With no increase in fuel consumption, with a production of 12,300 cubic feet of 15·80-candle gas from a mixture of South Yorkshire and Derbyshire nuts, and with a coke of superior quality, the system takes its place fairly among the best of the rivals, but has to prove, like them, superiority in other directions to justify future favour.

### For Common Protection.

THE last issue of the "Illuminating Engineer" contains an editorial dealing, or purporting to deal, with Mr. Corbet Woodall's recent suggestion (*ante*, p. 368) that an exigent necessity of the times is a Government Departmental inquiry into the reckless competition and management of municipal electricity undertakings. But our young contemporary appears to avoid seeing the real object of Mr. Woodall's proposal, and applies it to an inquiry into the scientific treatment of street illumination. There is other work to be done before we reach that stage; and until that other work is accomplished, we cannot possibly expect the major part of the members of electrical trading local authorities to see the commonsense of considering the question of street illumination from the scientific side. They will not

consider it from the plain standpoints of economy and efficiency; and something has to be done to first compel them to treat street lighting as a public service that has to be carried out efficiently and economically, and not as a service in which the municipally-owned electricity undertaking is to have preference, no matter the result. The electrically biased optimates in local government will listen to no reason; they go headlong down the course they have marked out for themselves. It is to compel them to listen to reason, to show no favour, and to conduct local administration according to the original tenets of good government, that an inquiry by a competent authority is suggested. Purely scientific considerations can be left for subsequent treatment, after the more pressing matter has been disposed of, of bringing local authorities to an appreciation of the correct action in this matter, and assuring that preference is not guided by ownership, but by the fair commercial rule of obtaining the best value for money expended.

There is another matter to which the gas industry should give heed, and that is the question of co-operation for its commercial protection and advancement. The electricity industry has started its Publicity Committee supported by a common purse; and this propagandist body is proposing to extend its agency from London and the suburbs to the country generally. Already some thirty provincial electricity undertakings have attached themselves as supporters of the Committee's operations. Columns of advertisement articles on metallic filament lamps and other subjects have appeared in the daily press; and much literature and illustrated mural advertisements is being prepared. The Committee are finding plenty of work in this direction. Their activity must be met by activity in a similar way. Publicity of this kind can only be attained by co-operation; and systematic tactics are required in carrying on the work. For instance, when a local authority owning an electricity undertaking are proposing to evict gas from street service, the Gas Publicity Committee—presuming the local gas undertaking to be a contributing body—could concentrate their efforts for the time being in enlightening the ratepayers of the town. The economy of the inverted incandescent gas burner has to be widely advertised; erroneous impressions (much has already been done) have to be removed in relation to gas-fires; and in numerous directions there is room for good co-operative work through a well-organized agency. The interests of the gas industry are being attacked; the gas industry must defend what it has already got, as well as work to make further progress. It is a fatuous course while working for more, to leave present possessions to take care of themselves. There are eyes smarting with envy looking over the wall of Naboth's vineyard. Is it not time to co-operate in its defence?

### Advancing Economy and Existing Interests.

THE gas industry cannot afford to ignore contemporary developments that in any way come into contact with its own immediate concerns; but at the same time it is impossible—and were it possible, it would be imprudent and the height of folly—to prevent the advance of anything that promotes the world's economy. The only thing to be done is to so endeavour to shape one's procedure, that whatever competition is set up the industry shall be in a better position to meet it. At the first blush, it may be said that the utilization of the gas from coke-ovens, blast-furnaces, and so forth cannot affect to any noteworthy degree the gas industry operating in those parts where such producers of gas suitable for power purposes exist. On second thoughts, however, it will be apparent that there are two ways in which, perhaps not largely, such utilization may affect gas undertakings more particularly in the manufacturing districts. The one is by using the gas for the generation of electricity, the supply of this in bulk to the Electric Power Companies, who in turn can distribute and retail it for power purposes at low rates to manufacturers. The coke-ovens have become (and their strength in this respect is accruing year by year) strong competitors in the residuals markets that were formerly largely held unchallenged by the gas industry; and the profitable disposal of their gas must make them still more formidable rivals in the disposal of their other residuals. The question of the systematic utilization of coke-oven and blast-furnace gases in the manner referred to here was mooted some time since, and was discussed in a paper read by Mr. Charles H. Merz at the meeting of the Iron and Steel Institute in 1908 which



paper was the subject of comment in the "JOURNAL" at the time (Oct. 20, 1908, pp. 180, 208). There had then been practical work in this direction; and in the meantime a concern—the Waste Heat and Gas-Electrical Generating Stations, Limited—has been largely extending the admittedly useful work of obtaining power from that which was formerly waste. It was only by the establishment of the Electric Power Companies to act as buyers and distributing agents that the scheme became feasible; for colliery and blast-furnace owners were not themselves in a position to put to profitable use all the electrical power that could be generated from the gas produced by them in their ordinary operations. The Company named above merely act as intermediaries in buying, transforming, and selling power; and last year they earned a profit of £16,731, and paid a dividend of 7 per cent., though their projected activities have been only partially developed. The operations of the Company call for large horse-power gas-engines from the makers. These large horse-power gas-engines represent a concentration of numerous smaller ones (or steam plants) that might, under other circumstances, exist in manufacturers' establishments, but the places of which are occupied by the electric motor to utilize the product of the formerly wasted energy. This is all part and parcel of the great march of economy by which the human and the material interests of the world are promoted.

### Gas Supply in Sydney during the Coal Strike.

The report of the proceedings at the last half-yearly meeting of the Australian Gaslight Company which will be found in another column, possesses more than ordinary interest, from the fact that the Chairman (Mr. G. J. Cohen) devoted a good portion of his address, when moving the adoption of the report, to the trouble arising from the strike of coal miners in Sydney. In one respect the strike was beneficial to the Company—it caused an increased consumption of gas, which, under ordinary circumstances, would have been gladly welcomed. But inasmuch as the gas was costing more to produce, the extra demand for it could have been dispensed with. The Chairman stated that if the Company had doubled their charge, it would not have recouped them for the enormous additional outlay incurred. But the Directors felt they were in duty bound to keep up the supply of gas; and when their stock of coal began to run low, they did not for a moment hesitate to incur the extra heavy expenditure necessary to increase it. At the date of the meeting (Jan. 27), this outlay had by no means ended. Unfortunately, the Company were not assisted in their difficulty by the consumers—indeed, their task was made harder, for instead of being economical with their gas, they used it all the more freely so as to reserve their coal. However, in spite of the trouble, the Chairman was able to state that there had been no curtailment in the gas supply throughout the city and suburbs, with the exception of a slight diminution in the hours of lighting the public lamps. The action of the miners not only affected the Company financially, but necessarily caused the Directors and officials a great deal of anxiety; and the desire expressed by the Chairman, at the close of his address, to see the early termination of the strike can be quite understood. He and his colleagues are to be congratulated on having passed through the crisis as well as they did.

### Gas Profits and the Rates.

The presentation of municipal budgets frequently furnishes an opportunity for the expression of diverse opinions with regard to the time-worn question of "High gas profits and relief of rates *versus* lower charges to the consumers." The advocates of the former policy, of course, base their arguments on the assertion that the ratepayers, as owners of the undertaking, are entitled to some return on the money invested. At Belfast, £12,000 is being handed over to the reduction of the rates; and another £12,000 has been paid into the sinking fund for the new City Hall. This makes £24,000 for one year—a substantial sum, but not enough for the Finance Committee, who "asked for more." So far, however, from acceding to this request, the Chairman has uttered a warning to the various Committees who are always looking to the Gas Committee for assistance "to be more careful in the future." Exactly as to what this may mean, we are left somewhat in doubt; but if the intention should be to give the consumers of gas the benefit of a lower price, and to leave the users of electricity to pay their own rates without any "relief,"

we should hail the innovation with satisfaction. The soundness of such a policy was, indeed, enunciated by one member, who moved that the proposed grant from the gas funds in aid of the rates be referred back. Really, he put the matter in a nutshell, when he said he would be told the gas-works belonged to the ratepayers; but if they were not paying, would the ratepayers be asked to make up the difference? This question he himself answered—and no doubt accurately—by maintaining that gas consumers would have to make up the difference. Stockport is another place where the same point has been raised in connection with the "budget." A profit of £22,000 has been realized; and of this £18,000 has been handed over in relief of the rates. This is £3000 more than in the preceding year; and one or two of the members expressed the opinion that a reduction in price would be preferable to this large allocation. One member thought it was not right that the large consumers should have to pay so much, and that those who did not use gas should share in the profits. While admitting the importance of keeping the rates down in order to attract industries to the town, he pointed out that high charges for gas were a deterrent in this latter respect. Another councillor, taking the same side, remarked that those who were not consumers were benefiting to the extent of a shilling in the pound at the expense of those who did use gas. These facts were met, as usual, by the argument that the gas-works must be regarded as a commercial undertaking. Capital was invested; and capital must give a certain return to the shareholders, who were the ratepayers of Stockport. As a local paper says, the benefit of the profits cannot be had both ways. This being so, we would rather see the consumers enjoy the full advantage of the excellent results which are obtainable solely through their support of the undertaking.

### The Question of the Rates.

The Salford Town Council have determined apparently on the exercise of a spirit of rigid economy; and, as so often happens under such circumstances, there has been a tendency in certain quarters to apply the pruning knife in the wrong direction. This showed itself on the submission of a resolution extending a hearty invitation to the representatives of the Municipalities of Düsseldorf, Cologne, Barmen, and Hamburg to visit Salford during their forthcoming visit to Manchester. An objection was raised to any money being so spent "at a time when the borough was under a financial cloud, and when some of the Corporation workmen had been put on short time." It is gratifying to note, however, that the resolution was adopted; a large majority of the Council rightly determining to show the visitors that hospitality which was showered on the Salford representatives when they visited the towns named last year. If economies are to be secured, there must surely be more fruitful directions than this in which to seek them; and a serious effort is to be made to find these. This is to be done by means of a Special Committee, who have been appointed for the following purposes: (1) To make a careful and systematic inquiry into the expenditure of the Corporation, with a view to ascertaining whether, by the adoption of a well-considered financial policy, its future expenditure may be confined within the limits of the present rate; (2) or what prospect (if any) there is of reducing the rates; (3) to confer with the various Committees, and to report upon the whole subject. The municipal rate is now 7s. in the pound, and the addition of the poor rate brings the total up to 8s. 10d. This figure, though, of course, it is exceeded in certain cases, is a sufficiently high one to cause uneasiness—especially when further increase is threatened. But there is another aspect of the matter. Last year the rateable value increased by £9369, while the expenditure increased by £24,385; and this is a distinctly unsatisfactory position. During the past ten years, the Corporation expenditure has grown from £260,000 to £360,000; but in quoting these figures, it is only fair to point out that of recent years great demands have been made for purposes of education—no less than £41,000 of the additional £100,000 expenditure having been under this head. An interesting item quoted when the subject was brought before the Council was that the rates had increased from 5s. 6d. in the pound in 1889 to 7s. last year, notwithstanding that, whereas ten years ago the contributions from the Corporation trading undertakings only equalled 3d. in the pound, they last year amounted to 12½d. It should not be too much to hope that good may come of the Special Committee's investigation.



### Profit-Sharing in the Electrical Industry.

The workers in the Electricity Department of the Stafford Corporation have for some years shared in the enjoyment of a bonus scheme with the men of the Gas Department. But for the first time, so far as knowledge goes, an Electricity Company has formulated a scheme of profit-sharing for their workers, which promises to be successful. This is the Westminster Electric Supply Corporation, Limited, the Directors of which have long desired to establish, but have always had to regret the impossibility of establishing, a co-partnership scheme on the lines of that inaugurated by Sir George Livesey in the South Metropolitan Gas Company. The reason that has prevented this is stated to be the conditions under which the Company exist, subject to future purchase. If this is a valid reason, then it extends to all British electricity companies. The only thing the Company can do is to provide a scheme that will encourage thrift, and give the men a direct interest in the success of the business. The scheme is a simple one, being this in brief: All regular employees are allowed to deposit any number of shillings up to 5s. each week. Interest is going to be paid half yearly at half the rate of the dividend on the ordinary shares, with a minimum of 4 per cent. Being credited to the account, the interest becomes compound; but any employee may withdraw his money at any time. A deposit of 1s. a week until 1931, it is calculated, will amount at that date to about £100 if the present rate of dividend on the ordinary shares is maintained. At present 85 per cent. of the Company's employees have taken advantage of the deposit fund; the average of the deposits being about 2s. each per week. There is at present a little over £900 in hand on account of the fund; but it may amount to between £20,000 and £30,000 by the end of the Company's term.

### Legal Expenses of Local Authorities.

A Bill has been introduced by Mr. Summers, the Member of Parliament for the Flint district, to enable local authorities to contribute towards the expenses of legal proceedings and Private and other Bills involving questions of common interest. In a memorandum attached to the Bill, it is pointed out that in the administration of local government it very frequently occurs that some point of law requires elucidating by a judicial decision. In present circumstances, some one local authority is obliged to bear the whole brunt of such action as is necessary; and, as the decision of a Court of First Instance is seldom sufficient in such a case, the expenses are usually considerable. The Bill is intended to make it possible for all local authorities interested to share the expenses of such a test action, which is carried on for the benefit of the whole community, and so to minimize the burden. As similar cases may arise in the course of proceedings relating to Private Bills and Provisional Orders, clauses are introduced to meet these cases also.

The London and Southern District Junior Gas Association will next Saturday visit the Hornsey Gas-Works. The Engineer (Mr. J. W. Buckley) has extended his invitation to the lady friends of the members; and the inspection of the works may possibly be followed by a musical programme.

**Dr. Rostin.**—It will interest many of our readers to learn that Dr. Rostin, whose name has been intimately identified with the development of a system of lighting and extinguishing public lamps, has severed his connection with the firm of A. Landsberger, and will henceforth independently devote himself to the manufacture of scientific apparatus for the gas industry, and at the same time will act as Consulting Engineer to the Telephos Company in conjunction with the lighting and extinguishing apparatus invented by Mr. A. E. Broadberry, the Engineer of the Tottenham and Edmonton Gas Company, of which apparatus we hope to have the pleasure of publishing further details at an early date.

**Direct Sulphate of Ammonia Manufacture.**—Writing in reference to the article on this subject by Mr. G. Stanley Cooper, B.Sc., in the "JOURNAL" for the 22nd ult., Mr. Ernest Bury, of Little Hulton, near Bolton, asks: "Has the author examined sulphate of ammonia from the Otto-Hilgenstock and Koppers processes, whereby the salt is recovered by washing coke-oven gas with sulphuric acid?" Mr. Bury says that since reading the article he has tested a specimen of sulphate from the new Otto-Hilgenstock direct recovery process, and found that it contained neither tar nor free sulphur. The sample which was very dry—having been on hand some time—contained 25.5 per cent. of ammonia; and he points out that since theoretically pure sulphate contains 25.75 per cent., little margin was left for impurity of any kind.

### GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 679.)

THE rush in the Stock Exchange upon highly speculative ventures is now on an increased scale. Rubber and Oil had it to themselves; but a new arrival has made its appearance, in the shape of Rhodesian concerns. Last week these three pretty well engrossed attention; but, on the whole, the high-class departments were none the worse for it. They were rather dullish on the opening day; and Railways were damped by the weather. Consols, however, managed an  $\frac{1}{8}$  rise; and the gilt-edged in general were fairly steady. Tuesday rather improved the tone in the best markets, quiet as they were; and Consols had another  $\frac{1}{8}$  rise. This attitude was scarcely maintained on Wednesday, and the leading lines were dull and inactive; but in the popular markets affording excitement there was plenty of life. The pendulum swung back on Thursday, and the better class of investments were then stronger. Home Governments were firm. Consols gained  $\frac{1}{8}$ , and Railways and the Foreign Market were good. Friday, as is not infrequently the case, brought about some realizing, which checked the rise; but Consols again advanced  $\frac{1}{8}$  in spite of it. On Saturday, the humdrum departments were quiet, and Consols fell back  $\frac{1}{16}$ ; but the speculative markets were full of life and action. In the Money Market, there was a fair demand, and rates stiffened except towards the close. Discount was harder and closed firm. Business in the Gas Market was more active, showing a recovery up to the level of a week or two ago. The general tone was excellent; and a considerable number of quotations advanced. Some of these were due to announcements of a material increase in the rates of dividend payable shortly—to wit, in British, Ilford, and San Paulo. The only shrinkage was a slight one in Gaslight and Coke ordinary, transactions in which ranged from 104 to 105 $\frac{1}{4}$ —a fall of  $\frac{1}{2}$ . In the secured issues, the maximum was dealt in at from 88 $\frac{3}{4}$  to 89 $\frac{1}{2}$  (a rise of 1), the preference at 104 $\frac{1}{4}$  and 105, and the debenture at from 81 $\frac{1}{2}$  to 83. South Metropolitan was firm and unchanged at from 120 $\frac{1}{2}$  to 122; and the debenture made 82 $\frac{3}{4}$ . In Commercial, there were only two or three deals in the 3 $\frac{1}{2}$  per cent. at 104 and 104 $\frac{1}{2}$ . The Suburban and Provincial group were really almost lively. Bournemouth "B" was done at 16 $\frac{1}{2}$  and 16 $\frac{3}{8}$ , Brentford old at 251 and 252 $\frac{1}{2}$ , ditto debenture at 101 $\frac{1}{4}$ , Brighton original at 214, ditto ordinary at 156, British at 43 $\frac{1}{4}$  and 43 $\frac{3}{8}$  (a rise of 2), Ilford "B" at 109 $\frac{1}{2}$  (a rise of 1), Lea Bridge at 121, Portsea "A" at 134 $\frac{1}{2}$ , and Tottenham "B" at 112 $\frac{1}{2}$  (a rise of 1). In the Provinces, Chester was done at 110, and Liverpool "B" at 167 and 168. In the Continental companies, Imperial was unchanged at from 175 $\frac{1}{2}$  to 176 $\frac{1}{2}$ , and European part-paid made 18 $\frac{3}{4}$  (a rise of  $\frac{1}{4}$ ). Among the undertakings of the remoter world, Bombay fully-paid changed hands at 6 $\frac{1}{16}$ , Buenos Ayres at 15, Cape Town at 3 $\frac{1}{2}$  and 3 $\frac{3}{4}$  (a rise of 1), ditto preference at 5 $\frac{3}{8}$  (a rise of  $\frac{1}{8}$ ), Primitiva at 71 $\frac{3}{8}$  and 7 $\frac{3}{4}$ , ditto debenture at from 99 $\frac{3}{4}$  to 101 (a rise of 1), River Plate at from 17 $\frac{1}{16}$  to 18, and San Paulo at 15 and 15 $\frac{1}{16}$  (a rise of 1 $\frac{1}{16}$ ).

### ELECTRICITY SUPPLY MEMORANDA.

**Great Expectations—Cost Demonstration at Chichester—The "Deadly Products" Slander—A Suggested Cause for the Bursting of Lamps—Effect of the Metallic Filament Lamps.**

THE heavy-priced units are still quantitatively sinking, and the low-priced ones are still ascending. That is the report from several quarters. There is still an attempt in public to put a good face on the position, and to try to convince shareholders that it is all very good business indeed, until some of the latter doubtless go their way wondering whether it would not, under the circumstances, be an excellent thing to drop all the units that bring in the greatest revenue apiece, and rely entirely for the sustenance of the concern and the profit of the shareholders on the low-priced units. Behind the scenes there are in some places wry countenances; and the perpetual inquiry is what can be done to stop this quantitative decline of the heavier priced units, and to make them move upwards again. One of the schemes for effecting this is the Electric Supply Publicity Committee, whose area of operations was originally intended to be limited to London and the suburbs. The Committee have commenced work. They have issued a circular and a poster; and the fact has received, in the aggregate, columns of notices (some with illustrations of the poster) in the electrical press. It requires the loss of all sense of proportion to make the achievement worthy the laudation. The poster is headed: "Electric Lighting for London and Suburbs." Then there is a view purporting to represent a large part of London; and about half-a-dozen times higher than the top of Big Ben's home, there is suspended one metallic filament lamp. This is described as a "giant metallic filament lamp" in one of our contemporaries; and in another it is stated that "over the whole blazes a glow lamp of several billion candle power."

This giant, billion candle-power lamp appears to be suspended by a piece of flex., which seems to be rather a dangerous proceeding, and a trifle suggestive of the work of the odd-job man. Underneath the picture, it says "great reduction in cost now within the reach of everybody." This interpreted means that the great reduction is within the reach of everybody—not the electric light. If the Publicity Committee intended the "within reach of everybody" to apply to the electric light, they bring down



upon themselves the criticism that there seems a great deal of reticence on the part of people to stretch out their arms to take it. The very existence and hoped-for activity of this propagandist Committee point to the difficulty electrical folk have to make people believe all they choose to tell them. If, too, it were true that the cost of electric lighting is now within the reach of all, there would be no necessity for the numerous expedients devised with the view of getting hold of new consumers. The Publicity Committee are trying to extend their purview. To this end, they have sent a circular round to every electricity undertaking in the British Isles inviting co-operation; and the electrical papers have been trying to beat-up interest in the appeal. Does this mean that the Publicity Committee have not got so much support as they expected from the London and Suburban electricity concerns? The extension of operations will be noted by provincial gas undertakings; and if increased gas activity is required anywhere to meet increased electrical activity, it will be forthcoming. The Committee are looking for great things from their operations. One of our contemporaries says: "The Committee expect by their work so to increase the connections of the various undertakings that the concentrated kilowattage will be sufficient to light up London—even in a fog." Good! It is indeed a great expectation. There is one thing we must congratulate the Committee on; and it is that this first poster does not partake of the vulgarly libellous character of those brought out some time ago by the Associated Municipal Engineers. The good those posters did the electrical industry was of a negative character. People merely laughed at the obvious spite underlying the grotesque productions. The money spent on them was entirely wasted.

Dear sedate and philosophic old Chichester—that is to say, during all those weeks when there is not the distraction of Goodwood Races to disturb the normal peacefulness. How thankful the citizens must be to the Electricity Company for coming along, and starting a competition with the Gas Company, which has brought to the surface the keen fighting spirit of the management of the latter concern, and has given the good citizens something fresh to be frequently thinking and talking about. The Gas Company have gained the best of the struggle up to the present; and there is no doubt as to the future. The Electricity Company, naturally, have obtained a few consumers who have for the most part not wholly gone over to them; and these consumers have already found out that electricity at 6d. per unit is not, consumed for lighting under the most approved method of metallic filaments, so cheap as modern incandescent gas-burners with gas at 3s. 6d. per 1000 cubic feet—the practical proof being contrary to electrical profession. One of the best and most attractive of public demonstrations that can be made to bear further witness to this is such as the one carried out in their show-room by the Gas Company's energetic Manager (Mr. T. E. Pye). He has two lamps in the window and also inside the show-room—a metallic filament lamp side by side with a modern incandescent gas-lamp of approximately equal illuminating power, the latter being rather higher in light-giving than the former—and showing progressively, in the diagrammatic manner illustrated in the "JOURNAL" for Feb. 22, the consumption and amount of money actually spent for gas and electricity. The gas-meter is in the show-room window; the electricity meter, by order of the autocratic and courageous Electric Supply Company, in the basement out of sight of the curious. But the Gas Company invite all who like to step down and inspect the truthful recorder of the electricity consumption of the lamps. We have a subsequent diagram to that illustrated by us on Feb. 22; and this continues a tale of consumptions working out in cost (at the prices named) to about 3 for electricity to 1 for gas. For example, the gas consumed from the commencement of the run to Jan. 22 (at 3s. 6d. per 1000 cubic feet) cost 3s. 2d., while the electricity (at 6d. per unit) amounted to 9s. 10d. The lamps being used the same number of hours, there can be no question as to the accuracy of the relation of costs. This is a demonstration that can be carried out by any gas authority having show-rooms on the line of electric cables. The electricity authority cannot refuse to supply, though they may prefer the meter fixed in some out-of-the-way place where it will not come immediately under public scrutiny. But please note that electricity meters are purchasable even by gas companies.

The scurrilities of electrical incompetents—incompetents in the matter of true knowledge concerning gas—continue a feature in the propaganda of the commercial departments of central electricity stations. An example reaches us from Hythe, where, as was seen from the statements of Mr. C. E. Rosevear, the Distribution Superintendent of the Hythe and Sandgate Gas Company, in the course of the paper he recently read before the London and Southern District Junior Gas Association, keen competition is carried on between the two illuminating rivals. A circular has been issued in the district by the Folkestone Electricity Supply Company, in which circular advantage is taken of an accident at the gas-works, which caused a temporary distribution of gas not thoroughly purified, to revile gas in manner peculiar to some electricians' notions of honourable conduct. We will pass over such assertions as that the metallic filament lamp will give four times the light of a carbon filament lamp for the same consumption of electricity, waiting only to say that, if it were true, the average consumption of carbon filament lamps would have been at the rate of 5 watts per candle, which, in the days of controversy when carbon filament lamps reigned supreme for interior lighting, was strenuously denied. And what is more, no electricity consumer is able to show that his accounts, by adopting

metallic filament lamps, are 75 per cent. less than they were when he used only carbon filament lamps. The whole of the points dealt with in the circular of the Electricity Company are common ones in such literature; and they have been admirably replied to by Mr. Rosevear, on behalf of the Hythe and Sandgate Gas Company. They have also been frequently handled in the "Memoranda." The point, however, in the Electricity Company's circular, to which again we would specially draw attention is this: Where electricity is used "you experience no headaches in the evenings, resulting from *deadly* products of combustion, as with gas." That is a statement for which there is no foundation; and it is on a par with many other postulatory assertions of electrical engineers. We challenge Mr. Thomas Hesketh, the Managing-Engineer of the Folkestone Electricity Supply Company, to name those "deadly" products of the combustion of gas. The statement is untrue. It is made with the obvious intent to do damage to the Gas Company's business. Slanders of the kind deliberately circulated in order to injure the business of another are not permitted by the law. If Mr. Hesketh cannot give some satisfactory explanation as to the "deadly" products of combustion, then the statement should be withdrawn by him and his Company on whose behalf he acted in the same public manner as that by which it has been circulated. Perhaps he has not heard of the withdrawal of a somewhat similar statement, now some time ago, by the St. Pancras Borough Council, when threatened with litigation at the hands of the Gaslight and Coke Company. The Folkestone Company have also circulated selections from the evidence of certain witnesses before the Board of Trade Departmental Committee on the Metropolitan Gas Supply; but they do not quote any of the rebutting evidence, nor do they say that the verdict of the Departmental Committee (over which Lord Rayleigh presided) was entirely in favour of the Gas Companies concerned in the inquiry. But this is the sort of thing to which electricians have accustomed us. It seems impossible for some of them to fight fairly and squarely, which shows the seriousness of the difficulties with which they have to contend. As they cannot succeed on the question of cost, their policy is to try to frighten householders into evicting gas. In trading, this must surely be the last resort. But they should not forget that the householders they desire to get hold of have used gas, and had experience of it, before the slanderous circulars have reached them; and so they know what value to place on their contents. That is one reason for the slow progress of domestic electric lighting.

Since the fire at Messrs. Arding and Hobbs, at Clapham Junction, there has been a little spasmodic discussion in the open (how much there has been behind the scenes, one cannot judge) as to the causes of the bursting of metallic filament lamps. In the opinion of a lampmaker (writing in the "Electrical Review") the fault lies with the extreme fragility of the filaments, which break when the lamp receives a slight knock, and then join together again, very often making the filament considerably shorter. When the current is switched on, the usual over-shooting takes place, but being much greater by reason of the decreased length of filament, the wires leading into the lamp through the glass stem are fused, causing the glass stem to crack; and in some cases the bulb bursts. "Lampmaker" thinks the cause of the fire following is the falling of hot globules of metal on inflammable material. These globules drop from the leading-in wires, which are of larger diameter in metal-filament lamps than in carbon. It would, in his judgment, be of great benefit to the industry if the metal-filament lamp were standardized.

An interesting statement was made by the Chairman of the St. James' and Pall Mall Electric Light Company, Limited (Mr. Walter Leaf), at the recent meeting of the shareholders, as to the effect of the metallic filament lamp on their business. It must be remembered that the Company occupy an excellent district for cultivating the lighting business. But, in considering the Chairman's remarks, it must also be borne in mind that, in such a district, there must be a limit, which will be reached early, to the power demand; and it can hardly be expected that economy in costs can continue to be made in anything like the same proportion as during a year when new machinery was brought into operation. The revenue for the year declined by £3229, or 2·7 per cent.; while the saving on costs was £3399. On the other hand, it was necessary to set aside an amount for depreciation exceeding the usual provision by about £4500. The number of units sold—9,504,438—was practically the same as in 1908. But (and this is a significant point) in this total there is a loss of about 3½ per cent. of the higher-priced lighting units, against an increase of about 20 per cent. on the lower-priced power units. The result is a loss on the average price obtained per unit from 3·026d. to 2·95d., or 2½ per cent. The decline in the lighting revenue is due to the steadily increasing supersession of carbon filament lamps by the metallic filament ones. The view of Mr. Leaf is that the new lamp is putting the electrical industry in a more favourable position for meeting the competition of the modern methods of gas lighting. The opinion of the officials is that the Company are only about half-way through the transition from carbon to metallic filament lamps, and that it will take some two years more before the change is complete. So that a further fall of revenue must be anticipated during those years. To meet this in the main, the Company are going to rely on the economies that may be effected, supplemented by a charge from Jan. 1 last of 7s. 6d. per quarter per rated horse power for motors, in addition to the flat-rate of 1d. per unit, in all cases where the work is of an intermittent nature,



## LOCAL GOVERNMENT FINANCE.

### The Taxation Returns Summarized.

It requires no less than eight Blue-Books to set forth the Local Taxation Returns in their entirety; the final one of the series being appropriately a "Summary and Index." The volumes relating to the financial affairs of Borough Councils (other than Metropolitan Boroughs) and Urban District Councils for the twelve months to March, 1907, were noticed in the "JOURNAL" a few weeks since (*ante*, pp. 229, 293); and the issue recently (as mentioned at the time) of Part VIII., enables us to give the total figures for that year, so far as the statistics are of particular interest to our readers.

This, it may be pointed out, is the final part of the thirty-seventh annual series of returns; and, as before, the local authorities whose financial transactions are summarized include all county councils, councils of municipal boroughs, councils of metropolitan boroughs, councils of urban districts other than boroughs, rural district councils, boards of guardians, the Managers of the Metropolitan Asylum District, the Receiver for the Metropolitan Police District, burial boards, harbour authorities not being commercial companies or private owners, authorities constituted for the purposes of the Unemployed Workmen Act, 1905, parish councils, overseers, and other local authorities who are authorized to levy, or order to be levied, rates, taxes, tolls, or dues, within the meaning of the Local Taxation Returns Acts, 1860 and 1877. The total number of separate authorities coming within this definition who had financial transactions during the year 1906-7 is 25,502—and that is counting only once those of them who made separate returns respecting their transactions in different capacities. Particulars of the sums received and expended by the Metropolitan Water Board in the twelve months dealt with were published in a separate paper; and with one or two small exceptions, none of the sums received or paid on income account by the Board are included in this summary, as no part of their income had been received from "rates, taxes, tolls, or dues." The receipts quoted include the sums received by local authorities from Government grants towards the expenses incurred in respect of elementary education, as well as the gross receipts from water, gas, electric lighting, tramways, and other undertakings carried on by them, and miscellaneous receipts from rents and sales of property and repayments on account of work done for private individuals. Money borrowed to meet capital expenditure is treated separately. Naturally, the expenditure included is such as has been defrayed out of the receipts mentioned. In a footnote, the Blue-Book states that the number of local authorities who had expenditure (other than that defrayed out of loans) during the year 1906-7 in respect of water supply was 1151, of gas supply 218, of electric light supply 235, and of tramways and light railways 153.

The total amount of public rates received in the year under review was £59,557,199, of which 25.9 per cent. was collected in the Administrative County of London. This total exceeded that for the previous year by £1,301,655. At March 25, 1906, the rateable value in England and Wales of the property assessed to local rates was £207,067,675, compared with £202,858,961 in the preceding year. The figure for agricultural land, which is included, is given as £23,701,843, against £23,736,588. The average amount of public rates per pound of assessable value for the year 1906-7 was 6s. 1.22d., as against 6s. 1.2d. in the previous year, or an increase of 0.02d. Calculated on the estimated population, the amount per head was £1 14s. 6d., compared with £1 14s. 1d. for the year before, or an increase of 5d. The Exchequer grants amounted to £20,988,017, or 2s. 0.2d. per pound of rateable value, and 12s. 0.8d. per head of the estimated population.

Turning now to the subject of borrowing, it is seen from the Blue-Book that the loans raised by local authorities during the twelve months dealt with amounted to £20,393,901, which was less by about £4,000,000 than the sum raised in 1905-6. The decrease affected all the more important classes of work for which local authorities borrow, except those coming under the headings of harbours, docks, piers, canals, quays, and water-works. The amount borrowed in 1905-6 for purposes of highways and street improvements was £3,210,627, as against £2,042,443 in 1906-7, or a decrease of £1,168,184. The amount of loans received in the twelve months for gas-works was £358,357, as compared with £486,102 in the preceding year; for water-works, £2,530,891, against £2,527,676; for electric lighting, £1,525,631, against £2,552,827; and for tramways and light railways, £3,194,190, against £3,344,249. In the case of electric light undertakings, it will be noticed, the falling off in the amount received on loans, as compared with 1905-6, is no less a sum than £1,027,196. The amount of loans outstanding (including sums accounted for by the Metropolitan Water Board) increased during 1906-7 by £11,503,583, which, it is pointed out in the Blue-Book, is smaller than any annual increase recorded between the years 1897-8 and 1906-7. Actually, the total amount of loans outstanding at the end of March, 1907, was £494,487,512; and the relative proportions in which this has been distributed over the various purposes for which it had been borrowed, are as follows: Baths, cemeteries, electric lighting, gas-works, harbours, docks, piers, canals, quays, markets, tramways and light railways, and water-works,

£262,549,564, or 53.1 per cent. of the total; elementary education, £38,823,208, or 7.8 per cent.; highways and sewerage and sewage disposal works, £91,973,595, or 18.6 per cent.; other purposes, £101,141,145, or 20.5 per cent. Dividing up the amounts still further, £23,550,765 relates to gas-works; £120,559,297 to water-works (including £47,407,029 loans of the Metropolitan Water Board and £1,027,929 to the Derwent Valley Water Board); £28,218,444 for electric lighting; and £30,888,640 for tramways and light railways. The average amount per pound of rateable value, over England and Wales, of the total loans outstanding is £1 5s. 4d. (including the Water Board loans) for undertakings which are revenue bearing, and £1 2s. 5d. for loans for all other works and purposes—the average amounts per head of the estimated population being respectively £7 12s. and £6 14s. 3d. The amount standing at March, 1907, to the credit of sinking and other similar funds applicable to the repayment of such part of the outstanding loan balance of £494,487,512 as was repayable by means of these funds, was £17,353,903.

The total receipts of the local authorities in 1906-7, excluding loans, amounted to £117,898,553. Excluding any charge made by a local authority for gas, water, or electric current used by the authority for public purposes, some of the items are as follows: Gas-works, £7,150,028; water-works, £4,615,664; electric light undertakings, £3,094,989; tramways and light railways, £7,115,789. It is pointed out by the compiler of the statistics that the revenue of tramway and light railway undertakings carried on by local authorities is shown in the returns as having increased from £5,942,127 in 1905-6 to £7,115,789 in 1906-7; while the receipts of electric lighting concerns rose from £2,853,537 to £3,094,989. The total expenditure, excluding loans, was £114,134,274; some of the items of which are: Gas-works: Maintenance and other expenses, £5,066,646; loan charges, apportioned as far as practicable, £1,457,000; total, £6,523,646, or 5.7 per cent. of the total expenditure. Electric lighting (other than public lighting): Maintenance and other expenses, £1,105,746; loan charges, £1,865,210; total, £2,970,956, or 2.6 per cent. Public lighting: Maintenance and other expenses, £2,148,355; loan charges, £25,718; total, £2,174,073, or 1.9 per cent. Water-works: Maintenance and other expenses, £1,742,579; loan charges, £3,371,685; total, £5,114,264, or 4.5 per cent. Tramways and light railways: Maintenance and other expenses, £4,752,967; loan charges, £1,704,505; total, £6,457,472, or 5.7 per cent. of the total.

## WATER PROVISIONAL ORDERS FOR 1910.

In the two preceding issues of the "JOURNAL," the principal features of the Water Bills of the session have been indicated. We have now only to deal with the Provisional Orders relating to water supply.

Application is being made by the Barnstaple Water Company for authority to extend their limits of supply so as to include the parish of Instow, in the county of Devon; but the Company are not to be required to supply water within any part of the area of the Barnstaple Rural District Council which is within the limits, except on conditions specifically laid down in the Order. The Company require power to make subsidiary works, to enter into contracts for the sale of water in bulk, to supply fittings, and to lay pipes in streets not dedicated to the public use. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Chelsham and Woldingham Water Company, Limited, are applying for an Order to authorize them to supply water in the above-named parishes, as well as in portions of the parishes of Oxted, Limpsfield, and Titsey. The Company ask for the repeal of so much of the Limpsfield and Oxted Water Act, 1888, as authorizes the Limpsfield and Oxted Water Company to supply water within the portions of the parishes of Oxted, Limpsfield, and Titsey indicated in the Order. The share capital of the Company is not to exceed £20,000, consisting of the original share capital of £7060 and additional capital not exceeding £12,940, inclusive of premiums. The new capital is to be sold by auction or tender. The dividends are to be limited to 10 and 7 per cent. per annum on the original and additional capital respectively. Borrowing powers to the extent of one-third of the capital raised are required. Authority is sought for the maintenance of the existing works, consisting of a well and a pumping-station in the parish of Chelsham and a tank and a covered reservoir in the parish of Woldingham. The rates for the supply of water are to range from 8s. 8d. up to 8 per cent. per annum, according to the gross estimated rental, with an addition of 7s. 6d. for an extra closet and 15s. for a fixed bath. Water sold by measure is to be charged at a price not exceeding 2s. 6d. per 1000 gallons. The Company require to be exempt from supplying with water otherwise than by measure any workhouse, hospital, or large public institution. [*Parliamentary Agents: Messrs. Lees and Co.*]

The East Kent District Water Company require to be empowered to extend their limits of supply to include the parishes of Wootton, Swingfield, Acrise, Poulton, and Houghton Without, in the county of Kent, and to raise additional capital not exceeding in the whole £25,000, with power to borrow to the extent of one-fourth, also to create debenture stock. The dividends are limited to 7 and 6 per cent., according as the new capital is raised as ordinary or preference. [*Parliamentary Agents: Messrs. Roberts and Co.*]



The Order for which application is being made by the South Kent Water Company is to enable them to raise additional capital to the amount of not more than £25,000, and to borrow in respect thereof one-fourth of the amount of the new capital actually issued. The dividend is to be limited to 7 or 6 per cent., depending upon the nature of the capital—the former rate if ordinary, and the latter if preference. Clauses of the Order enable the Company to sell water in bulk to the Mid-Kent Water Company and to supply fittings. Section 46 of the Act of 1889, giving the Company power to supply materials, is to be repealed. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Sutton District Water Company are applying for authority to extend their limits of supply so as to include the parish of Kingswood, in the rural district of Reigate, in the county of Surrey, maintain the present works, consisting of two pipe-lines, and construct another pipe-line to connect them with a water-tower (not exceeding 60 feet in height) in the parish of Kingswood. The new works are to be commenced, constructed, and completed within the time, and subject to the conditions, prescribed by section 11 of the Gas and Water Works Facilities Act, 1870. Authority is sought to make contracts for the sale of water in bulk. [*Parliamentary Agent: Mr. John Kennedy.*]

The following Orders have been applied for to the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

The Corporation of Aberdeen require authority to construct an impounding reservoir on the River Avon (a tributary of the Spey), in the parish of Kirkmichael, in the county of Banff, and an aqueduct commencing at the reservoir, and terminating in a water-tank to be erected at Kincardine O'Neil, in the county of Aberdeen. Until the completion of the Avon reservoir, the Corporation wish to be empowered to take from the river by means of the other works authorized a quantity of water not exceeding 10 million gallons per day. It is proposed to construct in the same county another tank in the parish of Echt, a service reservoir in the parish of Peterculter, four aqueducts, a number of washout-pipes, and two roads. Power is required to raise a sum not exceeding £1,500,000 for the above-named works and for the general purposes of the water undertaking; to increase the public water-rate within the city; and to make all rates, &c., preferential charges. [*Parliamentary Agents: Messrs. Martin and Co.*]

The Clydebank and District Water Trustees are applying for power to construct additional works, comprising the enlargement of the Burn Crooks reservoir, a catchwater, conduit, or aqueduct, a conduit or pipe-line, an access road, and a road diversion. It is proposed to abandon two reservoirs, a catchwater, a conduit, and an access road authorized by an Order obtained by the Trustees in 1906. The new works are to be completed within seven years from the commencement of the Order. The existing borrowing powers are to be applied for the purposes of the Order. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

The Corporation of Fraserburgh are applying for authority to construct additional works, consisting of an embankment or dam for the purpose of raising and storing the waters of two confluent streams forming a tributary of the stream known as the Water of Fedderate, a service reservoir in the parish of Strichen, filters in the parish of Fraserburgh, three conduits, and a road diversion. The works are to be completed within eight years. Power is required to borrow £2500 for the purchase of lands and servitudes, £47,487 for the various works, and the sum necessary for obtaining the Order—to be repaid, as to the larger amounts, in periods ranging from sixty to thirty years. The other provisions of the Order include the supply of fittings, the sale of water in bulk, &c. One clause sets forth that every person who fraudulently takes or uses water for any other than domestic or drinking purposes is to be liable to a penalty not exceeding £10 for each offence, and to a penalty of £5 for each day the offence continues after conviction. [*Parliamentary Agent: Mr. John Kennedy.*]

The Kirkcaldy Corporation are applying for an Order to enable them to extend the boundaries of the burgh as defined in a schedule; and one clause in the Order provides that, from and after Whitsunday, 1911, the limits for the compulsory supply of water are to be the enlarged area. All the provisions of the Kirkcaldy and Dysart Water-Works Acts, 1867 to 1908, which are applicable to the present limits are to apply to the extended limits. [*Town Clerk: Mr. W. L. Macindoe.*]

Application is being made by the Corporation of Montrose for authority to consolidate their powers with respect to their existing water-works, provide an additional supply, and construct and maintain new works. The present works comprise a number of wells, aqueducts, conduits, &c., and two reservoirs; and power is sought to construct two more reservoirs, a filter-house, and nine aqueducts or pipe-lines—all to be completed within ten years. The limits of compulsory supply are the burgh of Montrose. The Order contains a penal clause similar to the one contained in the Fraserburgh Order, only the penalty is £20 for each offence, with a continuing daily penalty of £5. There are also provisions for the supply of water for other than domestic purposes and for its sale in bulk to local authorities and others. The Corporation wish to be authorized to levy a public water-rate not exceeding 3d. in the pound; also to borrow for the purchase of lands and servitudes £5650; for the construction of works, £16,790; and for mains, conduits, &c., £1950—to be repaid, as to the first-named amounts, in fifty years, and as to the last in thirty-three years. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

## SCOPE OF ACETYLENE LIGHTING.\*

[So far as one of its authors is concerned, the new edition of "Leeds and Butterfield, on Acetylene," is a post-humous work. It was on this account that the Editor of the "JOURNAL" was prompted to ask the late Mr. F. H. Leeds' collaborator to write a few lines with reference to its scope and purpose, and especially as to Mr. Leeds' share in its preparation.]

THE book does not describe acetylene as a competitor with a supply of town gas wherever the latter is available at a price of not more than 5s. per 1000 cubic feet. Equally efficient illumination of a room is represented as obtainable from coal gas for half the expenditure that acetylene would entail—assuming that incandescent burners are used for both gases. But in such conditions acetylene would use up only two-thirds as much oxygen, and would produce only two-thirds as much heat, as coal gas. In respect of heat production, incandescent acetylene lighting is not greatly inferior to electric carbon-filament glow-lamps; while the latter are fully three times as costly—taking current at 6d. per unit. Even metallic filament lamps do not reduce the cost of electric lighting to that of acetylene; so that the latter is shown to be pre-eminently the cheapest lighting agent for country houses, &c., where a public supply of gas is not available. In the comparisons of cost, allowance is made for renewals of mantles, lamps, fuses, &c., as well as for the cost of acetylene, coal gas, and electricity. Acetylene is not unduly favoured, since calcium carbide is assumed to cost (including delivery charges in a country district) £15 per ton—a somewhat high estimate for present-day conditions. In the former edition of the book (published six years ago), the cost of carbide was taken at £20 a ton.

The present edition contains fully one-and-a-half times the amount of reading matter in the first edition; and a very large proportion of the additions is the work of the late Mr. Leeds. The book, with these additions, would have been published much earlier had not it been decided to include in it an appendix, giving descriptions, with illustrations, of the more important acetylene generators now made in this country and abroad. As these descriptions were practically compiled by the writer of these lines from information obtained in most instances from the makers themselves, while statements of comparative merit and eulogistic phrases were rigidly excluded from the descriptions, much correspondence and expenditure of time were entailed in the preparation of this appendix. Despite the delay thus caused, however, every effort was made to keep the text of the work revised to the date when the final proofs were read—August last.

It is due to the memory of Mr. Leeds to say that no one had followed more closely than he the progress of acetylene from the time of the discovery of the production of calcium carbide in the electric furnace, and that no one had a more exhaustive and sound knowledge of its qualities and potentialities. The results of much of his original experimental work with it, and many of his deductions therefrom and from the work of others, appear for the first time in this new edition of the book, which it was his chief ambition in the later years of his life to make as nearly perfect as a text-book of its character and scope may be. Ἄλλοι κάμουν, ἄλλοι ὠναντο.

\* "Acetylene, the Principles of its Generation and Use. A Practical Handbook on the Production, Purification, and Subsequent Treatment of Acetylene for the Development of Light, Heat, and Power," by F. H. Leeds, F.I.C., for some years Technical Editor of the Journal "Acetylene," and W. J. Atkinson Butterfield, M.A., Author of "The Chemistry of Gas Manufacture." Second Edition, Revised and Enlarged. London: Charles Griffin and Co., Limited; 1910.

## TABLES FOR ILLUMINATING ENGINEERS.\*

WE have received a copy of a book of tables, intended for the use of those connected with the lighting industries, compiled by Dr. Wilhelm Bertelsmann, the Chemist at the Berlin Municipal Gas-Works. A great number of the tables relate to photometry; and as the unit adopted is the hefner, it would appear at first sight that they will not be of direct service to English gas engineers. If, however, "candle" is read for "hefner" throughout these tables, the figures may be used in English photometry. The rest of the tables contained in the book are obviously of quite general application.

The book opens with a statement of the photometric dimensions and units as commonly accepted in Germany—viz., the unit of intensity is the hefner, and the derived units are based on the hefner. We must again protest against the German custom of referring to the hefner unit as a "hefner-candle" ("Hefnerkerze"), for the sufficient reasons that it is not a candle, and that it has a lower value than any standard candle. The application of the word candle to the hefner unit by German electricians is responsible for electric lamps being described as of considerably higher candle power than is correct. The book contains a table of factors for the conversion of hefners into English candles

\* "Rechentafeln für Beleuchtungstechniker." By Dr. Wilhelm Bertelsmann, Chemiker an den Berliner Städtischen Gaswerken. Stuttgart, Ferdinand Enke; 1910.



and German standard candles; so that there is no excuse for the practice of referring to the hefner unit as a "hefner-candle." The factors given for the conversion of hefners into English candles and carrels are those settled at the last International Photometric Congress at Zürich, and not the factors more recently proposed with a view to the establishment of a so-called "International Candle."

Next follow a series of tables for use with bar photometers of various types. Distances are stated in centimetres; and in the first table the disc is moved between lights fixed at a distance of 250 centimetres from one another. The second table is for a photometer in which the standard of light is at a fixed distance of 35 centimetres from the disc. The next table is for the case in which the light which is being tested is at a fixed distance of 35 centimetres from the disc, and is, of course, intended only for the testing of lights of low intensity. A useful table is given for the calculation of the mean spherical illuminating power of a source of light from measurements of intensity made at different angles. Then follow tables for calculating the illumination of horizontal and vertical surfaces by sources of light at different distances and different angles. Other tables follow, showing the consumption of gas, and the light afforded, by various types of burners and the distribution of light at different angles from them. Similar figures, based on Herr Bloch's researches, are given for various electric lamps. Next follow some data as to the effect of different globes and screens on lights, and as to the colour of different lights. The results of Féry's determinations of flame temperatures are reproduced. Other tables give the weights of a litre of various gases in laboratory standard conditions—i.e., 0° C. and 760 m.m. dry—the tension of aqueous vapour at different temperatures, the ignition temperatures and the explosive limits of various gases, the melting points of metals and alloys, some specific heats, and the conductivity for heat of certain inorganic substances.

The compilation appears to have been carefully made, and should prove useful to English gas engineers who have the slight knowledge of German necessary to follow the short explanations of the manner in which the tables are to be used.

## FITTING OF GAS-FIRES IN HOUSES.

IN the "JOURNAL" for Sept. 11, 1894, Mr. F. S. Cripps, in a letter under the heading of "Fair Play for Gas after it Leaves the Consumers' Meters," pointed out the deficiencies, from an artistic point of view, of gas-fittings in comparison with those used for electric lighting; and he laid stress upon the desirability of gas companies taking up the examination and control of fittings on consumers' premises, and manifesting willingness to give advice freely on all matters concerning illumination. A correspondent who has lately turned his attention to the subject of the letter has sent us the following reflections upon it.

There is no longer much complaint to be made on the score of the artistic deficiency of fittings, as they have decidedly improved; and when I say "fittings," I mean gas brackets, pendants, burners, and the like, or what may be termed the ornamental side of a gas company's business. There is, however, one direction in which there is still great room for improvement, and that is in the application—or perhaps I should say the preparation for the reception—of gas-fires. At the present time all gas-fires, when introduced into a house, look like so many after-thoughts—they do not look as if they belonged to the place; and, as a rule, they are either put in a fender in front of an existing grate, or fixed inside the grate-bars. Of course, I am aware that, in the vast majority of cases, at the present time, we are forced to provide that which can either be fitted into the existing grates or stand in front of them; but my contention is that houses should now be built without the ordinary fire-grates, and that a properly designed gas-fire should be substituted for them—the chimney and flues being arranged to suit.

Then, again, the gas-pipes leading to the gas-fire are, as a rule, hideous in the extreme. They are brought to the side of the fender (outside, in most cases), and then, by some crooked pipe or flexible tube, are connected in a roundabout way with the gas-fire, all the fittings to which are designed without any regard to appearances. Why cannot a suitable fitting be designed for standing on the hearth, and the pipe be brought under the hearth and so connected as to be out of sight; the house, when it is first built, being arranged in this way on purpose to take gas-fires—at least, in all bedrooms? The ordinary open grate and mantelpiece arrangement should be discarded, and everything designed to fit in with the requirements of the gas-fire only.

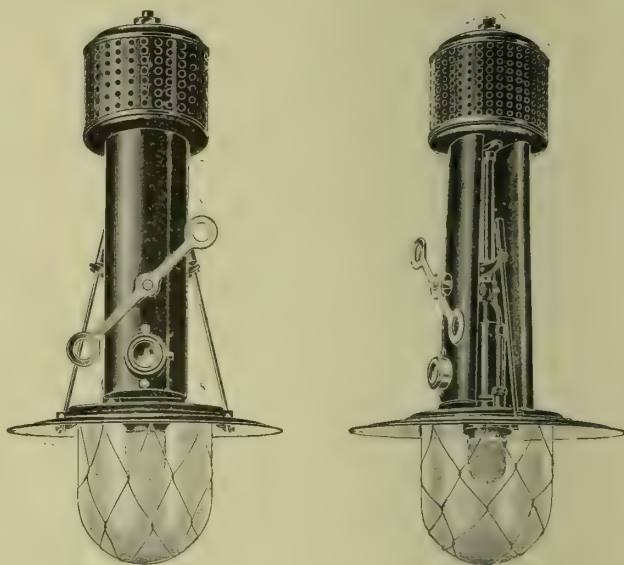
If some of our leading fitting manufacturers, assisted by good architects and artists, would take this matter in hand, there would appear to be an opening for good business in this direction.

**Pontypridd and Rhondda Joint Water Board Bill.**—The names of Messrs. Torr and Co., Parliamentary Agents, were inadvertently omitted at the close of the notice of this Bill which appeared in the "JOURNAL" last week (p. 570).

## THE LUCAS HIGH-POWER INVERTED LAMP.

### A Self-Contained (Single-Mantle) Lamp Giving 1200 Candle Power.

WITHOUT external aid of any kind, or movable parts within, but by the simplest of all means—an induced draught, with appropriate design and arrangement of lamp parts—the Lucas lamp has attained an individuality and reputation of its own, with a claimed efficiency that is uncontested in point of accuracy. There has been a considerable development by the application of the principle to a specially-designed lamp, with novel features in every part, whereby, with one inverted mantle, an illuminating power of 1200 candles is obtained, and is maintained, with a gas of southern qualities, and with higher efficiencies using the higher grades of gas that are the vogue northwards. But, speaking generally, with the ordinary lower grades of gas, an efficiency of 40 candles is realized per cubic foot of gas consumed by this self-contained lamp; the total consumption therefore being from 30 to 33 cubic feet of gas per hour, according to the composition of the gas. The field of application for such a lamp is therefore a large one, not only for the illumination of extensive open spaces, but for spacious interiors where a source of light of high power is required, and a noiseless source.



The new lamp has been produced by the well-known firm of Moffat's Limited, of No. 13, Farringdon Road, E.C., and in it they have concentrated their considerable experience as to requirements. Before being made acquainted with the construction in detail, the first two things that strike one are novelty in design and the strength of all parts. When in use, there is a constant active cycle of operations going on from head to head, with the effect concentrated in the brilliantly incandescent inverted gas-mantle situated midway in the cycle. Simply described, before going into particulars, from the drum-shaped head of the lamp there depend two ducts, the left-hand one leading to the burner, and the right-hand one connected with the interior of the globe. From the head the left-hand duct draws in the fresh-air supply, and the right-hand one sucks away the products of combustion and ejects them at the head of the lamp—the construction of the head being such that air admission and products ejection are kept well apart, so that the incoming air shall not be contaminated by the outgoing products, and so cause loss of efficiency. The gas supply is taken by a central tube (provided with a screw regulator) to the burner connected with the mixing-chamber (between the two ducts). The burner is specially constructed, and its air connections designed in such a way, that the primary and secondary air supplies from the left-hand duct are kept absolutely distinct. In the trumpet-shaped bottom part of the burner from which the mantle depends, in place of the ordinary gauze, a honeycomb head is arranged, composed of a bunch of small diameter tubes, about 2 inches long, through which tubes the gas and air mixture is ejected, while outside the bunch, and between each individual tube, the secondary air passes. This is accomplished in this wise: There are connections between the air duct and the chamber containing the burner; and they are independent of each other. The top connection is for the primary air supply; and it is so regulated that the proportions of air and gas are equal—that is to say, a mixture of one and one is formed, so that there is no possibility of an explosive mixture being formed in the burner. Then the lower connection supplies about  $4\frac{1}{2}$  parts of air, which flows between the small tubes to ensure complete combustion, and the surplus to support combustion—an incidental advantage of this arrangement being that the cold air assists in keeping down the temperature of the small burner-head tubes. The condition of the mantle shows that thorough admixture of gas and air is obtained; and the same visual proof is all that is required as to the effectiveness of the general arrangement. The secondary air supply passes from the main air duct to the burner through a small nicely balanced aluminium flap-valve, seen through a glass-



faced sight-hole. Should there be any tendency to light-back through any circumstance, the pressure set up forces this flap-valve back on its seat, and so prevents the admission of the air from this channel, and thus any mischief arising from explosion. On normal conditions being regained, the flap-valve immediately opens, and resumes its regular function. The glass-faced sight-hole and flap-valve have their own removable casing, so that the whole is readily withdrawable for inspection or adjustment.

The mantle is suspended on a movable support attached to the burner-head. The mantles are specially made for the lamp, and are uncollodionized. They are no less than 7 inches long before being burnt off, and afterwards are  $3\frac{1}{8}$  to  $3\frac{1}{2}$  inches deep, with a diameter of  $2\frac{3}{8}$  inches; so that there is a large surface of completely incandescent mantle. A test in the show-rooms resulted in the mantle keeping in perfect condition for use during 180 burning hours. The lamp is lighted by a fixed flash-light and lever; and a secondary means is provided should there be any necessity for its use. The finely wired globe is carried by a band, which is supported in a simple but effective way. Passing through holes in the reflector are a couple of rods attached at the lower end to the globe support; and at the other end (slightly expanded for the purpose), there is engagement, as illustrated, in the slotted ends of an arm centrally attached to the gas-supply pipe. On the release of the rods from the slots, the globe is lowered well below the lamp body, so that cleaning, mantle attention, adjustment, and so forth can be carried on with the greatest freedom. In the lamps as sent out, there is a slight curvature in the rods, which acts as a check in lowering the globe. A good, broad reflector not only serves a useful purpose, but it improves the appearance of the lamp. As already said, the lamp is strongly constructed; the casing being of enamelled steel, and the burner of heavy cast brass, so that there should be no question as to an excellent life record. Unquestionably Moffat's Limited have here a most efficient lamp that will do excellent service in the competition with high-power electric lamps.

## CALORIFIC POWER OF NEW YORK GAS.

THE report for the past year issued by the New York State Public Service Commission, exclusive of New York City, contains the results of an investigation of the calorific value of the gas supplied by the 93 Companies under their jurisdiction. According to a summary in the last number to hand of "Progressive Age," the average of the 352 tests made was 631 B.Th.U. gross, or 637.8 B.Th.U. for coal gas, 626.3 B.Th.U. for water gas, and 622.3 B.Th.U. for mixed gas. The maximum variation of individual tests from the averages was 15, 20 to 28, and 10 per cent. respectively. These investigations form the basis of conferences which are being held between the Commission and the Companies with the intention of recommending a calorific standard requirement to the Legislature for enactment. It was found that only 20 per cent. of the gas was used for purposes where its luminosity was important.

The report contains a long list of comparative values of calorific and candle-power tests; and the Editor of our contemporary plotted some of them to note the degree of variation. In the figures for coal gas, the results were almost too widely scattered to form even a band; but the trend, if any, might, it is stated, be expressed by the relation B.Th.U. = 75 (c.p. - 8), corresponding to 600 B.Th.U. for 16-candle coal gas. A minimum heat value of 600 B.Th.U. gross per cubic foot seems, our contemporary thinks, to be a popular coal-gas limit, and corresponds to a gas requiring practically no enrichment; thus cutting out the cost of oil and the amount invested in enriching plant. The statutory illuminating power of gas in New York State is 16 candles; and the average of the tests seemed to show that this was obtained with a gas of 625 B.Th.U. The legal requirement of a water gas—20-candle power—was found in gas not lower than 575 B.Th.U.; while the 18-candle power standard of a mixed coal and water gas was obtained with a gas of 600 B.Th.U. Our contemporary remarks that these figures show how complex the problem really is, and how necessary it is to introduce some equitable regulations which shall be more to the advantage of all concerned.

**Illuminating Engineering Society.**—At the next meeting of the Society, which will be held on the 15th inst. in the rooms of the Royal Society of Arts, there will be a discussion on "Recent Progress in the Measurement of Light and Illumination." In order to make it as complete as possible, some queries on the subject have been circulated, with the view of suggesting a few points on which remarks might be founded. Different forms of apparatus will be exhibited on the occasion.

**Southern District Association of Gas Engineers and Managers.**—As already announced in the "JOURNAL," the annual meeting of the Association will be held next Thursday, at the Hotel Cecil. We learn from the circular issued by Mr. A. F. Browne, of Vauxhall, who is relinquishing the honorary secretaryship, that the principal business will be the presentation of the report of the Committee, the election of new members, and the delivery of the address of the President, Mr. C. Stafford Ellery, of Bath. At the close of the business, the annual dinner will be held.

## THE RATING OF ARTIFICIAL LIGHT SOURCES.

THE interesting question as to the fairest and best method of expressing the true value of light sources has been several times of late referred to. In the January issue of the "Illuminating Engineer," an article was contributed by an "Engineering Correspondent," who alludes to the subject in discussing the determination of mean spherical candle power. It is suggested that in the great majority of cases the total amount of light emitted by a source is of more importance than its value in any one direction, and that this is being increasingly realized. The distribution of the light is alterable by suitable shades or globes, although the total amount of light or "luminous flux" cannot by such means be increased. The mean spherical intensity, or M.S.C.P., of a light source may be defined as the candle power which would be possessed by a source radiating the same luminous flux equally in all directions; and it is regarded therefore as a direct measure of its value as an illuminant. The writer of the article remarks that there are cases—as, for instance, continuous current arc lamps—where the mean hemispherical candle power is a more convenient term, but states that in a number of instances, such as incandescent electric lamps, a constant ratio exists between the M.S.C.P. and the mean horizontal candle power; and such ratios, called reduction factors, may be used for purposes of rapid comparison.

Many who during recent years have followed the technical literature on the subject will have noted the tendency, on the part of some lighting experts, at any rate, to express values of light sources in mean spherical candle power. It is a question, however, whether they will all agree with our contemporary's correspondent that the method best indicates their utility.

The measurement of the mean total luminosity of a light source would at first thought seem to have advantages, since it takes into account every available ray of light in whatever direction emitted; and assuming the possibility by reflection of bringing them all into useful work, the method might be right. In a sense, the argument is a reasonable one, that all the luminous rays are at the service of the lighting expert through the use of suitable shades and reflectors, or by the judicious choice of wall papers. But, unfortunately, shades and reflectors are not always convenient or adequately applicable, and there is even then some loss by irregular reflection and by absorption. The same may be said of walls and ceilings which are seldom or never under the control of the lamp designer. Nevertheless, there are advocates of the method; and the rating of lamps in terms of mean spherical intensity is still in vogue, with consequent comparison of costs on this basis. Reasons are occasionally given for the preference of the system to (say) the hemispherical computation, on the score that, in the latter, reflectors of uncertain and varying quality are, or may be, involved.

On the other hand, now and again suggestions of doubt as to the sufficiency of the method are found in the fact that those who use the M.S.I. method also add the hemispherical data. Two or three such dual comparisons have recently been published through the pages of the "Illuminating Engineer;" and the effect of the different methods on the important question of cost is striking, and warrants the doubt shown. As an example, a table of cost comparison is extracted from a paper contributed to the American Illuminating Society in December, 1907, by Mr. M. C. Whitaker. This gentleman deals with various forms of light sources; but it will be sufficient for the purpose in view to take two or three typical cases as under:—

Light Source.	Cub. Ft. or Watts Per Hour.	M.S.C.P. Basis.			M.H.S.C.P. Basis.	
		Cost Per Hour Per Unit \$	M.S.C.P. of Unit.	M.S. Candles Calculated Per 1 Cent. (Money)	M.L.H.S. C.P. of Unit. \$	M.H.S. Candles Per 1 Cent.
Upright gas-mantle	3'7	0'0037	63	170	51'27	138'5
Inverted "	3'0	0'003	54	180	70'6	235'33
Enclosed arc	600	0'060	213	35'5	329	54'84
Nernst	264	0'0264	81	30'7	134'3	54'6
16-candle power Edison	55	0'0055	13'2	24'0	11'68	21'78

The doubt in this case is not merely suggested, since, as a matter of fact, Mr. Whitaker explicitly recognizes that the M.S.C.P. basis is insufficient, and he accordingly gives the additional data as being less misleading and calculated to do greater justice to certain types of light sources. The cost figures clearly confirm this view. Such M.S.I. comparisons, whether supplemented or not as above, would seem to bear out "Engineering Correspondent's" suggestion that some lighting practitioners consider the M.S.I. data as adequate bases for comparison.

It is to be hoped, however, that those who use the method (except for theoretical or special ends) are few in number. The method is not an equitable one, and does injustice to the majority of light sources which are in general use. Lamps and burners avowedly employed for varied purposes, and emitting their more valuable lighting rays at distinctly different angles, cannot be judged by their mean spherical candle power value. Their relative efficiency and economy should be computed on a basis which has reference to the conditions of usage. Lamps are bought for



specific purposes; and any lighting expert who knows his business selects them, and their accompanying globes or reflectors, to suit the circumstances of the case. A lamp, for instance, with its horizontal rays at a maximum is chosen for linear illumination, and one with its maximum effect in a downward direction is obviously adapted for floor or table lighting. The rating in M.S.C.P. in such cases is idle and useless, since the serviceable rays are seriously depreciated.

There is, on the other hand, a very strong case for the determination of the value of a light source according to the standpoint of the use to which it is applied. The futility of any other method is probably best indicated by a few instances of various lamps rated both by the spherical and the hemispherical method. The following examples of tests are taken from various contributions on the subject to technical literature. It will be remembered that Mr. Jacques Abady, in lecturing before the Dutch Association of Gas Managers in 1904, dealt somewhat fully with the question of rating, and at that time, being himself an advocate of the M.S.C.P. expression, gave several useful illustrations of light sources so denominated, and methods for their determination.

The following examples are abstracted from his paper to serve the purpose now in view—that of showing the general inadequacy of a M.S.I. denomination as an expression of the value of a light source used for any defined purpose. The mean candle power readings of an enclosed electric arc lamp (500-candle power nominal) and two “C” burners respectively, fitted with “Jena” chimney and squat globe, are given as under:—

Longitudes.	Enclosed Arc.	“C” Burner with Jena Chimney.	“C” Burner with Squat Globe.
90 N. . . . .	0	37°0	37°0
67½ . . . . .	33	33°0	41°0
45 . . . . .	19	54°0	33°0
22½ . . . . .	58	76°9	34°5
Horizontal . . . . .	184	77°0	47°0
22½ S. . . . .	203	66°7	75°0
45 . . . . .	211	50°7	76°0
67½ . . . . .	80	17°4	37°0
90 . . . . .	80	0°0	0°0
M.S.I. . . . =	115°3	59°3	50°1
Candles per cub. ft. =		17°0	14°3

The inapplicability of the method to these cases is obvious. In all three instances, the M.S.C.P. fails to express the true value of the lights for any particular purpose. The arc lamp, used either for space or street lighting, has its horizontal rays (which, by the bye, are proportionately higher than is usually found to be the case), and those immediately below the horizontal, distinctly depreciated. The “C” burner with Jena chimney, if employed for street or linear illumination, is robbed of its possible 67 to 77 candle power light by being credited with 59°3 M.S.I. value; while the “C” burner and squat globe, obviously intended for room lighting, is similarly depreciated. Mr. Abady, in advancing these examples, did so to show how M.S.I. values were obtainable; but at the same time he thought the system more equitable than that in which either horizontal or maximum ray values are expressed. Later, as Mr. Abady frankly stated in his lecture to the London Junior Gas Association, he considered the lower hemispherical computation more to the purpose for a general comparison of light sources.

In a paper contributed by Mr. J. Foreman (who is associated with Messrs. Simmance and Abady) to the North of England Gas Managers' Association, a detailed and useful comparison of various lamps and burners was given on the latter basis. In the discussion of lighting efficiencies, lower hemispherical rays were given only, and the rating was made in terms of the respective M.H.S.C.P. of the lamps and burners dealt with. The liberty of extraction is taken, as in the case of Mr. Abady's lecture, for the purpose of indicating how far the M.H.S.C.P. serves to express the value of any light source—that is to say, the value which, judged from the user's point of view, is of most consequence. The lamps chosen are a flame enclosed arc with alabastrine globe, an enclosed arc with clear inner but no outer globe, a Keith 20-inch H.P. lamp, a Welsbach 600 “S.I.” lamp, a “C” burner with Jena chimney, a “C” burner with opal comet shade, and a “New Inverted” burner with plain globe.

While the previous examples indicate that the M.S. intensity expression, if applied to all alike, does scant justice to certain lamps, the cases taken from Mr. Foreman's paper show that the value of any light source, as judged by its applicability to definite and specific illumination requirements, is not revealed by even the L.H.S. determination. Take, for instance, the question of street linear lighting, where horizontal rays or those from 0° to 10° S. are desirable for the purpose of illuminating, as far as possible, the street lying between the columns. The M.H.S.C.P. of the flame arc lamp is given as 1342—a figure three times as great as that of the Welsbach “S.I.” lamp. On looking at the table, however, it will be noted that the required horizontal rays are almost equal in value—a fact which materially alters the comparison when the cost of current or gas is considered, even apart from that of lamp maintenance.

Where space lighting is wanted, the ratio of the M.H.S.C.P. to the more useful rays is entirely altered, and the comparison as between lamp and lamp is quite different. With the flame arc the mean is below the recorded value of the downward rays, whereas

	Flame Arc.	En-closed Arc.	Keith H.P.	Wels-bach S.I.	“C” Burner with Jena Chimney.	“C” Burner with Comet Shade.	New Inverted at 3/2 Cubic Feet.
Horizontal . . . . .	600	432	361	615	77	47	52°7
10 . . . . .	760	450	295	575	..	..	50°5
20 . . . . .	1120	460	282	543	..	..	53°4
22½ . . . . .	..	..	..	..	66°7	75	..
30 . . . . .	1520	1180	297	473	..	..	58°5
40 . . . . .	1830	990	232	420	..	..	53°4
45 . . . . .	..	..	..	..	50°7	76	..
50 . . . . .	1750	775	202	360	..	..	52°0
60 . . . . .	1700	680	180	280	..	..	56°8
67½ . . . . .	..	..	..	..	17°4	37	..
70 . . . . .	1680	116	181	210	..	..	52°4
80 . . . . .	1560	45	94	190	..	..	57°1
90 . . . . .	1000	50	105	175	0°0	0	51°2
M.H.S.C.P. . . . .	1342	658	267	452	56°6	62°5	54°0
Candles per watt or cubic foot . . . . .	3°51	1°55	26°46	23°8	16°2	17°86	16°88
Cost per 1000 M.H.S. candle hours (pence)	1°14	2°568	1°13	1°26	1°85	1°68	1°77

with the Welsbach lamp (using the same reflector as before) it is above it. In the case of the smaller units of light, the illustrations are confined to gas-lamps. So far as the two “C” burners are concerned, those taken are obviously the burners already referred to. The difference between the M.S.I. and the M.H.S.I. computations is striking. Those in the case of the “C” burner with Jena chimney are respectively 59°3 and 56°6; the maximum ray being 77. As to the second burner with shade, the figures are 50°1 and 62°5; the maximum ray being 76.

Considering the purposes for which these burners are likely to be required, it is evident that, while the M.H.S.I. determination does greater justice in the second case, it reduces the rating in the first instance; but by neither method is the true value of the burner properly indicated. Referring to the data of the inverted burner, it would seem that the M.H.S.I. computation is a fairly close index of its value; and this is shown by most tests of similarly constructed sources of light. This, in itself, is so far satisfactory; but the fact that so widely different results are obtained in the other cases, when considered in relation to specific ends, suggests that, for all-round purposes of comparison, neither the spherical nor the hemispherical method of rating lamps is adequate for every-day lighting requirements.

Since lamps are used for very varied purposes, and are frequently designed to suit special requirements, there is no necessity to attempt to bring them, even if it were possible, to the same basis of comparison. Lighting practitioners who know their business are cognizant of the kind of lamp which may be suitable for any particular purpose; and it is sufficient for lamp manufacturers to express, as they do at present, the power of their light sources in terms of their best results. For all general purposes, it would seem the fairest, if not the only, way to deal with the matter; and it is difficult to agree with the suggestion that the M.S.C.P. affords a good and direct measure of a lamp's value as an illuminant. The method may be useful from a theoretical point of view; but from that of rating and of cost, it is misleading, and does considerable injustice to many lamps and burners.

At the monthly ballot for membership of the Institution of Civil Engineers last Tuesday, Mr. H. P. Maybury, the Surveyor to the Kent County Council, and formerly of Great Malvern, was admitted a member.

Mr. John Miles has retired from the Board of the Brighton and Hove Gas Company, after 28 years' connection with the Company in the capacity of Director and Chairman respectively; and in the report presented by his colleagues at the recent half-yearly meeting, they testified to the great value of the continuous and important service rendered by him during this long period. To fill the vacancy, they have elected Mr. John Marshall Miles to a seat on the Board, and have appointed Mr. Arthur Matthews Paddon as Chairman.

The annual dinner of the Manchester Association of Students of the Institution of Civil Engineers, at which there was a distinguished attendance, took place last week, under the chairmanship of the President, Mr. J. G. Newbigging. The toast of “The Institution of Civil Engineers” was proposed by Mr. A. C. Dean, and replied to by Sir Alexander Kennedy. Mr. Walter Hunter proposed “The Manchester Association of Students,” pointing out that besides this there were Students' Associations in Glasgow, Newcastle, Leeds, Bristol, and Birmingham, consisting altogether of some 760 members. The Chairman, in reply, said the Association had a membership of 156. There was a tendency to municipalize almost every branch of engineering, and it was desirable that municipalities should attract thoroughly trustworthy and competent men to their employ. No institution in the country was doing more to place such men at the disposal of municipalities than the Institution of Civil Engineers. It was true that every branch of engineering was becoming more crowded, and it was more and more necessary for young engineers to find employment abroad. As one who had spent a great part of his life abroad—in the tropics—he could truly say an experience abroad was the finest thing a young engineer could have.



## MIDLAND ASSOCIATION OF GAS MANAGERS.

### Annual Meeting in Birmingham.

The Annual General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham. There was a good attendance of members at the time the retiring PRESIDENT (Mr. W. Langford, of Longton), took the chair.

#### MINUTES OF LAST MEETING.

The HON. SECRETARY (Mr. Harold E. Copp) read the minutes of the autumn meeting, held in Birmingham, on Oct. 21 last; and these were confirmed, on the motion of Mr. W. C. JONES, of Brierley Hill, seconded by Mr. T. BERRIDGE, of Leamington.

#### LETTERS OF APOLOGY—MR. HACK AND THE GAS PROFESSION.

The HON. SECRETARY announced that he had received letters of apology from Mr. R. O. Paterson, of Cheltenham, Mr. James Paterson, of Redhill, Mr. J. W. Auchterlonie, of Cambridge, Mr. T. H. Duxbury, of South Shields, Mr. Henry Hack, of Birmingham, and Mr. T. Glover, of Norwich. Mr. Hack, in his communication, stated that some two years ago, when he resigned his appointment at Birmingham, he intended to sever his connection with the gas profession entirely; but owing to the improvement in his health and to other reasons, he had reconsidered the matter, and hoped to be able to continue his connection with the gas profession as well as with the Association. (Applause.)

#### NEW MEMBER.

On the motion of Mr. A. T. HARRIS (Market Harborough), seconded by Mr. W. J. R. BAKER (Malvern), Mr. Frederick Shewring, of Droitwich, was added to the roll of membership.

#### THE RETIRING AND INCOMING PRESIDENT.

The PRESIDENT said the time had now arrived when he must relinquish the charge the members entrusted him with twelve months ago, and make place for a worthy successor. It was with very great pleasure that he vacated the chair in favour of Mr. Vincent Hughes, of Smethwick. In Mr. Hughes, they had a man who had lived a strenuous life, who was thoroughly practical, and who, they all felt sure, would do honour to the Association, and his work would be a credit to himself. He (Mr. Langford) had much pleasure in asking Mr. Hughes to at once enter upon his duties.

Mr. VINCENT HUGHES was very heartily received by the members on taking the chair.

The PRESIDENT said his first duty was to propose a vote of thanks to their retiring President. Mr. Langford had told them that he relinquished the office with great pleasure in order that he (Mr. Hughes) might take it from him. It always seemed to him to be an unfortunate thing, in regard to such offices, that just when one had got used to the work, and felt quite at home in it, that one had to give up the position; and a newcomer then came in, and felt quite as strange probably as his predecessor when he took the chair. It was well known that the past year had been a most successful one for the Association; and this was solely owing to the interest and the energy that had been displayed by their late President. He commenced his year of office with an address of absorbing interest. He followed this up with a meeting at Longton, the splendid gathering on which occasion he was sure must be very fresh in the minds of the members, together with the hospitable entertainment extended to them by the then worthy Mayor, who unfortunately was soon after called away from the scene of his activities and good work. But not so well known to all the members was the amount of time and work Mr. Langford had given in Committee. He had been present not only at every Committee meeting, but in other ways he had kept the members of the Committee up to the mark. It was solely owing to their Past-President that the past year had been so interesting and successful.

Mr. J. FERGUSON BELL (Derby) seconded the motion, remarking that they were much indebted to Mr. Langford for the way he had occupied the chair during the year. They remembered the interest in his address, and also the visit to his works at Longton, where they saw most up-to-date plant. Afterwards he took the members to see the coke-oven plant at the works of the Midland Coal, Coke, and Iron Company. He could confirm the President in saying that Mr. Langford had shown great energy during his year of office; and it was due to him that the attendance of members at the meetings had been increased. They had, in fact, had record attendances.

The motion was cordially carried.

Mr. LANGFORD said he thanked the members very heartily for the kind and appreciative manner in which they had received the resolution. To him it had been a very pleasant year. He began with fear and trepidation, knowing well his own limitations, as well as the peculiarity of his circumstances at that particular time. It was due from him that he should testify to the very courteous and kind support he had received not only from the members of the Association, but also from every member of the Committee, as well as to the very great kindness shown to him by their worthy Hon. Secretary (Mr. Copp). He (Mr. Langford) had striven to do his best for the Association; and it had been a

work of love. During the year, he visited four kindred Associations, and at their meetings had represented the Midland Association. He was most kindly entertained, and thoroughly enjoyed the visits to the various works. He did hope that the year's work had proved of interest, and had assisted in advancing the interests of the Association. He felt positive if the members by-and-by passed the revised rules which would be submitted to them, that they would have greater interest manifested by the individual members—that was to say, by enlarging somewhat the number of members of the Committee, and making it more representative, they would go along even better than in the past.

The PRESIDENT then delivered the following

#### INAUGURAL ADDRESS.

Before venturing to address you on other subjects, allow me very sincerely to thank you all for the honour you have conferred upon me in having elected me your President for the ensuing year. As I look back at the names of the distinguished members of our profession who have occupied this chair, I feel it will be difficult to reach the high standard they have set. I must, therefore, ask you to extend to me not only your indulgence but also your assistance; and I know this will not be withheld.

It is very gratifying to me to occupy such a position in this the thirty-third year of the existence of our Association. We embrace a district reaching from the South Coast to Hull, and from the East Coast to North Wales; and as showing the importance of our Association, I may mention that we now number nearly 120 members, who are responsible for the carbonizing of about 3 million tons of coal per annum. The Association was formed chiefly with the object of rendering mutual assistance; and in this direction I think it has more than justified its existence. During the 33 years, much has been accomplished to improve and extend the manufacture and use of gas; and it is pleasant to know that the members of our Association have satisfactorily played their part. It has occurred to me that the short time at my disposal might be usefully employed in reviewing our position, and, if possible, learn something, not only from the successes but also from the failures, of the past, and, further, to improve upon the ideas and aspirations of those pioneers who have gone before and cleared away many obstructions for us.

It is perhaps natural that my thoughts should travel to the past, as it is my privilege and pleasure to have charge of the Smethwick Gas-Works. There is no very ancient history connected with Smethwick; but in the matter of lighting, it stands pre-eminent. In general engineering, Smethwick has always been well to the front—in fact, distinguished by the greatest inventions of the last century; for it was here that Messrs. Boulton and Watt produced their first steam-engine, and for many years we have sent from Messrs. Chance Bros.' glass-works gigantic lighthouses which illuminate the coasts of practically the whole world. But it is with gas lighting that we are more particularly interested; and it is unnecessary for me to remind you that it was at Soho, Smethwick—in fact, on the site adjoining the present gas-works—that William Murdoch effected that triumph in artificial lighting which has so influenced the whole of civilization.

The names I have mentioned above are household words; but by us, as gas engineers, the name of Murdoch should be especially revered. The house in which he lived and died still remains—although in a sadly dilapidated condition—only a few hundred yards away; and he sleeps in Handsworth Parish Churchyard, about 2 miles from Soho Foundry. The gasholder he first erected is still in use; and it is very remarkable to notice that we continue to follow his methods of construction; the size of the sheets used, and the pitch of the rivets, being exactly the same as in present practice. The holder is 36 feet in diameter by 22 feet deep, and has a capacity of 20,000 cubic feet—quite as large as many built for villages to-day.

It is almost startling to find that the name of William Murdoch does not appear in any patent granted in connection with gas manufacture. In fact, I can only trace that surname once previous to 1860—viz., for a patent granted to a James Murdoch (Feb. 20, 1845), No. 10,532, for "Improvements in the manufacture of gas." The improvements consisted: "First, in causing the gas from coal, on leaving the distillatory retort, to enter a tube or tubes containing an iron spiral, maintained at a cherry-red heat, for the purpose of purifying the gas and for decomposing and converting into gas the tar and essential oils which are mingled with gas;" second, when in combination with the first improvement, the decomposition of water by means of incandescent coke or charcoal for the purpose of obtaining hydrogen gas, &c." I fear James Murdoch found trouble with the first part of his patent; but he was undoubtedly very close to a successful water-gas plant in the second idea.

Having at various periods spent considerable time in searching through patents, I have found it a charming study, not only from an instructive, but also from a historical point of view; and a few notes thereon may prove interesting to you also. I think "Coal-ite," or some other similar half-bred process, must have received considerable attention for years before gas lighting was introduced,



as numerous patents were granted for partial or slow carbonization. The following are samples.

Aug. 19, 1681, No. 214—John J. Becher and H. Serle grant 14 years for: "A new way of making pitch and tarre out of pit coale, never before found out or used by any other, which, being putt into practice, may be of great advantage to our subjects in general."

Jan. 29, 1694, No. 330—Martin Eele and others, for "A way to extract and make great quantities of pitch, tarr, and oyle out of a sort of stone of which there is sufficient plenty within our dominion of England and Wales . . . and for breaking grinding and boyling rock or rooffe stone."

Aug. 14, 1742, No. 587—Michael Betton and Thomas Betton: "An oyl extracted from a flinty rock for the cure of rheumatick and scorbutick and other cases."

The latter is a point that our "Coalite" friends appear to have overlooked. Perhaps it is the "missing link" to complete the chain of successes.

A somewhat popular idea seems to prevail that such systems as "verticals," "inclines," and "continuous carbonization" are altogether new, and only of very modern introduction. This is a great mistake, as, in many other instances, we are only treading in a beaten track. It is well known to most of you that William Murdoch used vertical retorts at Soho—in fact, I saw them (by the courtesy of Messrs. W. & T. Avery) only two or three years ago. Of course, they were small (about 3 feet high) and direct fired. No doubt the same difficulties were met which we have recently found, and, owing to our want of knowledge or reading, we have had to learn over again that the coke would jamb. In October, 1828, a patent (No. 5712) was granted to John Brunton for an improved retort which was to be "made of a conical (taper) shape for the purpose of facilitating the discharge of the coke at the larger end when the retorts are fixed in a vertical position with that end downwards." Others followed on somewhat similar lines; but the increased make per ton from verticals is specially mentioned in a patent granted to Henry Richard Smith, March 9, 1857 (No. 683), describing the "use of a conical-shaped vertical retort, which shape and position greatly conduces to a more uniform distribution of the heat from the furnace, and thereby effect a thorough conversion of all the gaseous matter with which the retort may be charged, extracting a much larger quantity of gas than can be obtained from the same amount of coal or other matter than is generated in the retorts as at present constructed."

The first mention of inclined retorts that I have been able to trace is in a patent dated May 27, 1851 (No. 13,642), granted to Alfred Vincent Newton (being a communication from abroad). The retort is placed "in such a curved or slanting position that when the lower mouth of the retort is opened at the termination of a charge, the hot coke will slide down into a 'cooling chamber' placed lower also in a slanting position. The charge of coal may be renewed at the upper end of the retort, where a tilt-waggon and rails are provided for the purpose."

Something nearer our present requirements is described in the patent of Aug. 23, 1854 (No. 1854), granted to Aristide Balthazard Bérard—"by distilling the coal in masses of not less than one ton in a cylindro-conical fire-clay retort having its axis inclined to the horizon at an angle of not less than 40° nor more than 60°, and having in its axis a detached or movable perforated pipe by which the gas is withdrawn from the centre of the mass of coal by means of an exhauster, and which perforated pipe is capable of being removed during the operation."

Alexander Angus Croll patented a retort, Jan. 3, 1857 (No. 31), which was not only inclined but also continuous. The coal was reduced to "small particles" and "placed in a closed hopper attached to the upper end of an inclined retort," and admitted into the retort in a gradual and continuous manner by means of a "feeding screw"—the "thin layer or stream being speedily carbonized."

The idea of continuous carbonization was evidently as fascinating to our predecessors as it is to us to-day, and although for nearly a hundred years this object has been kept in view, we have not yet reached the goal.

As early as June 22, 1824, a patent (No. 4978) was granted to John Hobbins, for a "novel construction of retort" and consists "in making the mouthpiece at each end of a separate piece from the body of the retort, which is alone exposed to the action of the fire and thereby becomes the only part that will want renewing; also in the addition to one of the mouthpieces of an opening, which may be closed by a door or valve whereby the retort may be supplied with fresh coals without requiring to open the door, and . . . a corresponding opening to allow of the exit of the coke; also in the introduction into the retort of a rake and a rod at each end through holes in the doors, one of which is for the purpose of discharging the coke and the other for equalizing and spreading the fresh coal." This, I think, must have been the first time separate or detachable mouthpieces were used.

Eleven years later, March 25, 1835 (No. 6799), John Brunton was granted a patent on somewhat similar lines "by which means the retort is kept at an uniformly fullness, introducing and discharging simultaneously bulk for bulk . . . without exposing the interior of the retort to the cooling effect of the atmospheric air, and in a great measure avoiding loss of time, the waste of gas, and the laborious operations necessarily attendant on the usual methods of charging and discharging retorts." At the front of the retort was fixed a hopper provided half way down with a

diaphragm. The coal was fed on to this diaphragm, and a rod and screw working through a stuffing-box forced the coal into retort and coke out at other end into a tank with water seal. A somewhat similar arrangement is described in a patent, No. 9070, granted to Luke Herbert on Sept. 8, 1841.

Another idea for continuous charging and discharging is stated in patent No. 7560, dated Jan. 31, 1838, granted to William Holme Heginbotham, who used a kind of archimedean screw running through the retort. The Count de Hompesh appears to have improved on the latter design (see patent No. 9060, Sept. 4, 1841), and recommends that retorts be used of "considerable length and small in diameter."

Among other very remarkable contrivances I may mention a revolving retort patented by Henry Pinkus (No. 5541) on Aug. 15, 1827, and which, if I understand it correctly, he also proposed to apply to an ordinary kitchen fireplace. Our old friend Samuel Clegg (patent No. 3968, Dec. 9, 1815) describes a "retort or distilling chamber, flat, circular, about 12 feet in diameter, fitted up internally with perpendicular shaft, to which are attached radiating arms. Shallow boxes are suspended from the arms, and the shaft slowly rotated." The fire was on one side of the chamber, and the boxes gradually turned round from the cool side (where they were taken out and replaced) to the heated side.

John Grafton (patent No. 7788, Aug. 30, 1838) proposed to employ a waggon or carriage travelling the interior of the retort longitudinally to deliver the coals in a regulated stratum equably over the floor of the retort, and to the tail of which waggon is attached a flap turning on hinges, which flap, on being let down, will act as a rake or expeller to push the coke out through the doorway of the retort.

The employment of steam in connection with carbonization is frequently met with; and one of the earliest proposals reads almost like the present Continental method of steaming vertical retorts. John Holt Ibbetson was granted a patent (No. 4954, May 15, 1824) for improvements in the manufacture of gas, in which he describes a "fire-place constructed in the interior of a retort or decomposing chamber, and thereby gives an efficient radiation from its surface and from both sides . . . also in admitting steam into the 'decomposing chamber' when in operation among the ignited coal or coke alone, or mixed with tar or oil. The solution (consumption) of the coal will always be in proportion to the quantity of steam passed through it."

Many other peculiar ideas in relation to carbonizing and kindred subjects have come to my notice; but I will not weary you by describing them. I would, however, like to mention that from about the year 1840 many patents were granted for increasing pressures or "modes of improving gas supply to towns, &c." This was generally to be accomplished by an archimedean screw. A Mr. Charles Carpenter Bompas (April 29, 1828, No. 5644) went so far as to propose using compressed gas as a motive power, by applying it to pistons of engines in the way that steam is used—and, I presume, to consume the gas afterwards.

A method of lighting railway carriages by gas was patented as far back as 1857 (No. 650).

A very beautiful arrangement (quite equal to anything obtainable to-day) not only for lighting gas, but also for opening and closing the cocks (any number) by means of electricity, is described by Charles Cowper (July 22, 1856, No. 1732); and I find several other somewhat similar ideas about the same date.

The following very quaint description of a "portable gas-lamp" is found in patent No. 4381, June 19, 1819, granted to David Gordon and Edward Heard. "This invention relates to a gas lamp or vessel made of sufficient strength to admit of gas being pumped into it under pressure. The vessel may be of any suitable shape and dimensions . . . when in use it may be placed in any convenient position, such as in another room, in a coach, on board ship, &c. The stopcock on the exit-pipe is worked with caution. . . . While the vessel is being charged with gas, it is proper to keep both the pump and vessel cool by means of water." Probably many of you will agree that it would be advisable to use this lamp "with caution."

I will mention only one other lamp, as it has special interest at the present time; an important part of it being very similar to an excellent lamp quite recently placed on the market. It is described in a patent granted to John Braithwaite on Jan. 28, 1847 (No. 11,546). After mentioning improvements in the construction of burner and methods of ventilating, he claims: "Fourth, consists in regulating the flow of air to be heated by the pipe above referred to, or for other heating and ventilating purposes by means of a thermostatic lever." This lever is composed of two slips of metal, possessing different degrees of expansibility, soldered together. "The different degrees of curvature which this lever assumes in consequence of being heated is caused to act, more or less according to its curvature, on a rod and bell-crank, which communicate, by means of another wooden rod, with the air-valve, which is thereby opened or closed as required."

I think I have said enough to show that half-hours in the Patent Office may be very interestingly and profitably spent; that that which is paraded as original and new is often only an old dress re-dyed, and with new trimmings; that many ideas will be found worthy of your consideration; and that probably you will be able to detect just the defect which caused failure and disappointment, and by a slight modification bring success to yourself and benefit to the gas profession generally.

From the days of our childhood we have believed in a close connection between electricity (or lightning) and the powers of



evil. For stage effect, his Satanic Majesty always appears and disappears in an electric flash; and for some years electricity filled us with awe, if not with reverence. But at the present time, although we look on with suspicion, the bogey has ceased to frighten us. It is impossible to deny that electricity has proved one of our best friends, as it was the means of rousing up both sleepy gas managers and directors; and our position to-day is due to the energies and talents thus newly awakened. As a consequence, gas consumers now receive at least ten times the amount of light for the same money.

It is well known that some of us have to meet competition of a very unfair character, when electricity is supplied by companies at  $\frac{1}{4}$ d. per unit for lighting and power purposes. Of course, it is less than cost price and cannot last long, as even shareholders in electric companies will expect a dividend some day. Probably the most iniquitous thing is where a municipal electric undertaking is run at a loss to suit the caprice of town councillors, and the deficiency is made good at the expense of the gas department. Under such circumstances, a recent decision of the Local Government Board, that both gas and electricity shall be supplied at cost price, is most welcome; and it would undoubtedly be much to the advantage of any town to follow this policy rather than for gas profits to be applied in the reduction of the rates. Take, for instance, a factory rated at £1000 per annum. If the gas profits equalled 3d. in the pound, the manufacturer would get an advantage of £12 10s. on his rates. But such a factory would probably use at least 10 million cubic feet of gas per annum; and if no profits were handed over to the rates, the price of gas could be reduced by 1d. per 1000 cubic feet. This would save the manufacturer about £40 on his gas bill, or (say) three times the amount he gains by having his rates reduced. He would therefore be able to find employment for more hands, and so increase the prosperity of the town generally.

The metallic filament lamps have not resulted in the prosperity electricians prophesied: "The experiences of many users of so-called metal filament lamps are by no means as cheerful as some of the advertising designs would suggest. The extreme fragility of the filament, and the difficulty of its firm suspension in the bulb, have resulted in very short life for these wonderfully 'economical' lamps; and as the price is considerably higher than that of the carbon filament, the actual saving has sometimes been of little advantage." This condemnation is not mine, but an extract from an exceedingly smart publication devoted solely to electricity.

Another competitor which we must not overlook is suction-gas plant. As an economical motive power, this, without doubt, has now for some time been our strongest opponent; and although very satisfactory in many ways, and desirable where cheap town gas is not obtainable, I am convinced that many such plants have been supplied without any, or only a small, advantage to the users, several of whom have informed me that they regret having purchased. The reason for this is that makers of these plants always carefully omit from their advertised calculations the cost of water, which is often a most serious matter. In many factories, too, the carting in of fuel and removal of ashes proves very inconvenient. The ground space required for the plant itself and for storage of fuel is a further difficulty. The greatest trouble, however, arises from the fact that all makers still base their figures on anthracite at about 25s. per ton. It is well known that this is now at least 50 per cent. below the market value; and the probability is that the price will be further advanced. This is only natural, as the anthracite area is very limited; and the owners are all strongly combined, and every additional suction plant increases the demand. Consequently, the owners know that, whatever price they decide to ask for the fuel, must be paid. Of course, gas coal may also increase in price; but we always have the compensation of a proportionate rise in the value of coke and other residuals. Every 1d. added to the cost of fuel, however, either for electricity or suction gas, is a dead-loss to the users of either system.

It always appears to me that the interests of gas-engine makers are identical with our own; but for some inscrutable reason we almost invariably find disparaging statements or comparisons made by gas-engine makers when referring to town gas. Most of us have specially low prices for power gas, in order to extend its use for this purpose; and this must have resulted in the sale of thousands of gas-engines which would probably otherwise never have been made.

While on this subject, I must draw your attention to what I consider a great mistake on the part of gas-engine makers, including the best firms. Owing probably to competition, they have increased the speed of engines and height of compression very considerably, thus enabling them to represent a small engine as of greater power. This, of course, will result in reducing the life of the engine, and also entail additional expense in maintenance. For some years past, Mr. Michael Longridge, the Chief Engineer of the British Boiler and Electric Insurance Company, has pointed out, in his annual reports, that the rate of breakdown of electric motors was about double that of gas-engines. Under the new conditions, I fear the comparison will not continue so favourable.

We have recently witnessed some remarkable developments in gas-engine construction. The three, or multiple, cylinder vertical engines have the advantage of occupying small ground space for great horse-powers; but they do not yet appear to be quite perfect. The latest idea is a continuous firing gas-engine, which

is wholly under the control of a specially-arranged governor for graduating the charge according to the load. The result of this is perfect steadiness in running. These engines are now made to great perfection, and will certainly displace the quick revolution high-class steam-engine.

Some years ago, an exceedingly useful and economical appliance was introduced—viz., the "Tangye gas-hammer"—and many of us welcomed it as likely to assist us in our day-load. But for some reason unknown to me we have not heard anything of it for a long time. Probably the cost for gas was then found to be too high; but whereas the price was then about 3s. per 1000 cubic feet, it is now only half that figure. I am convinced there is plenty of room—in fact, a distinct want—for tools of this class; and this gas-hammer was certainly one of the best. Its power was cheaper than that of the gas-engine, and its capabilities ranged from *nil* to a blow of 3 cwt. (but this may be indefinitely extended). The hammer was under most perfect control. The blows were repeated at any rate up to about 120 per minute, and over 4000 blows could be given for 1d. with gas at 1s. 6d. per 1000 cubic feet. In conjunction with the gas-hammer, we should also have gas punching, stamping, riveting, and shearing machines, all equally efficient.

Pumps of the direct-acting or positive type are not much used, and I fear almost unknown. They are, however, very compact and economical in working; and it would often be much more convenient to run a gas-pipe than a steam-pipe, as the loss by condensation in the latter case is enormous. I have in my mind one which was working for some time against 100 feet head of water. This is a subject that should receive more consideration.

During the past year, no important modification has been made in our methods of purification; and in this respect we stand practically in the same position as we did nearly a century ago. Our one aim should be continuous purification, or, as it is sometimes called, purification in closed vessels. It is equally as desirable as continuous carbonization; and if time allowed I could show, from the Patent Office records, how our fathers tried to accomplish this, as in the early part of this address I have pointed out how they endeavoured to arrive at a solution of the other problem. It is a fascinating subject, and worthy of the attention of all of you. There are many difficulties, and I think the successful realization will rest with the chemist and engineer combined. To the popular mind, it is the purifier that is always wrong. As an example, I may quote the following, which I received from an old friend some years ago, addressed "To the Purifying Machine at the Gas-Works:"

Oh, ye machine of fickle mind,  
To us in future act more kind,  
In semi-darkness we sit to-night,  
The reason is we've bad gas-light.

There is always something serious to be expected when one's friends try poetry; and in this case I think the meter was short of water.

Much might be said on conveying machinery, calorific value, carburetting, public and private lighting, slot installations, &c.; but I will only mention one matter in connection with the latter item. I know that some managers who already have a good number of small ordinary meters find a difficulty in obtaining the necessary funds to replace them by prepayment ones. I would therefore remind you that, previous to the introduction of slot meters, I and one or two others adopted a system of weekly collections—using the ordinary meters. It was really prepayment, as the collector called on the consumer on Monday, and received sufficient money to cover the consumption for the week—a kind of railway ticket being used, and a small charge per quarter was made for hire of fittings. There are still many advantages to be shown for this method, as it entirely obviates all trouble of robbery from meters, and no additional expense whatever is entailed for automatic attachments, while the consumer is charged less accordingly.

I have already exceeded my allotted time; but I have tried to take a general review of our position, as I think the elucidation of special fields of inquiry are best covered by papers and discussions in the ordinary way, and I trust that during the coming year there will be an ample supply of such material. I am sure that many of you, even by reciting failures as well as successes, can help forward the interests we all have at heart. But should there be a lack of fresh pabula, I purpose that we shall rediscuss some of the papers read at former meetings—perhaps more mature experience may have modified the views of the authors, and interesting discussions will no doubt follow, and the attractive nature of our gatherings be thereby maintained.

At the close of the address,

Mr. J. H. BROWN (Nottingham) said he had great pleasure in proposing a vote of thanks to their President for the very able and instructive address to which they had listened. Those who had known him for some time were led to expect something out of the ordinary. Mr. Hughes combined with his considerable experience an excellent sense of humour; and they had that day listened to not only an instructive address, but to one which was more than usually amusing. Mr. Hughes had not troubled them with any problem connected with carbonizing; but there was no doubt the subject would be dealt with in some of the papers which would follow during his presidential year. Nevertheless he had covered a vast field, and had opened up new ideas, which some of the members had probably never touched upon before. He



(Mr. Brown) was sure he was voicing the feeling of the meeting when he said they were greatly indebted to the President for his excellent address.

Mr. LANGFORD seconded the motion. They had, he said, had from their President an address that was original, comprehensive, and intensely interesting. He felt sure Mr. Hughes would have a very successful year of office; and they all hoped that to him his continuation in the chair would be as pleasant as had been the opening.

The motion was heartily passed.

The PRESIDENT, in his response, said he felt that the complimentary remarks of Mr. Brown and Mr. Langford were somewhat undeserved. When he commenced to prepare the address, he was rather charmed with the idea that a study of the doings of their forefathers would interest the members. He must confess that the farther he proceeded, the more he thought he had made a mistake. However, he still adhered to the path he had set himself, because he thought that although it might be very prosy and uninteresting to the members to sit and listen to a lot of quotations from old patents, in the days to come the facts he had recounted would be useful and instructive. If this was so, he should be more than satisfied.

#### EXPERIENCES WITH SEMI-VERTICAL RETORTS, AND NOTES ON CARBONIZING SYSTEMS AND RESULTS.

The next item on the agenda was a paper by Mr. ALFRED T. HARRIS, of Market Harborough, on the above subject. Before the paper was read,

The PRESIDENT remarked that certain gentlemen had kindly consented to open the discussion on the paper as they were specially acquainted with the carbonizing methods that were to be brought before them by Mr. Harris. Unfortunately two of these gentlemen were unable to be present on this occasion; and had they been with them, he still thought the discussion would have had to be adjourned, because they had alterations to the rules and other questions to consider that afternoon. Therefore, with the members' permission, he would ask Mr. Harris to read his paper, and then adjourn the discussion to the autumn.

The paper (which is published on pp. 659-62) was then read, and points in it were further elucidated by the aid of drawings. At the close of the communication,

The PRESIDENT observed that Mr. Harris had dealt exhaustively, and in masterly manner, with the subject he had taken in hand. The extent of the field covered by the paper pointed to the advisability of adopting the course the Committee proposed in the first instance—that was, to adjourn the discussion to the autumn meeting. In the interval, the members would be able to properly digest the paper; and there would no doubt then be an interesting discussion upon it.

#### ANNUAL REPORT AND ACCOUNTS.

The HON. SECRETARY presented the annual report of the Committee and the accounts. The former, in the main, reviewed the proceedings of the year. In the concluding lines, the Committee regretted to announce the death of Mr. John Tindall, of Walsall, who was one of the founders of the Association. It was also mentioned that during the year four new members were elected, and one member resigned; the number on the books at present being 111. The accounts showed a balance in the bank of £82 13s.; but the expenditure included the contribution of £40 to the Livesey Memorial Fund.

On the motion of Mr. ADAM COOKE (Oldbury), seconded by Mr. GEORGE HELPS (Nuneaton), the report and accounts were adopted.

#### DISTRICT REPRESENTATION ON THE INSTITUTION COUNCIL.

On the proposition of Mr. BERRIDGE, seconded by Mr. BELL, the President was appointed District Representative on the Council of the Institution.

#### REVISION OF THE RULES.

The HON. SECRETARY presented the following report on the above subject:

A Committee Meeting was held at the Grand Hotel, Birmingham, on Thursday, Feb. 17, 1910—the President (Mr. W. Langford) in the chair. The following members were also present: Messrs. Hughes, Bell, Lee, Bird, Webb, Peaty, Pooley, and Copp.

After a full discussion, the following alterations were agreed upon; and it was decided that the same be recommended to the General Meeting for adoption.

That the Association be called "The Midland Association of Gas Engineers and Managers."

The object for which the Association is established is to promote the advancement of the gas industry in all or any of its branches.

RULE 1.—That the Association shall consist of (1) Members and Associates; Members must be Engineers or Managers of gas undertakings or Superintendents of gas-works making 500 millions or more per annum; and Associate Members shall be persons who, by reason of their professional knowledge or experience, are, in the opinion of the Committee, qualified to assist in promoting the objects of the Association, and who shall not be engaged in trade; and (2), Honorary Members, who, though formerly qualified as Members, have retired from active management, to be elected at the discretion of the Committee. All Members to have equal voting power.

RULE 2.—That the management of the affairs of the Association shall be confided to a Committee which shall consist of a President, Vice-President, six\* immediate Past-Presidents, Hon. Treasurer, Hon. Secretary, and six\* members, any four of the foregoing to form a quorum. The President and Honorary Secretary, for the time being, of the Midland Junior Gas Engineering Association to be *ex-officio* members of the Committee.

RULE 4.—Two elected Members of the Committee and one of the Past-Presidents shall retire annually in rotation, and shall be ineligible for re-election during the following year. Nominations of Office-Bearers and Members of Committee shall be made by two members (with the consent of the person nominated), and be sent to the Honorary Secretary by the 30th of September each year. That at least seven days prior to the Autumn General Meeting, a list of the Members so nominated be posted to each Member, together with printed envelope for reply, which must be returned to the Hon. Secretary within four days, or by the date named on the list. The ballot papers to be opened by two Scrutineers appointed at the autumn general meeting, and the result announced.

RULE 9.—All questions, except those of a personal nature, to be decided by any convenient system of open voting; the Chairman to have a second or casting vote when necessary. Questions of a personal nature to be decided by ballot.

RULE 13.—The annual subscription to be paid by each Member and Associate Member shall be 10s. 6d., payable in advance on the 1st of January in each year.

\* These numbers were altered during the discussion (see below).

The rules were considered *seriatim*; but the discussion, referring to matters of purely domestic interest, need not be alluded to at any length here.

The PRESIDENT, on Rule 1, remarked that for some years past there had been a question as to the election of members of the Association. In certain quarters, everlasting offence had been occasioned by not admitting to membership gentlemen who had occupied positions as superintendents in large establishments. It would be noticed that the Committee now proposed to admit members occupying positions as superintendents of works making over 500 million cubic feet a year. He thought it was a very proper proposal; but he did not think it would embrace more than half-a-dozen gentlemen in the whole district. They were, however, men who would strengthen the Association very much, and just the class of men who were able to work out research problems.

There was considerable discussion initiated by Mr. W. C. Jones, of Brierley Hill (who received a large amount of support), as to adjourning the discussion until the proposed new rules had been circulated among the members. But eventually it was decided to discuss them at once in rotation, and to amend them as determined by the meeting; and then present them complete at the autumn meeting for confirmation in one resolution.

Mr. J. F. BELL, speaking on Rule 1, said it was 33 years since the Association was formed, and during that time there had been no substantial alteration of the rules. There had been great changes in the gas industry; and the Committee found it necessary to make these alterations. The change proposed in Rule 1 would be the means of adding strength to the Association. It was a matter of great regret that applications for membership had had to be refused from gentlemen who would have been a credit in their ranks and a source of strength; and this was an anomaly they now wished to sweep away. The rule, he felt sure, would appeal to the members as being reasonable and fair. There were also members who had retired from the profession; and it would be a grave mistake to lose the benefit of their knowledge and interest in the Association. The Committee had taken steps to retain them. Then there was the question of associate members. They wanted young men in the Association; and they wished to encourage them. He proposed that the first rule be adopted.

Mr. J. T. LEWIS (Wellingborough) seconded the motion.

Mr. W. A. SAPEY (Tamworth) did not like the words "who shall not be engaged in trade," as he thought it might deprive the Association of gas engineers who had left the profession, or who might do so, and engage in trade. He proposed that the words in question be eliminated.

Mr. A. O. JONES (President of the Midland Junior Association) was anxious that under the new rule there should be no interference with the Junior Association. They did not want any part of their talent withdrawn by the wider opening of the door of the Senior Association.

The PRESIDENT assured Mr. Jones that nothing of the kind would happen.

Mr. W. J. R. BAKER (Great Malvern) seconded Mr. Sapey's proposed modification.

Mr. F. J. BYWATER (Birmingham), Mr. Fletcher W. Stevenson (Coventry), Mr. George Helps (Nuneaton), Mr. J. A. Harris (Great Wigston), the Hon. Secretary, Mr. H. Haddock (Atherstone), Mr. J. T. Lewis (Wellingborough) and others continued the discussion on Mr. Jones's suggestion and that of Mr. Sapey. The result has already been mentioned regarding Mr. Jones's proposition; and in regard to that of Mr. Sapey, it was decided that the words should remain as submitted by the Committee.

Mr. A. T. HARRIS asked whether the rules were to be made retrospective.

The HON. SECRETARY: That is a point that can be dealt with when the general resolution comes before the members.



Mr. BELL moved the adoption of Rule 2. He considered it desirable that the number of the members of the Committee should be increased.

Mr. LANGFORD seconded the motion, remarking that the addition of six Past-Presidents to the Committee would be of great use to the Association. He thought it was a pity that directly a President retired from office, he should drop out of the administrative work of the Association. What the resolution proposed to effect was to enhance the interest of a greater number in the affairs of the Association.

Mr. SAPEY thought that three Past-Presidents and nine ordinary members would be better than the proposal in the new rule.

Mr. J. A. HARRIS supported Mr. Sapey.

Mr. A. T. HARRIS agreed with the recommendation of the Committee, as he believed it was better that the Past-Presidents should for a period be kept in close touch with the inner working of the Association.

Mr. G. HELPS said the proposition of the Committee appealed to him because it ensured continuity of control.

Mr. W. G. S. CRANMER (Willenhall), Mr. BELL, and others continued the discussion, which ended in the rule being altered so as to provide for four Past-Presidents being continued in office, and for an increase of the ordinary members to nine.

The question of the election of Committee men was then discussed; and the only point that arose from it was a promise that the Hon. Secretary should in future notify members when the time came round for sending in nominations.

The remaining rules were passed; and, on the proposition of Mr. BELL, it was decided that a copy, as amended, should be circulated among the members, and the general resolution for confirmation be brought forward at a subsequent meeting.

This concluded the business proceedings.

In the evening the members dined together; the President being in the chair.

## ILLUMINATION.

### The Importance of Good Lighting.

Professor Silvanus P. Thompson, D.Sc., F.R.S., on Thursday afternoon delivered, at the Royal Institution, Albemarle Street, the third and last of his series of lectures on the subject of "Illumination, Natural and Artificial." The first two discourses (which have already been noticed) dealt respectively with light and lighting and sources of light; the final one referred to problems of illumination.

In his opening sentences, the lecturer remarked that there was nothing more extraordinary than the inefficiency, from a scientific point of view, of every source of artificial light. The amount of radiation to which the eye was sensitive, as compared with the quantity of energy that was expended in securing it, was ridiculously small. No lamp that he knew of succeeded in turning 12 per cent. of the energy expended into what was useful for the purpose of artificial illumination. The "Magnetite" arc lamp was much more efficient in this respect than the ordinary arc lamp; but there was only one of them in this country at present—and that he had beside him, as he thought his audience might be interested in seeing it working. The interesting point about it was that, whereas in the ordinary carbon arc lamp the light was from the white hot tip of the positive carbon, and was thrown mainly downwards, in the "Magnetite" lamp the light came from the arc itself (which was luminous), and was mainly horizontal. This lamp was intended for street lighting, and was arranged so as not to give a great splash of light right downwards. It was called the "Magnetite" lamp, because this was the material originally employed; but an improvement had been made in the way of mixing this with other oxides.

Some comparisons of cost of different sources of artificial light were thrown on the screen; and one of these gave the cost per 1000 candle-power-hour with gas at 2s. 6d. per 1000 cubic feet and electricity at 4d. per unit. The figures were: Electric flame arc, 1d.; high-pressure gas, 1½d.; low-pressure incandescent gas, 3d.; tungsten, 5d.; osmium, 6d.; ordinary carbon filament lamps, 1s. 2½d. The lecturer said that these figures were "rather more recent" than some three or four years old which he had previously shown on the screen. He next gave an interesting explanation of the directions in which illumination is distributed from different forms of light. The ordinary upright incandescent mantle, he pointed out, owing to the fact that the mantle was a sort of vertical cylinder, threw the light out sideways all round. Very little was thrown upwards. In the case of the inverted mantle, the distribution of light was wonderfully uniform in the hemisphere below the horizontal. With the Pernst lamp, the maximum light was sideways on the horizontal plane; and with the "Millennium" gas-lamp, the maximum distribution was also sideways—nothing downwards, and practically nothing upwards.

By illumination, said Professor Thompson, was understood the amount of light received on a surface per square inch, or per square foot, or per square yard of that surface. He would take for his purpose the amount of light received on a surface from a standard candle at a distance of 1 foot. This quantity of light would be called 1 candle-foot. Two candles 1 foot away produced 2 candle-feet; but one candle 2 feet away did not produce

½ candle-foot. A candle 1 metre away produced about 1-11th of the illumination given by a candle 1 foot away. The exact figure was 10⁹. The colour of the surface had, of course, nothing to do with this matter. A very great deal depended on the question of illumination; and people should know how bright the light ought to be for comfort in (say) reading. One could read with an illumination of less than 1 candle-foot; and it would not be too bright even up to 5 candle-feet. It was impossible to read, with ordinary eyesight, with an illumination as little as 1-10th candle-foot; and it was hard to do so with 1-5th candle-foot. Of course, this was, after all, a matter which depended upon the sort of type that had to be read. It would, however, be a very good prescription to say that in any place where reading had to be done, in any schoolroom or office where writing had to be done, and in any drawing office, the illumination on the desk or reading surface should never be less than 1½ candle-feet, whether artificial or natural light. In Holland, it was prescribed by law, in the case of certain factories and other places, that the illumination must not be less than from 0.9 to 1.35 candle-feet in our terms. How did this compare with daylight? How much illumination would one, as a matter of fact, receive upon a flat surface when sitting below a window opening to the north, on a bright day? Certainly (unless it was in the afternoon, when darkness was coming on) not less than 3 candle-feet. It might be as much as 4, 5, or 6 candle-feet; and with direct sunlight, it would be a great deal more.

Continuing on this branch of his subject, the lecturer proceeded to give his hearers much valuable information on the lighting of schools, &c. He pointed out that the Medical Officer to the London County Council Education Committee had made a number of observations as to the lighting of some of the schools under his charge; and he had stated that the lighting was bad in a very considerable proportion of cases. The officer did not, however, say what constituted good or bad lighting—what standard he had been going by; and it would have been much more satisfactory, from a purely scientific point of view, if he had stated the maximum and the minimum amount of illumination in the different parts of the rooms he visited. If in a schoolroom, for example, the illumination fell below 1 candle-foot in the back row of desks, that room ought to be condemned. The distance from the window made a difference; and a very great deal also depended upon whether the windows were high. It was important to carry the window to as near the ceiling as possible; for the light which was of value was that which came from the top. It was quite feasible to measure the amount of illumination by photometers; and this was a matter which ought to be put on a better basis. With the instruments which now existed, surely there ceased to be any excuse for architects not knowing exactly what to provide! After attention had been drawn to the Trotter-Edgcombe photometer, there was shown on the screen an instrument which was invented over twenty years ago for use in schools in Russia.

School and factory inspectors, continued Professor Thompson, should have the means of definitely ascertaining whether the illumination was satisfactory. The law should see to it that a factory, for instance, was properly lighted, so as not to endanger the workpeople's eyesight. All oculists were agreed upon the progressive harm that was caused by imperfect illumination. The increase in myopia while children were passing from elementary to higher grade classes, was thoroughly established by statistics. Damage was, however, done to eyes not only by insufficient illumination, but by the glare of badly-arranged lights; and it was therefore necessary for them to most carefully consider the question of whether the intrinsic brilliancy was endurable or unendurable.

When one could not comfortably endure the brightness from a given source of illumination, how was it possible to scatter the light without wasting it? This had been done in various interesting ways. Light could be diffused by reflection from mirrors upwards, or by refraction from glass surfaces. Something like thirty years ago, Mr. Trotter proposed to flute or rib glass in certain manners for the purpose of scattering the light. The glass was ribbed one way vertically, and the other way horizontally. These dioptric shades had been modified in various manners; and he had on view a number of samples of globes from the Holophane Company. In the illumination of rooms by lamps, it was necessary to discover the laws that governed the illumination which one surface gave another—to find out, not only how much light fell on a surface, but how much the surface gave back. He suggested that a good lamp, generally speaking, would be one which was provided with a mirror above it, and which had a globe with the bottom so ribbed that the light coming downwards would be scattered.

In conclusion, the lecturer remarked that he had tried to show his audience how, by employing artificial devices, to spread, or scatter, or diffuse light so as to guard the eye against glare if the unprotected light was too great. This was, of course, only one of the problems of illumination; there were many others. He claimed that a great step had been taken during the last few years in the improvement of sources of light and in their measurement (particularly by the illumination photometers). In ten years' time, a lecturer would no doubt have many more facts to lay before his hearers on a subject the investigation of which had really only just been begun. There was now an Illuminating Engineering Society which they might fairly expect to look after these matters.

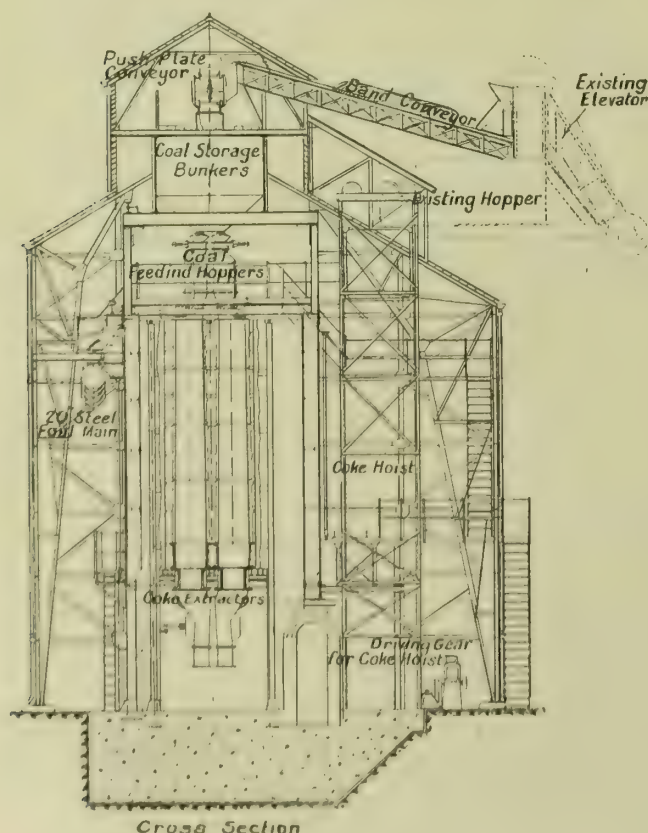
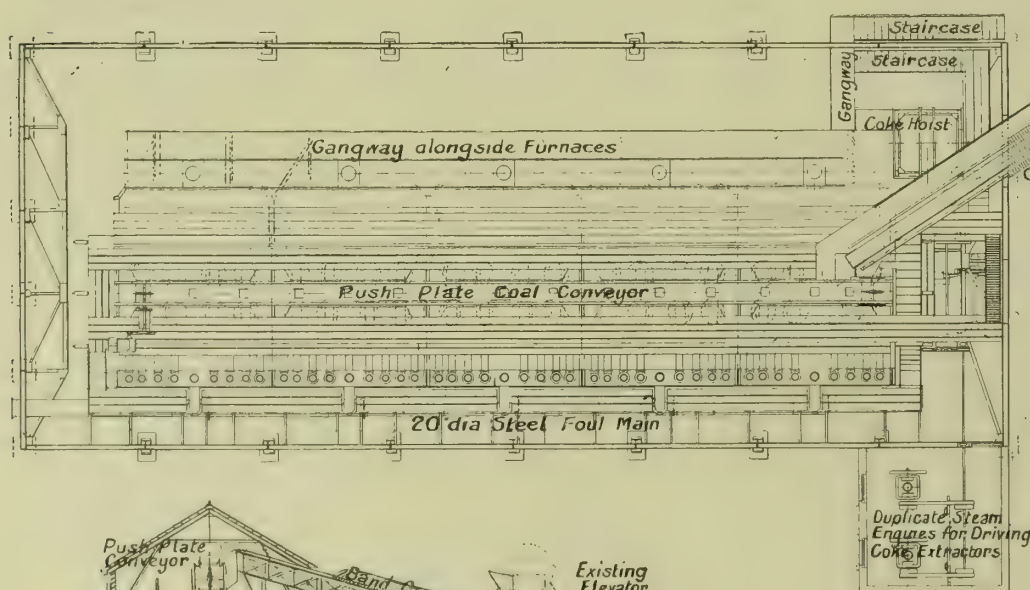
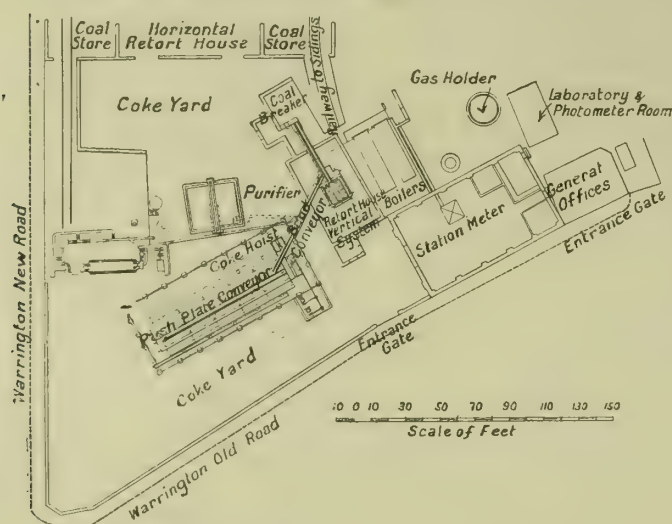


## THE EXTENSION OF THE GLOVER-WEST VERTICAL RETORT SYSTEM AT ST. HELENS.

ONE of the interesting features at the recent meeting of the Manchester Institution of Gas Engineers was the display of a number of drawings by Mr. Samuel Glover, with an extempore description, relating to the projected extension of the Glover-West vertical retort system at the St. Helens Corporation Gas-Works. Then it was a project advised by Mr. Glover, and accepted by the Gas Committee, but awaiting the sanction of the Town Council. To-day, the contractors, West's Gas Improvement Company, Limited, have the mandate of the Council to proceed with the work, in accordance with the proposals the Company have sub-

mitted to meet the requirements of the Corporation Gas Engineer. The matter came before the Council last Wednesday; and the recommendation of the Gas Committee was unanimously confirmed, as it was expected it would be. From the very beginning of the working of the original installation of eight retorts (to which working carbonizers for gas production the world over have had their eyes directed), the Gas Committee of the Corporation have been enamoured of the results. They could not be otherwise. Apart from the fact that the setting, though incorporating new principles, has given such little trouble, the results, with the same local coal as used in the horizontal retorts, were of such a superior character that the economy and additional profit appealed to men largely engaged (as are the members of the Committee) in other classes of industry and commerce, as marking an acceptable advance. It is not, therefore, a matter of surprise that they have given—considering, too, that a question appertaining to the site came in—hearty approval to the extension of the system, which in every respect has afforded proof of conspicuous merit.

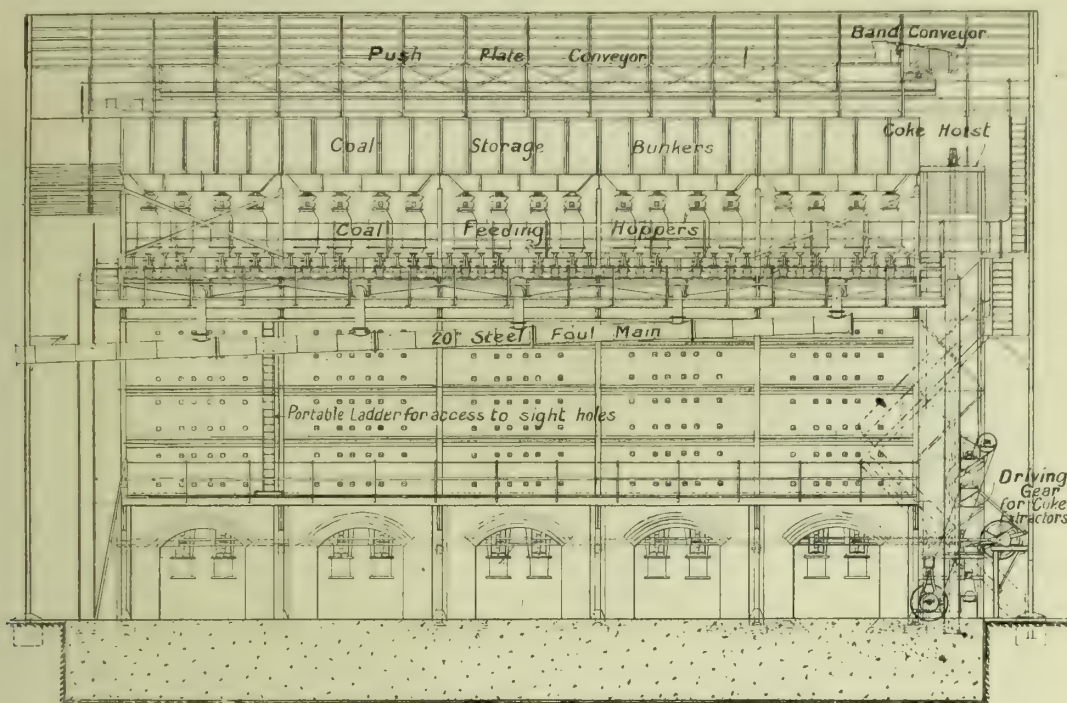
In view of the fact that the Corporation had not adopted the Gas Committee's recommendation (though there was no doubt as to their acceptance of it) at the time Mr. Glover explained the extension proposals to his confrères of the Manchester Institution, it was then a little premature to publish the plans and drawings as a concrete scheme fully authorized for materializing. But now, owing to the endorsement of the Council last week, we are in a position to present our readers with a plan, cross-section, and elevation of the extension settings, together with a ground plan



showing the portion of the gas-works site to be devoted to the new plant. The site, it will be observed, is of somewhat awkward shape; and certainly its dimensions would not allow of a retort-house of suitable capacity being erected on any other system. Here we have a point for consideration in the contemplation in other works of carbonizing plant extensions. While this site is not appropriate for retort plant on the older systems, it will admirably accommodate an installation of verticals, the ground space required for which is much less than that needed for horizontals with power machinery. There may be many a piece of ground in other works that can be utilized in similar manner. The point was made when the first setting of eight retorts was described in our issue of June 8 last. It was then remarked: "Owing to the saving in space that can be effected with vertical retorts, the system will enable a large extension of the carbonizing plant to be made within the boundary of the land belonging to the Gas Estate. An additional machine-charged horizontal retort-house would be out of the question; and the present retort-house, with horizontal retorts charged and discharged by West's manual machinery, cannot be extended. If the plan is referred to, a projected extension on the vertical system will be seen. The site represents the little remaining property, within the public roads surrounding the works, belonging to the Gas Department. This is now occupied by the old plunge baths of the town and other buildings. But it will be sufficient to enable an extension of the carbonizing plant to be made on the vertical system; and thus the necessity of going to another site (already secured) will be deferred, as well as the consequent large expenditure."

The proposed installation comprises forty retorts in all, and as the retorts are designed to carbonize 3 tons of coal a day, it may





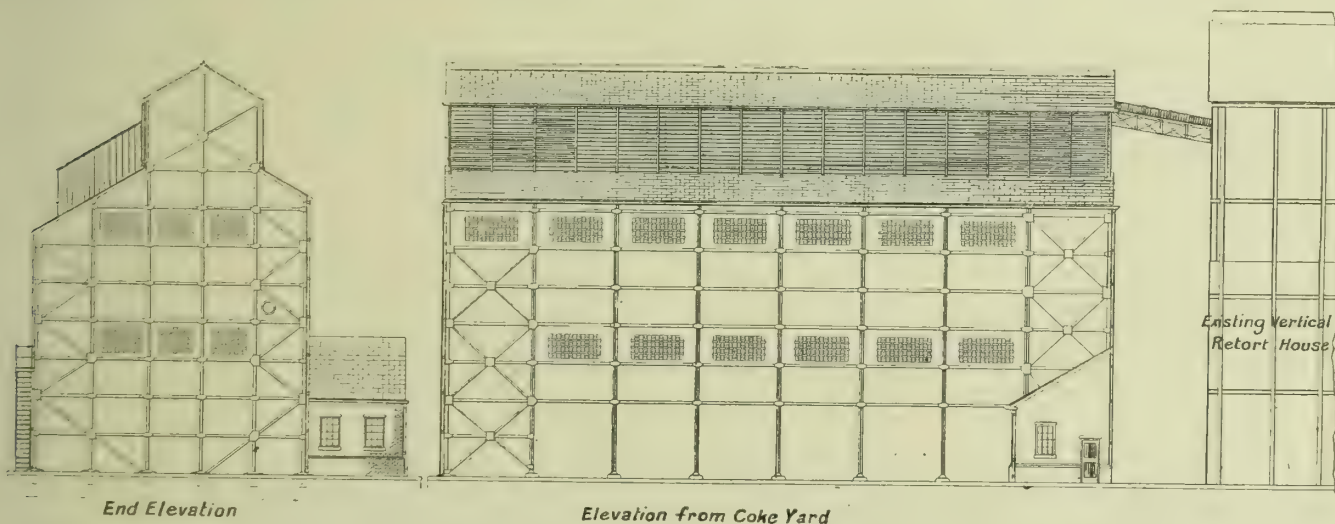
Longitudinal Elevation of Retort Bench

be taken that the new settings will be capable of daily carbonizing approximately 112 tons of coal. Being on the continuous system of working, the quantity of coal dealt with per day per retort can, of course, simply by regulating the rate of discharge, be varied at will. At the Manchester Institution meeting, Mr. J. G. Newbigging mentioned the installation of the system that his Committee are making at the Droylsden works at Manchester; and it is interesting to note that the retorts there are of the same section and capacity as those that are about to be erected at the St. Helens works.

The plans and drawings are self-explanatory; but it may be added that the contract (which is to be completed and the retorts ready for working next winter) entrusted to West's Gas Improvement Company, Limited, embraces the retort-house building, the

whole of the materials comprised in the five beds of eight retorts, with retort-bench fittings, discharging gear, firebrick and silica materials, coal-handling plant, storage-hoppers, &c.

Reference has been made to the first published description of the original St. Helens installation (which continues its work without interruption) in our columns on June 8 last. Accompanying that description were the results of working tests with the local slacks and nuts by Dr. Harold G. Colman and Mr. J. E. Blundell. But readers may be reminded that from time to time in subsequent volumes of the "JOURNAL," there have appeared the results of substantial trials made by Dr. Colman (quite independent of control in any way by Mr. Glover or West's Gas Improvement Company) with other, and for gas making the more commonly used, varieties of coal.



## THE CAUSES AND RANGES OF VARIATION IN CALORIMETRIC TESTS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

(Concluded from p. 575.)

### SIGNIFICANCE OF THE NET CALORIFIC VALUE OF GAS.

THE recent remarks of Dr. C. Vernon Boys, F.R.S., upon the relative value of calorimetric tests stated as "gross" or as "net," are worthy of consideration. Quoting from the "Journal of the Society of Chemical Industry" for Dec. 15, 1909 (p. 1236), he says:

In taking a net test, the heat due to the condensation of most of the steam, and the cooling of the resulting condensed water to the outlet temperature, was subtracted from the total observed heat; but this did not represent any actual use of the heating power, as the heat given out by the permanent gases in cooling from the boiling-point to the outlet temperature was included in the net value. The figure so obtained was absolutely artificial; it meant nothing.

This valuable opinion may well be divided into two portions:

(1) The statement of the worth that attaches to the gross value, and in this the present writer entirely concurs; (2) the statement that the net value is of doubtful worth or utility. As to this, an explanation would appear to be necessary, because only in a rigid and restricted sense can it be said that net value means nothing. Probably if Dr. Boys' views had been more fully set forth, the statement would read as follows: The net value does not correspond to any one chemical reaction or physical change. This would, of course, be correct. Again, the statement that the net value is absolutely artificial, is doubtless correct; but, in the writer's opinion, this is no proof of its being useless. On the contrary, there are good reasons for retaining it—reasons that very likely operated in the minds of those who first put forward the net value, whoever they were.

The factors that come into operation between 100° C. and atmospheric temperature—say, 18° C., the standard temperature of Thomsen's calorific data, or 15.5° C. = 60° Fahr.—are as follows: (a) The sensible heat in the nitrogen, oxygen, carbon dioxide, and water vapour forming the products of combustion. (b) The latent heat of liquefaction of the same. (c) The changes of specific heat of the same. Now, if these three proceeded along perfectly parallel lines throughout this range of temperature, the



matter would be simplified, and it would be possible to attach a simple interpretation to the net value—say, as being all heat available above the boiling-point of water. But although its signification would be definite, yet its estimation would be more difficult than the present procedure, and further would have the disadvantage of not being an index to the hydrogen content of the gas.

As a matter of fact, however, the properties mentioned do not, through the given range of temperature, behave similarly for all components of the products. The principal departure from such uniformity is due to the change of physical state of the water as it is cooled below 100° C. This change involves two factors: (a) The latent heat, which at 100° C. is 9660 Cal. for every 18 grammes of water; and (b) the change of specific heat by weight from 0.4805 as vapour to 1.0 as liquid. Now, while it is true that similar physical facts would apply in relation to the other constituents of the products, if they were cooled below atmospheric temperature down to their several points of liquefaction, yet as this behaviour is outside normal practical usage, it is not brought into any reckoning of the net value.

Dr. Boys' adjective "artificial" is, to the extent indicated, justified, because "net value" deals with water vapour differently from what it does with the other products of combustion. The justification for that artifice is that water vapour is the only one that changes its physical state within the range of ordinary working temperature; and the effect thereof has a bearing upon the value of a gas in its flame temperature.

The gross value is made up of two parts: (1) The heat of combustion of both carbon and hydrogen; and (2) the heat due to change of the physical state of the water produced by the hydrogen. Now, the first may be regarded as kinetic energy put into the products of combustion, capable of raising them to a high temperature, and thus of doing work. But the second does not contribute to rise of temperature; on the contrary, it only makes its appearance at the point of liquefaction. To determine the temperature of a flame—say, in an incandescent mantle—by calculation from its chemical composition, it is permissible only to use the net value, since the heat of liquefaction of the water vapour merely comes into existence at a subsequent stage.

Hence, while *net value*, as now understood, is a convention, yet, when properly defined, it is a most useful quantity. It is, moreover, capable of being ascertained with a high degree of accuracy if the necessary precautions are observed. Further, it is possible to calculate easily therefrom a figure which would represent a definite function, relative to the flame temperature, as will be subsequently explained. The information that gross and net values together give of the chemical make-up of the gas, is worthy of recognition; and it is not desirable that either of them should be abandoned. On the contrary, it will be found that this information, when supplemented by an analysis of the exit gases from the calorimeter, which tells the carbon dioxide, goes a long way towards fixing the quality of the gas, not only as a heating but as an illuminating agent.

The magnitudes of the heat changes from 100° C. to 18° C. of the *exit gases*, when the theoretical air supply is employed for the sample of gas herein adopted, are as follows:—

Latent heat of the water vapour—  
1.7294 grammes × 0.5367 Cal. . . . . = 0.928 Cal.  
Sensible heat of the water vapour—  
1.7294 grammes; 82 × 0.831 small calories . . . = 0.068 Cal.

Against an almost equivalent quantity of heat in the inlet gases varying with their relative humidity.

Sensible heat of the carbon dioxide—  
26.02 grammes; 82 × 5.629 small calories (see  
Section III., Table I., ante p. 356). . . . . = 0.461 Cal.  
Do. of the nitrogen—  
139.31 grammes; 82 × 33.961 small calories (see  
Section III., Table I., ante p. 356). . . . . = 2.785 Cal.

Permanent gases in exit give a total of . . . . . 3.246 Cal.

There are thus 3.246 Cal., ± a quantity dependent upon the volume of the air supply and its relative humidity, that would need to be further deducted from the net value as ordinarily ascertained, to obtain a value that should represent the utility of the gas for all purposes where the products of combustion escape gaseous at 100° C.

We must now ascertain what is the amount at present deducted for the water which is condensed within the calorimeter, produced by the combustion of hydrogen. In the example chosen, this water as vapour occupies 1.24 cubic feet, and yields to the calorimeter heat as follows:—

	Calories.
Sensible heat—	
26.94 grammes × 82° = 2209.08 × specific heat of 1 .	= 2.209
Latent heat at 100° C—	
26.94 grammes × .5367 Cal. latent heat per gramme .	= 14.459
Ordinary deduction from gross to obtain net value . .	16.668

From this we learn that the heat in question for the whole of the products is 16.668 + 3.246 ± *x*, or approximately 20 Cal. and that about five-sixths of the same is covered by the present practice, while about one-sixth is not assessed. But, strictly, the sensible heat equal to 2.209 Cal. should be further considered. It represents the heat capacity of the water after it has become liquid—viz., when its specific heat is 1, as against a specific heat 0.4805 in the state of vapour. For it is only the difference between these two specific heats that, by a strict interpretation, should be included in the total attributed to physical change as distinguished

from the chemical combination or true combustion. The figures showing this division are as follows:—

2209 × sp. ht. 0.4805 . . . = 1.0615 Cal. sensible heat as vapour.  
2209 × sp. ht. inc. 0.5195 . . = 1.1476 Cal. additional sensible heat as liquid.  
Corrected total heat change }  
due to liquid state . . . } = 14.459 + 1.147 = 15.606 Cal.

The deduction for net value would thus, on a strict basis, be 15.606 Cal., in lieu of 16.668 Cal., or 93.64 per cent. of the present practice, as applied to this particular sample.

The following shows the same principle applied to hydrogen:—

	Calories.	Percentage of Gross.
2 grammes at 18° C. burnt, and products cooled to 18° C. . . . .	= 68.360	100.00
Deduct from ditto—		
Latent heat at 100° C. . . . .	9.660 Cal.	
Sensible heat as liquid at 82° C. 1.476 „	11.136	16.29
Present practice for calculating net value .	57.224	83.71

The alternative estimation of net value would be as follows:—

	Calories.	Percentage of Gross.
Gross value as before . . . . .	68.360	100.000
Deduct from ditto—		
Latent heat at 100° C., as before. . . . .	9.660 Cal.	
Sensible heat of liquid in excess of that of vapour (1476 × 0.5195). . . . .	0.767 „	1.123
Alternative net value . . . . .	57.933	84.747

That is, a consistently computed net value would have a figure as to the hydrogen content of 84.747 per cent., against 83.71, or 1.037 per cent. higher than by the present practice. This does not appear to be a sufficient difference to justify an alteration of the existing rule, which is applied throughout the civilized world. But if, as Dr. Boys points out, a strictly scientific statement is desired, then it can easily be ascertained by calculating 15.253 Cal. for every 16.29 Cal. at present returned. In the example of coal gas, the disparity is 16.668 — 15.606 = 1.062 Cal. in one aspect of the case, and about 3.246 Cal. in another. The former can be easily adjusted from the present system of returns, if exact comparisons are desired; while the latter is disregarded both in the existing and the alternative method. Continuing to ignore it is justified by the difficulty of ascertaining its exact magnitude, and by the absence of any utility when the figures are found, either precisely or approximately. In other words, the existing rule as to determining the net calorific value from the gross is in accordance with a definition which is intelligible, and which if carried out with accurate data, yields results that are useful.

The French practice of speaking of the net value as that with water as steam, and the gross as that with water condensed, carries, upon the face of it, the explanation, which includes no reference to any method of using the gas, or realizing the heat below 100° C. It is possibly through the introduction of the latter conception that misunderstanding has arisen. The factor of 1.86 Cal. per cubic centimetre of water collected for the condensation value, as in the Gas Referees' "Notification," would become 1.74 Cal. if the alternative method described were made use of for any purpose.

## Masonic.

In consequence of the serious illness of Bro. John Mackay, the W.M. Elect of the Northern Star Lodge, No. 3053, the Installation Meeting, which should have taken place on the 25th ult., was postponed (by dispensation) until Friday last. Bro. Mackay, however, was still unable to attend; and, consequently, W. Bro. Wm. Batt was continued in office until Bro. Mackay's recovery to assume the position to which he was elected. The officers appointed for the ensuing year were: Bro. G. B. Smedley, of Swadlincote, S.W. Illness, however, prevented him attending to be invested. Bro. H. Barker, of Buxton, was invested as J.W. W. Bro. J. W. Scott, of Stockport, was appointed Chaplain, but was not present to be invested. The Treasurer and Secretary were re-appointed—namely, W. Bro. Walter Whatmough, of Heywood, in the former office, and W. Bro. R. G. Shadbolt, of Grantham, in the latter. The other officers were: Bro. Fred. J. West, of Manchester, S.D.; Bro. S. Meunier, of Stockport, J.D.; W. Bro. William Prince, of Stoke-on-Trent, D.C.; Bro. T. W. Jordan, of Stockport, Organist; and Bro. James M'Ewan, of Manchester, I.G. The Stewards were: Bro. S. E. Halliwell, of Littleborough, Bro. E. O. Watson, of Rawmarsh, Bro. E. J. Wellens, of Hebden Bridge, and Bro. John Bond, of Southport. W. Bro. S. R. Ogden, of Blackburn, was re-appointed Charity Representative. The annual banquet was subsequently held; W. Bro. Batt, who occupied the chair, being presented with the Past Master's Jewel as a slight acknowledgment of his services during last year.

Mr. A. Scott, who has been Manager of the Markinch Gas Company for 36 years, has tendered his resignation. The Directors have accepted it with regret, and have voted him a retiring allowance.

The number of the "Journal des Usines à Gaz" for the 5th inst. contains a notice of the life-work of M. Emile Leclerc, whose death, at the age of 73, occurred early last month. Deceased was the Engineer of the Compagnie Centrale du Gaz, of Paris (Lebon et Cie.), and was President of the Société Technique in 1885-6.



HIGH-PRESSURE INCANDESCENT GAS LIGHTING FOR MILLS.



The Weaving Room at the Blackstaff Company's Factory, Belfast.  
[Photograph taken by Incandescent Gaslight.]

THE Blackstaff Flax Spinning and Weaving Company, Limited, of Springfield Road, Belfast, are now well into their second season's experience with high-pressure incandescent gas lighting. The pressure is raised to 55 inches by means of a rotary blower; the drive being taken off the shafting in the mechanics' shop attached to the mill premises. The blower is in duplicate, for prudential reasons—both being supplied by the James Keith and Blackman Company, of London.

The three interesting photographs accompanying these notes (recently taken by Mr. A. R. Hogg, of Trinity Street, Belfast) show how clear and penetrating the light is, and amply justify the high opinion held by the Company of this system of gas lighting. The principal portions of the premises lighted are spinning rooms Nos. 2 and 3, the winding room, reeling room, and weaving sheds. These apartments were formerly lighted by 809 No. 7 (Bray) flat-flames, which have now been replaced by 594 high-pressure incandescent burners, of either 150 or 100 candle power.

The consumption per No. 7 Bray union burner may be taken as 7 cubic feet per hour at 15-10ths. The pressure in some parts of the building might be more, and in some parts less. Some of the burners, again, would be more worn than others. The illuminating power per burner, for 7 cubic feet per hour, may be assumed to be 2.75 candles per cubic foot = 19.25 candles per burner. Taking these figures as a basis for calculation, the following results are obtained:—

Number of No. 7 Bray burners . . . . .	809
Total consumption per hour . . . . .	5663 cubic feet
„ cost per hour (at 1s. 9½d. per 1000 cubic feet) . . . . .	10s. 1½d.
„ illuminating power . . . . .	15,573 candles
Cost per candle per 1000 hours . . . . .	7.8d.

The 150-candle power burners consume 2½ cubic feet, and the 100-candle power burners consume 2 feet per hour each. The actual figures from practical working at the Blackstaff Mill are a fraction under the above. The results shown on next page are therefore obtained.



The Spinning Room.



The Reeling Room.



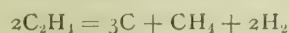




of a penalty for non-maintenance would entail very careful supervision and examination. The calorific value is subject only to much smaller fluctuations, and so in itself would be more easily controlled.

In the old days of flat-flame illumination, and the necessity of having a high candle power gas, engineers soon realized the possibilities of enrichment of the gas by means of benzol, &c.; and it was customary to increase the candle power of the gas produced by charging it with some good illuminating body. With the introduction, therefore, of a high calorific value—assuming it to take the place of the present standard—there is no doubt that some processes would be elaborated for the "enrichment" of the calorific power. A short consideration of the composition of coal gas, and the use of each constituent, suggests various directions from which such a process might spring. In an average sample of gas, the constituents can be divided into three classes broadly. Thus (1) Illuminants—ethylene, acetylene, benzene, &c., about 6·5 per cent. (2) Diluents—which contribute the main heating effect—hydrogen, marsh gas, and carbon monoxide, about 90 per cent. (3) Impurities—nitrogen, carbon dioxide, and sulphuretted hydrogen—about 3·5 per cent. The heating effect of coal gas is due almost entirely to the gases in the second class—and especially hydrogen and marsh gas; those in the first class contribute all the light and very little heat. If, then, the production of a heating gas is the chief object, we must aim at increasing the proportions of hydrogen and carbon monoxide at the expense of the acetylene, ethylene, &c.

The temperature of the hydrogen flame in air is one of the highest attainable by any gas flame; and therefore the addition of a small amount of this gas to the coal gas should have beneficial results as far as heat is concerned. The question then arises as to how the amounts of these gases can be increased. It is well known that high heats in carbonization result in the production of a lower candle power gas. This is due to the fact that the unsaturated hydrocarbons are partially decomposed into saturated bodies, free carbon, and hydrogen. Thus, ethylene when strongly heated breaks down, forming marsh gas, hydrogen, and carbon—



This hydrogen may pass into the coal gas unchanged, or may unite with oxygen and pass over as steam. The combination of a water-gas process with the manufacture of coal gas is also a possibility. No doubt, with the adoption of a calorific test, some such arrangement would be resorted to; but all depends on the imposition of the test by the Government.

The double penalty will be doubly hard, as it necessitates the production in full of both the first and second groups referred to above, and, as has been shown, the functions of these groups are diametrically opposed—the quantity of one can only be increased at the expense of the other. If a standard is imposed, it ought to be a sufficiently high one—say, 500 B.Th.U.; and it is to be hoped that the Government will take all circumstances into full consideration before inflicting such a hardship on the gas industry at large as the imposition of a high double standard would be.

## EXPERIENCES WITH SEMI-VERTICAL RETORTS, & NOTES ON CARBONIZING SYSTEMS AND RESULTS.

By ALFRED T. HARRIS, of Market Harborough.

[A Paper read before the Midland Association of Gas Managers, March 3.]

In fulfilment of a promise made some time ago, I have now the pleasure of laying before you particulars of the setting of semi-vertical retorts of the angle known as Love's "Forty-fives" erected at these works, and my experiences as to their working.

An increased demand for gas rendered an extension of the carbonizing plant necessary during the summer of 1908; but having erected a new retort-stack with full-depth regenerator settings in 1900, no reconstruction was necessary—the extension being merely required to provide for the increased output, which, it may be remarked, has risen from 33 million cubic feet in 1900 to 53½ millions in 1910. During 1907, experiments extending over several months were made with heavy charges in the horizontal settings; and so satisfactory were the results, both as regards increased yield of gas, better quality of coke, and freedom from choked ascension pipes, that I decided, subject to the approval of my Committee, that the extension should be of such a system as would permit of the advantages of the full retort being obtained.

It may be stated that, owing to the difficulty of drawing the coke by hand from horizontal retorts with full charges, I have been reluctantly compelled to revert to the six-hour charges. With a view, however, of returning to the system of full charges as soon as possible, the whole of the horizontal retorts are being converted to throughs as renewals of the settings occur, which will thus permit of a mechanical appliance being used to discharge the coke. After inspecting the Guildford setting, it was decided to adopt the principle of the "forty-fives" so far as the angle was concerned. And here may I be allowed to express an appreciation of the kindness the writer and his Committee received at the hands of the late Mr. G. R. Love, who, whatever the future of the system may be, was undoubtedly the pioneer in applying the principle of full charges to inclined or semi-vertical retorts.

The setting at Market Harborough differs from the original Guildford setting in several respects; the latter being of the shallow regenerator type, and the feeding door of the producer being placed on the charging side, about 7 feet above the ground level. Having regard to the satisfactory results obtained from the horizontal settings here, it was decided to put down a full-depth regenerator of the same design as those already in use; so that, in the event of the new setting proving a failure, the work up to the ground level could be utilized for a bed of horizontals (the new bed being a continuation of the existing retort-stack), while the setting is so designed that the producer is fed direct with hot coke from the discharging side.

The setting consisted of eight retorts, each 11 feet long, □ shape, tapering from 20 in. by 14 in. at the top to 22 in. by 16 in. at the bottom; the taper in the retort being adopted to facilitate the discharge of the coke. The height of the roof would not permit of longer retorts being put in; and as the erection of the bed was practically in the nature of an experiment, it was decided not to incur any expense in raising the roof until it was proved that the results would justify the expenditure. The mouthpieces, ascension pipes, hydraulic main, tar-tower, &c., are of the usual pattern; the gas being taken off at the top end of the retort.

The elevator is driven by a 5½ B.H.P. National gas-engine, and discharges the coal into an overhead bunker of 8 tons capacity, from which the movable charging hopper is fed. The shoot of the charging hopper is arranged so that each tier of retorts can be charged at will; the charging of each retort being, in the first instance, operated by one lever, the stop-plate controlling the

discharge of the coal being at the point where the vertical shoot is attached to the hopper.

On starting the setting to work in November, 1908, troubles soon commenced to arise. In the first place, the heating of the setting was not so regular throughout as could be desired, as, if satisfactory heats were obtained in the two outside retorts in the top tier and the two bottom retorts, the heat of the retorts in the middle tier, more especially the central retort, was too intense. This, however, was not the greatest trouble, as, right from the commencement, excessive back-pressure on the bottom mouthpieces of the two bottom tiers of retorts arose. This pressure usually commenced when the charge had gone about two-thirds of the period required for carbonization, rising to its greatest until to about one-and-a-half hours before the completion of the charge being carbonized, when it gradually fell to *nil*. A pressure-gauge was fixed on one of the bottom mouthpieces, and as much as 7 inches of pressure registered.

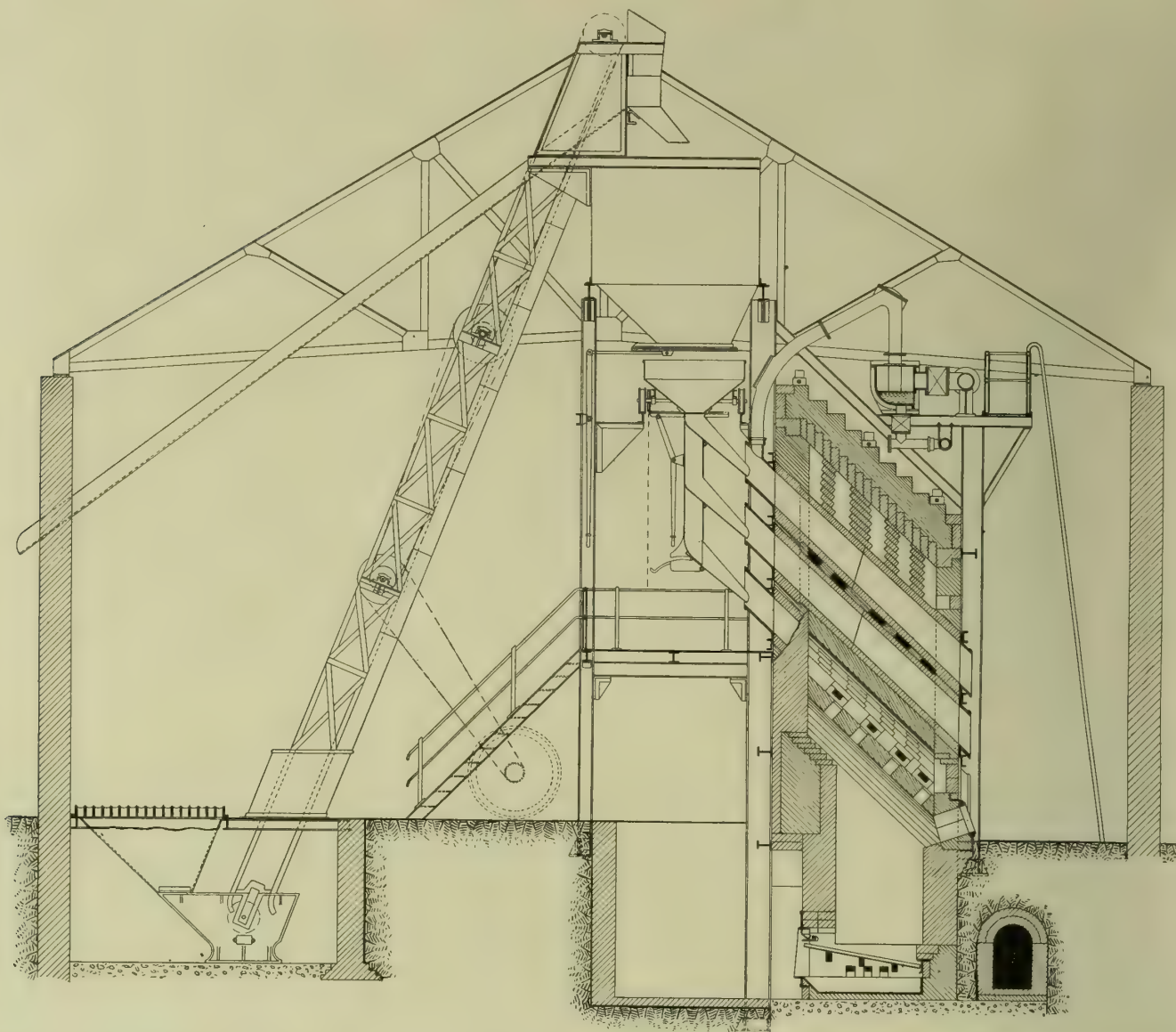
This back-pressure resulted in the rapid formation of carbon on the retorts, more especially on those in the centre tier, which were the hottest, and from which the greatest trouble in both respects was experienced. Very little trouble arose with the top tiers of retorts; a little pressure being only occasionally experienced with coals that expanded on carbonization. This applied to certain Yorkshire and North Staffordshire coals; no trouble occurring with Derbyshire coals. But although the trouble did exist in the two lower tiers with the latter coal, it was not so great, nor extended over so long a period, as with the better class of coal.

These conditions pointed out that the trouble, apart from that relating to the heating of the retorts, arose principally from two causes: (1) The character of the coal used; and (2), the density of the coal within the retort. With regard to the latter, it will be noted that in the top tier of retorts, where the coal practically slides from the charging hopper into the retort, very little trouble was experienced; but in the lower tiers, where the coal had a drop of 3 ft. 6 in. and 6 ft. 6 in. respectively on to the branch shoot into the retort, this not only caused the coal to be broken into smaller particles, but, by the greater velocity gained, it resulted in the charge being more compressed, and of a more dense character, than that in the upper tier of retorts.

Some relief was obtained in reducing the rate of feed of coal into the retorts; but with the better class of coals, the trouble more or less remained during the period the retorts were working, which extended into the Spring of 1909, when, with a view of remedying the defects referred to, the setting was put out of action. A twenty-four hours' test of the working results was made, which showed a production of only 8000 cubic feet per mouthpiece, with a yield of 11,400 cubic feet per ton with South Yorkshire coal. Having regard to the fact that the distance between the front and back wall of the setting (inside measure) is only 5 ft. 4 in., as compared with 8 ft. 9 in. in our horizontal settings (these retorts being 10 ft. 3 in. long over all and the producer being practically of the same size as those in the horizontal beds of eight), it will be seen that, after deducting the space occupied by the transverse walls, there is not nearly so much space available for the combustion and travel of the gases as in the horizontal settings.

Being convinced that the working of the producer was right, and that more room was required in the setting for the combustion and travel of the gases, it was decided to take out the centre retort in the middle tier; thus making room for a much larger





Bench of Eight Semi-Vertical D Retorts—20 inches by 14 inches to 22 inches by 16 inches—Erected at the Market Harborough Gas-Works.  
Heated by Drakes Patent Tube Regenerator Furnace.

combustion chamber. A curtain arch was also built in the producer, so as to convey the furnace gases nearer to the lower end of the retorts, where the heating had not been so good as near the upper ends.

Having regard to the fairly satisfactory working of the top tier of retorts, alterations were also made in the charging shoot, by the insertion of two movable stop-plates in the vertical shoot immediately above the branch shoots which feed the middle and lower tier of retorts. Prior to charging the retorts in either of these two tiers, the coal is allowed to fall down the vertical shoot on to the stop-plate above the retort intended to be charged; and on withdrawing the plate the coal slides into the retort—the rate of feed being easily controlled by the operator. A movable iron plate is inserted in the mouthpiece during charging, which enables the coal to slide freely into the retort, clear of any tarry matter lying on the mouthpiece.

The setting was brought into use again early in October last, and has been working continuously to date. The alteration to the setting has resulted in the more even and better heating of the retorts, while the trouble from pressure on the bottom mouthpieces has entirely disappeared, provided due care is exercised in regulating the feed of coal when charging the lower part of the retorts. The rate of the formation of carbon has not been nearly so great as in the previous winter; but it is still in excess of that taking place in the horizontals, and accumulates quickest in the hottest retorts, these requiring cleaning every six or seven weeks. There has not been complete immunity from stopped ascension pipes; but these are of very rare occurrence, and only with the pipes from the top retorts. The deposit is of a very soft nature and easily removed.

The fuel consumption is similar to that in the horizontal settings. The coke produced is of a superior quality to that obtained from the horizontal settings; being larger, denser, and heavier, and practically free from breeze. The majority of the charges require a little assistance in the discharge, very few coming down completely of their own accord; but, generally, very little trouble is experienced in fetching them down.

Since the setting was started in October, it has not been possible to carry out tests over an extended period; but the result of a short test recently made shows the productive capacity to be equal to 9500 cubic feet per retort per diem, with a yield of 12,300 cubic feet of gas per ton of coal carbonized; the gas being

15'80-candle power tested with a No. 2 "Metropolitan" burner. The coal used was South Yorkshire and Derbyshire nuts.

It is impossible to give any figures relating to working costs, as, being a small unit, only a portion of the stokers' time is occupied in working the bed.

The charges in the two top tiers of retorts are of nine hours' duration, and the two bottom retorts eleven hours' duration; the weight of the coal in each charge being slightly under 7 cwt. There is no doubt, that a great saving in labour is effected by this system; but expectations in regard to producing capacity have hardly been realized, due to the long length of unworkable retort in the front and back walls; the proportion being considerably in excess of that in horizontals.

The carbonizing results from this setting, in conjunction with the horizontals, during December were as follows; the largest make in twenty-four hours being 237,000 cubic feet.

Gas made	6,670,000 cubic feet
Average make of gas per diem	215,161 " "
Number of retorts at work	25
{ 18 horizontals	
{ 7 semi-verticals	
Average make of gas per retort per diem	8606 cubic feet
Number of stokers	6
Average make of gas per stoker per shift	35,860 cubic feet
Coal used	550 tons
Gas made per ton of coal	12,127 cubic feet

The coal used was 30 per cent. each Derbyshire and North Staffordshire, and 40 per cent. South Yorkshire.

The subject of carbonization has never in the history of gas manufacture received such universal attention at the hands of gas engineers as at the present time and during the past two or three years. Recent experimental and research work has resulted not only in the reintroduction of old ideas in the form of heavy charges, but has also brought into actual practice systems which hitherto could only be regarded as in the experimental stage. This refers more especially to vertical retorts, and also to the introduction of machinery, which has enabled the advantages of heavy charges to be applied, not only to existing settings of horizontal retorts, but also to permit of carbonization in bulk in chamber settings.

The methods of carbonization may now be described as continuous and intermittent; the introduction of the vertical retort having, through the ingenuity and perseverance of Messrs. Woodall and Duckham and Messrs. Glover and West, been the means by





A Corner of the Retort-House at the Market Harborough Gas-Works.

which the ideal method of continuous carbonization has become practicable. In a communication by Herr E. Körting, of Berlin, on "Modern Methods of Carbonization" (an abstract of which is given in the "JOURNAL OF GAS LIGHTING" of Jan. 11 last), it is stated that an advantage of continuous carbonization is the complete absence of smoke; but it presents the following disadvantages: (1) Separate charging and discharging mechanism is required for each retort. (2) The continuous movement of the whole contents of the retort cannot possibly be advantageous to the coke. The economy of the system would be thoroughly dubious if the reduced durability of the coke increased the quantity of coke breeze by only a small percentage of the coal carbonized. (3) It is impossible to inspect the inside of the retorts (because they are always quite full) and ascertain if they need repair and whether the coal is properly disposed in them. Whether these supposed disadvantages are not more imaginary than real can now be proved by the experience gained in the working of such systems in actual practice. I hope reference will be made to these points in any discussion that may arise.

The intermittent system of carbonization is also applied to vertical retorts, the most prominent of which is the Dessau system. Having regard to the trouble experienced by the writer in respect to the pressure in the lower part of the semi-vertical retorts, it would appear that any system of vertical retorts in which the coal is allowed to drop for a considerable distance, and so become compressed, must be subject to the same drawback, and more especially with coals that expand during carbonization. Reference to this point directs one to the interesting study of the travel or passage of the gas from retorts with full charges.

The absence of pressure in the lower part of the semi-vertical retorts during the earlier stages of carbonization points to the conclusion that during this period the passage of the gas is through the centre or core of the charge, but that during the later stages of carbonization, when this centre or core becomes fluxed, the gas is forced to make its exit through the passages offering the least resistance, which is either through the coke itself or between the coke and the walls of the retort. With coals that swell considerably during carbonization, rendering the coke very dense and compressed tightly against the sides or walls of the retorts, very great resistance to the passage of the gas occurs; and in such cases the rapid formation of carbon must inevitably result, reducing the capacity and rendering frequent cleaning of the retorts necessary.

In the continuous system with the vertical retort the same conditions do not obtain in this respect as in the intermittent. In the former, the drop of the coal is very short. Moreover, the coal is not completely carbonized until nearing the bottom of the retort; thus leaving the centre or core open over the greater length of the charge for the free passage of the gas—the fluxed condition only extending over a comparatively short distance, and this at a point where the coke does not press heavily on the sides of the retorts. In the intermittent system, the conditions being approximately the same throughout the whole length of the retort, it is only reasonable to suppose that, under certain conditions, very great resistance to the exit of the gas generated in the lower part of the retort during the later stages of carbonization must occur. The rapid formation of carbon which must occur under these conditions must necessarily have a prejudicial effect, not only on the make of gas, but also on the life and working of the retort.

The advantages claimed for vertical retorts are too well known to require repeating here, and experience of their working in this country has apparently been too short to enable any disadvantages that may actually exist to be recorded. Personally, I am of opinion that vertical settings will not adapt themselves to intermittent use so readily as horizontals or inclines, as the construction and size of the retorts do not permit of their being so easily repaired.

The writer is informed that on the Continent considerable trouble has occurred in restarting settings to work, owing to the difficulty in executing repairs which are always necessary after a setting has been put out of action, consequent upon the contraction of the material on cooling and the resultant cracking of the retorts.

Retort-house practice, even with existing plant, has made great progress during the past two or three years, consequent upon the introduction of machinery which has enabled horizontal retorts to be adapted to the latest methods of carbonization. Mr. Bell, in his paper on "Carbonization," read at the last meeting of the Institution of Gas Engineers, showed to the fullest the advantages to be gained from heavy charges in horizontal retorts; and it is pleasing to hear from Mr. Bell that the figures given in his paper are fully borne out in his balance-sheet, which is, of course, the most important factor.

A close study of the Derby figures tends to show that the results obtained from the Derby system, so far as yield of gas is concerned, approximate very closely to those obtained from vertical



TABLE showing Yield of Gas and Illuminating Power obtained from Various Systems.

System.		Place of Working.	Name of Coal.	Gas Made per Ton. Cubic Feet.	Illuminating Power No. 2 "Met."	Sperm Value per Ton of Coal.	Calorific Value B.Th.U.
(1) Woodall-Duckham	Continuous vertical retorts	Nine Elms, London	Blackwell and Sutton (Notts.)	12,833	15'18	667	570 gross
(2) Glover-West	"	St. Helens	Thornley, Durham	13,102	15'56	698	514 net
(3)	"	"	(Barrow) Yorkshire silkstone	12,435	16'19	689	522 net
(4)	"	"	Arley mine, Wigan	12,145	15'22	633	516 net
(5) Dessau	Intermittent vertical retorts	Sunderland	Mixture, 4 varieties (Durham)	12,465	16'84	719	559'2 net
(6) Bell	" horizontal retorts	Derby	Screened (Yorkshire silkstone)	12,788	16'25	712	Not given
(7)	"	"	(small nuts)	12,544	15'35	660	"
(8)	"	"	(black)	12,607	15'00	648	"
(9) Glover	" chamber settings	Norwich	Not given	13,247	14'94	677	493'9 net
(10) Meunier	" inclined retorts	Stockport	"	12,807	14'96	656	Not given

retorts. This is borne out by the recent statement by Mr. J. W. Helps at the Manchester meeting in regard to a yield of 13,000 cubic feet of gas per ton of coal being obtained in horizontal settings at the works of the South Metropolitan Gas Company, and which I understand are worked under similar conditions to those existing at Derby. These figures indicate that the horizontal retort is far from being played out, and will still be an important factor in the future production of coal gas, as, apart from the financial liability in respect to existing horizontal plants which prohibits their being scrapped, the introduction of the Fiddes-Aldridge, De Brouwer, and other charging and discharging machines has brought the labour costs in large works down to a point which leaves a very narrow margin of difference between this system and its latest rivals.

The gas results which appear to be obtained from the chamber settings at Norwich are very satisfactory, in addition to which the coke produced is of a much better quality than that obtained from other systems. The ease and reliability with which charges of one ton are placed in and discharged from these chamber settings also point to low labour costs by their adoption, and prove that the system of carbonization in bulk can successfully be applied to gas-works practice.

No information is as yet to hand as to any attempt being made to apply the principle of heavy charges to the ordinary inclined retort, probably due to the difficulty that would arise in fetching down the coke. The results of any tests that may have been made in this direction, even if not successful, would no doubt be interesting. Considerations other than yield of gas and labour costs must be taken into account when considering the relative merits of various systems. Yield and quality of residuals, fuel consumption, wear and tear, frequency and cost of renewals, and relative first costs are all important points to be considered, and can only be determined by experience.

It is gratifying to note that such eminent authorities as Messrs. Samuel Glover, Thomas Glover, and J. Ferguson Bell have promised to take part in the discussion and contribute further valuable information in addition to what they have previously given, and for which the gas industry as a whole is indebted to these particular gentlemen.

The above table shows the results obtained from the various systems referred to in respect to yield of both gas and illuminating power. The figures given do not enable a fair comparison of the results obtained from the various systems to be made, owing to the different character and gas-producing qualities of the coals used. Is it not possible for the Carbonizing Committee of the Institution of Gas Engineers to make arrangements for reliable working tests of the various systems to be made with the same class of coal? If this could be done, it would enable a definite comparison to be made as to the gas producing and other merits of each system. Personally, I am of opinion that the increased yield of gas which is now generally being obtained from the coal is not entirely due to the alteration in former, or the introduction of new, carbonizing methods, but is to a great extent attributable to the improved conditions now generally prevailing in regard to a free and steady passage of gas from the retorts.

The recent invention of Mr. Meunier for preventing the oscillation of the seal in the hydraulic main, and enabling a steady gauge to be maintained within the retort, has, apart from the advantages claimed in respect to the naphthalene trouble, resulted in an increased yield of 1220 cubic feet of gas per ton of coal carbonized. I understand the make of 12,807 cubic feet of 14'96-candle power gas, now being obtained with inclined settings at Stockport, are results which compare favourably with those from other systems.

The retort-house governor has undoubtedly been one of the most important and valuable adjuncts to the carbonizing plant introduced during recent years, as by its use, perfect and steady control of exhaust or pressure within the retorts is now obtainable; and not only is it possible to reduce the seal to any desired extent, but also to dispense with it altogether. One of these governors has been in use at Market Harborough during the past four years; and its adoption has resulted in an increased yield of gas to the extent of about 400 cubic feet per ton of coal—the average make of gas per ton during the above period having been 11,650 cubic feet.

During the past winter, we have dispensed with the seal alto-

gether, except when drawing or charging; and while a large yield of gas has been obtained, no trouble has been experienced either in regard to choked ascension pipes or the control of the illuminating power.

To secure the unsealing of the dip-pipes, a displacing chamber consisting of a cast-iron rectangular box with an open top and fitted with a wood plunger is connected by a 2-inch wrought-iron pipe to the hydraulic main, through which the ammoniacal liquor forming the seal passes to and fro between the hydraulic main and the box. In order to unseal the dip-pipes, the wood plunger is raised from the box to above the seal-level; and to reseal, the plunger is lowered into the box. The raising and lowering of the wood plunger is performed from the retort-house floor by means of a wire rope running on pulleys supported from the roof principals. The plunger is arranged to admit of a displacement of a ¾-inch seal in the hydraulic main. By the above simple means, without incurring expense for anti-dip valves, existing hydraulic mains can be converted into dry mains, with the advantage of the seal being always available. Serrated dip-pipes have also been fitted to three of the horizontal beds; the oscillation of the liquor being less with these than with straight ends—this being observable by sight-glasses fitted to the hydraulic mains.

One of the advantages claimed for vertical retorts on the continuous system is that a hydraulic main is not always necessary—the gas having a free passage from the retort to the take-off pipe. Where a seal is employed and no means taken to prevent oscillation of the liquid forming the seal, the conditions prevailing in the retort itself cannot conduce to the best results being obtained.

It is unfortunate that some scheme cannot be devised whereby carbonizing returns would reflect a reliable indication of the merit of the results actually obtained. The varying qualities of coal used in different works prevent a reliable comparison being made as to the relative efficiency of working; and in many instances where such returns are in the hands of persons unacquainted with the conditions prevailing, the figures often create a wrong impression, both in regard to works showing high and low makes of gas respectively. A separate record may at least be given where the coal-gas plant is augmented by a water-gas or other auxiliary plant, as, unless each gas is measured separately, the figures can only be estimated, and a fair comparison with other works making only straight coal gas cannot be arrived at.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Second Annual Dinner.

Last Saturday evening was the date fixed for the second annual dinner of the London and Southern District Junior Gas Association; and at the hour appointed, a party of about eighty sat down at the Horse Shoe Hotel, Tottenham Court Road. In every way, the function proved a great success; the musical programme (the majority of the contributors to which were members of the Association) being most enjoyable. The chair was occupied by Mr. W. J. Liberty, the President; and he had on his right and left hand Mr. E. Pilbrow, of the Gaslight and Coke Company, and Mr. Henry Austin, of the South Metropolitan Gas Company. Additional interest attached to the event on this occasion from the fact that the meeting of the Joint Council of the Junior Gas Associations had met together earlier in the day in London; and the delegates were therefore able to be present at the dinner. These gentlemen were Mr. James Taylor (President) and Mr. J. Alsop (Secretary) of the Manchester Junior Association; Mr. S. W. Shepherd, President of the Yorkshire Junior Association; Mr. A. O. Jones (President) and Mr. H. E. Temple (Secretary) of the Midland Junior Association; and Mr. A. L. Holton, Secretary of the Joint Council.

The Loyal Toast having been duly honoured, the Chairman proposed "The London and Southern District Junior Gas Association;" remarking that in his opinion the Association never stood in higher esteem with the seniors than it did at the present time. Members found it easy to obtain leave of absence to join the visits; and all possible help was afforded them in the preparation of papers, and in the provision of apparatus for demonstrations at the meetings. Some years ago, it was hard to



find young men who would take a place at the head of the organization; and now the difficulty was to choose from the large number available. He felt sure that in a few years' time they would have many of their present members occupying positions which would qualify them for membership in another Society. He coupled with the toast the name of Mr. D. W. Winslow, one of the oldest Vice-Presidents. Mr. Winslow said he presumed he was called upon to respond in the absence of Mr. W. Upton, who he knew had the interests of the members much at heart, and had helped greatly to put the Association on the splendid footing it occupied now.

"Our Visitors," coupled with the names of the delegates of the English Junior Gas Associations and Mr. Pilbrow, was submitted by Mr. L. F. Tooth, the Senior Vice-President, who offered them a hearty welcome and the sincere thanks of the Association for the compliment conveyed by their presence. The delegates had, he remarked, attended a conference that afternoon, much to the benefit of all concerned; and Mr. Pilbrow had been most hospitable in providing them with accommodation for the meeting, and with tea. In response, Mr. Taylor said he was pleased to have an opportunity of acknowledging the kindness that he, along with the other delegates, had received that day. The treatment they had experienced was such that he would have very gratifying reports to give to his friends in Lancashire. As the representative of the oldest of the Junior Gas Associations, he was delighted to be present. He felt that a meeting of the representatives of 700 members of English Junior Gas Associations could not but be productive of a vast amount of good—if for nothing else than the mere fact of the friendship that was thereby engendered. The only matter for regret was that the Scottish Junior Associations, except on one occasion, had been unable to be present at these conferences. But this must in fairness be put down to the distance away at which they lived. Mr. Jones expressed his pleasure at visiting the London Association, and at the generous treatment meted out to the delegates. He thought that at the conference they had pretty well agreed that next year should see a united visit of the Associations to Birmingham; and if this came about, he could assure them all that they would have a thoroughly hearty welcome. Mr. Shepherd also acknowledged the hospitality shown to the delegates. Mr. Holton recalled the fact that the first joint meeting was held in Manchester. The second was at the Franco-British Exhibition in London; and had the reception then not been of a cordial character, he imagined that little would have been heard of future joint meetings. But because it had been of such a cordial nature, the Junior Associations were now joined together permanently for good and useful work. Mr. Pilbrow said he hardly felt he was a visitor, as he was one of the patrons of the Association. He had been pleased to do what he could to make the meeting of the Joint Council a success; and it would always be a pleasure to render any assistance in his power to the Junior Associations. He hoped to meet many of the members of the various Associations throughout the country at the Japanese Exhibition this year.

Mr. P. Smithers proposed "The Chairman." Those who had come in contact with Mr. Liberty, he remarked, could not fail to recognize his earnestness of purpose. His whole heart and soul had been put into the work of the Association. In reply, Mr. Liberty said there was certainly a great amount of work to do in connection with the position of President; but if one's heart was in the task, it became easy. They would be glad to know that there were about eighty present at the dinner this year, as compared with forty last year. Also that the Association had been strengthened by the accession of many members residing outside the London district. As President, he was able to go to the meetings of different Societies and shake hands with many men the members knew and revered; and he always had a hearty welcome. At such meetings, he was always asked, "How strong is the Junior Association now?" and "Are you really doing good work?" It would, however, have been impossible for him to have held the office for two years, had he not been ably backed up by the Council and the members. Mr. Tooth as Senior Vice-President, and Mr. T. F. Canning as Junior, had given him much help; and then there were Mr. S. A. Carpenter, the hard-working Secretary, and Mr. J. Hewitt, the Treasurer.

The assistance rendered by the Technical Press to the Junior Associations was gracefully acknowledged by Mr. H. Rothwell, Mr. Temple, and Mr. Alsop; and before separating, the Stewards (Messrs. Rothwell, Smithers, and Tooth) were, on the proposition of Mr. Carpenter, seconded by Mr. Canning, heartily thanked for the large share which they had taken in making the evening so great a success.

The absorption of the Hailsham Gas Company by the Eastbourne Gas Company under their Act of last year, the extension of the mains to Polegate and Hailsham, and the increased business arising from the natural growth of the Company's undertaking in Eastbourne and the district, have necessitated the raising of more capital; and it will be seen, from an announcement which appears elsewhere, that the Directors are inviting tenders for an issue of £10,000 (inclusive of premiums) of "B" stock, the present dividend on which is 6½ per cent. The present issue of stock commends itself to small investors, inasmuch as, under the Company's last Act, £5, or multiples thereof, may be applied for. The Company work on a low capital, there are no debentures or mortgages, and there is a reserve and special purposes fund of £6108.

## THE ELLIOTT GAS-ANALYSIS APPARATUS AND STANDARD PHOTOMETRIC LAMP.

By E. C. UHLIG,

Chemist at the Citizens' Gas-Works, Brooklyn, New York.

[Papers read before the New York Section of the Society of Chemical Industry.\*]

### THE ELLIOTT GAS ANALYSIS APPARATUS.

Comparative results obtained with the Elliott and Hempel gas-analysis apparatus in my laboratory gave the following results: A volume of gas (3 cubic feet) was taken into a 5 cubic feet gas-holder, the water in which had been standing there for about two years—evaporation being replaced from time to time, so that the water was as saturated with gas as was possible. Samples of the gas were taken from this holder for both apparatus and analyzed, with the following percentage results:—

	Elliott.	Hempel.
Carbon dioxide . . . . .	3'6 ..	3'7
Illuminants . . . . .	13'6 ..	13'4
Oxygen . . . . .	0'6 ..	0'6
Carbon monoxide . . . . .	27'0 ..	26'5
Hydrogen . . . . .	29'3 ..	29'3
Methane . . . . .	19'5 ..	18'6
Nitrogen . . . . .	6'4 ..	7'9

The above methane and nitrogen results were calculated from the explosion, using the regular contraction factors. Calculating the same from the residual nitrogen left after explosion and absorption of carbon dioxide and oxygen with sodium pyrogallol, the following figures (percentages) were obtained:—

	Elliott.	Hempel.
Methane . . . . .	19'6 ..	17'5
Nitrogen . . . . .	6'3 ..	9'1

From the residual gas of the Hempel sample, 20'2 c.c. of the gas were taken and mixed with 47'9 c.c. of air and burned in a palladium tube, with the following results calculated on the residual gas: Hydrogen, 30'3; carbon monoxide unabsorbed by cuprous chloride, 1'1.

The absorptions in the Elliott apparatus were done in the usual manner by allowing the reagents to spread over the inside surface of the absorption tube; and in the Hempel apparatus by allowing the gas to remain in contact with the reagent while shaking the pipette till two successive readings agreeing within 0'1 c.c. were obtained. Carbon dioxide was absorbed in sodium hydroxide in both apparatus. Illuminants were absorbed with bromine in the Elliott apparatus, and with fuming sulphuric acid in the Hempel apparatus. It was found that this reagent was more effective than bromine in the latter apparatus, and that bromine in the former was as effective as fuming sulphuric acid in the Hempel apparatus. Bromine in a Hempel pipette is in an aqueous solution; and, on shaking, weak bromine vapours are given off, which do not act very strongly on the illuminants. This makes the absorption slow; and repeated absorptions are necessary. Fuming sulphuric acid acts rapidly, and one or at most two absorptions are all that are needed. Bromine in the Elliott apparatus is applied as liquid element and not in the aqueous solution. Strong vapours are given off which act at once—in fact, the reaction may be watched, and the bromides formed can be seen running down the tube. Oxygen was absorbed in the Elliott apparatus with alkaline pyrogallol, and in the Hempel apparatus with phosphorus. The results agree very well. Carbon monoxide was absorbed in both appliances with acid cuprous chloride. The results show that the absorption is perhaps slightly more complete in the Elliott apparatus. Two pipettes were used in the Hempel apparatus. Constant readings were first obtained in one pipette; and on trying the second pipette a further absorption of 1'5 c.c. was obtained. Cuprous chloride is slow in its action; and any unabsorbed carbon monoxide will affect the subsequent explosion.

The explosion was done over water in the Elliott apparatus and over mercury in the Hempel. All comparative analyses made with different apparatus appear to agree as far as the explosion; but at this point variations are noticed. These differences have been ascribed to several causes; principal stress being laid on the solubility of the carbon dioxide in water. It is my opinion that while this may be one of the causes, it is not the main cause. It will be noticed in the preceding analyses that explosion over mercury gives even more divergent results than explosion over water. I think the reasons for these differences are principally unabsorbed carbon monoxide in the residual gas, and too much air mixed with the part taken for explosion. In regard to the latter, I find that the best results are obtained by taking just sufficient air to leave about 0'5 to 0'7 c.c. of oxygen after the explosion. This lessens the possibility of the nitrogen of the gas being oxidized in the explosion. The amount of air to be taken is variable, and can only be found by experimenting with a portion of the residual gas. Illuminating gas may also contain ethane; and as this forms two volumes of carbon dioxide in the explosion, it will cause some difference in calculating the methane.

Almost any apparatus will give good technical results in the hands of a careful operator; but in gas-works practice preference must be given to apparatus which will produce the results in the

\* Reprinted from the Society's "Journal."



shortest time. With the Elliott apparatus, an analysis can be finished in from 30 to 40 minutes—in cases of great hurry in possibly 25 minutes; but the best results are probably obtained in about 45 minutes.

#### THE ELLIOTT STANDARD PHOTOMETRIC LAMP.

This lamp is designed as a secondary standard for the determination of candle power by the men on the works; and it is intended for the guidance of the gas-maker in place of the unreliable jet photometer. It is of the well-known "student-lamp" type of about 16-candle power, the light being reduced by means of a screen to 10-candle, and in the latest models to 5-candle power. The fuel burned is "Astral" oil. It is furnished with a reservoir which will hold sufficient oil to burn for 12 hours; but the lamps have been made with 24-hour reservoirs. The lamp is standardized against candles or against a standardized sample of gas which may be taken from a 5 cubic foot gasholder. When once standardized, the lamp will maintain its candle power for 12 hours or even longer. The 5-candle standard permits of more accurate adjustment in this respect. It requires reasonable care in its use. The wick must be properly trimmed according to the directions given with the lamp, the oil must be clean, and the burner kept clean, particularly in the air-holes. Observing all these precautions, a careful operator will get results which agree very closely with those obtained with other standards.

The method of using the lamp is as follows: After cleaning, filling, and trimming, it is placed in position at the end of the photometer bar, at the other end of which the candles or standardized gas is burning. The lamp is lighted and allowed to burn for about 15 minutes. Readings are afterwards taken, and the usual corrections applied. The gas to be tested is then put in the place of the candles or standard gas, and readings taken with the value of the lamp as the standard. These readings may be taken as often as required during the day.

It has been found that this lamp varies very little each day from the value found on the first standardization. Generally the 10-candle lamp will not vary more than 0.1 candle from day to day, while the variation of the 5-candle lamp is even less. Any variation will be due mostly to a change in the quality of the oil used. It is good practice to reserve a quantity of oil for use in the lamp only, and not take oil from a receptacle in general use. Of course, variations will occur, due to wear, particularly in the burner; but this can be corrected by occasional repair.

A test of this lamp was made by taking the candle power of gas delivered to two photometers, on one of which (60-inch) the lamp was used as a standard, on the other (100-inch) the standard was sperm candles. The lamp was 10-candle standard, and tests were made hourly on each photometer for 13 hours. The average results were as follows: Illuminating power of the gas by lamp, 24.30 candles; of gas by standard candles, 24 candles.

The following results with a 5-candle Elliott lamp against a Hefner amyl-acetate lamp adjusted to 1 standard candle are communicated:

	Candle-Power.		Candle-Power.
Elliott lamp . . .	= 5.02	After 7 hours . . .	= 5.00
After 2 hours . . .	= 5.01	" 8 " . . .	= 5.00
" 3 " . . .	= 5.01	" 9 " . . .	= 5.00
" 4 " . . .	= 5.01	" 10 " . . .	= 5.00
" 5 " . . .	= 5.00	" 11 " . . .	= 5.00
" 6 " . . .	= 5.00	" 12 " . . .	= 5.00

#### ANALYSIS OF ILLUMINATING GAS.

By DR. ARTHUR H. ELLIOTT,

Engineer-Chemist of the Consolidated Gas Company, New York.

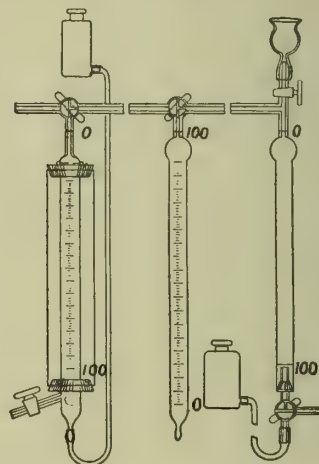
[A Paper read before the New York Section of the Society of Chemical Industry.]\*

The gas analysis apparatus which I use in my laboratory consists of three tubes, one of which is water jacketed. These are connected to one another and with aspirator bottles by means of rubber tubing. There are three aspirator bottles, and each is filled with water of the temperature of the room. The gas is introduced by means of rubber tubing, also filled completely with water, attached after removing the funnel above, and connecting with the source of supply. The apparatus must be used with water at a constant temperature. For this purpose, we have in our laboratory a tank that is kept at the uniform temperature of the room, and fills automatically from time to time. The temperature remains very constant.

The first operation is to fill the glass collection-tubes (which hold 200 c.c.) with water from the tank, and then, upon opening the stopcocks, the outflow of the water allows the gas to flow in. By reversing the operation, connecting by a water-filled rubber tubing, the gas can be forced into the gas-analysis apparatus. Having drawn the gas into the first tube (which is marked below, indicating 100 c.c.), more gas is taken in than is required. It is introduced by the aspirator bottles into the second or middle graduated tube and measured accurately—arranging the bottles so that the water in the lower one is level with that in the tube. After the upper stopcock is closed, the excess in the first tube is rejected through the funnel. The chemicals are introduced by

means of the funnel, which fits on the outside of the end of the stopcock on the first tube, called the laboratory tube. Transferring the gas (100 c.c.) from the middle tube, where it has been measured, back into the laboratory tube, which is full of water, the water is driven over from the middle tube until it occupies a position marked on the capillary part of the laboratory tube above. Owing to the peculiar shape of the bulb of the laboratory tube, the gas is pulled down at the sides by the solutions used, and returns up the middle of the tubes, thus circulating.

A very little (a few drops) of the chemical makes an enormous surface and gives the gas a chance to be absorbed. The first fluid put in is sodium hydroxide solution (1 in 5) to absorb carbon dioxide. A little water is then added to wash out the capillary tube of the funnel, and a little is also forced from the middle tube. The upper surface of the fluid in the laboratory tube is then nearly clear water. The gas is driven into the middle measuring tube by means of the aspirator bottles; the fluids being stopped at the zero point above. We do not measure the gas at once, but wait for the tube to drain. In order to allow the water to settle uniformly, the lower and upper stopcocks on the laboratory tube are opened, the sodium hydroxide and carbonate solution allowed to drain out, and the tube washed with clean water. The water is now passed up into the laboratory tube from its aspirator bottle below, and through the top of the tube at the funnel point to expel the air. The loss of volume in the middle measuring tube gives the carbon dioxide in the gas. The next step is the introduction of the gas into the laboratory tube, again by means of the aspirator bottles, and the bringing up of the water from the central tube into the capillary tube above the laboratory tube.



Two or three drops of liquid bromine are now introduced, using a little clean water in the funnel. Too much bromine must be avoided, or the gas will expand so much from the bromine vapours that it will pass through the rubber tubing into the aspirator bottle, and be lost. As the bromine enters, it is volatilized; and the bromo-benzene and other bromo-hydrocarbons condense on the sides of the laboratory tube. After this some sodium hydroxide is run into the funnel and thence to the tube, to absorb the bromine vapours. As soon as these are absorbed, the stopcocks are washed with water. After the transfer of the gas to the middle tube as before, the contents of the laboratory tube are washed into the waste below. The difference between the last and the former reading on the measuring tube is called "illuminants."

The same series of operations is repeated in regard to allowing the water to settle a definite time in the measuring tube, as was mentioned above, to ensure a correct reading. Pyrogallol solution in water (1 in 10) and the sodium hydroxide solution (used as above) mixed together in equal volumes are used to absorb oxygen, and the cuprous chloride (solution in hydrochloric acid) is used to take out the carbon monoxide. This cuprous chloride is troublesome in the transfer of the gas between the tubes. Between the absorption and transference of the monoxide, water is added to the laboratory tube to wash out the chemical and to absorb the hydrochloric acid vapours. This water will make the fluid milky; but there will be a little clear water on the top, which alone must be transferred.

The residue of the gas which is in the measuring tube consists of hydrogen, nitrogen, methane, and possibly some other hydrocarbons, the nature of which is not well known. Formerly the explosion apparatus was used with oxygen; but uniform results could not be obtained, and sometimes the nitrogen was exploded. In the first explosion, the excess of oxygen is kept within 1 per cent.; anything much higher will give erratic figures for the nitrogen. The gas in the measuring tube is drawn into the jacketed explosion tube by its aspirator bottle. For the test, 12 or 13 c.c. are sufficient; six or seven times its volume of air is added from a quantity drawn into the laboratory tube for this purpose. Rejecting excess of air from the laboratory tube, this is used with the explosion tube and the two aspirator bottles to transfer the gas and air mixture several times between the explosion and the laboratory tubes so as to thoroughly mingle the gases. After the final transfer to the explosion tube, several minutes are allowed to elapse before making a reading, to let the water drain down to the proper level.

The mixture is exploded by a spark from an induction coil, and

\* Reprinted from the Society's "JOURNAL."



the contraction "C" read after several minutes. Transferring the gas to the laboratory tube, the carbon dioxide is removed from the mixture by means of the sodium hydroxide solution, and the gas is returned to the central tube for measurement with the usual precaution of waiting. This loss we call "D." The pyrogallol mixture first used for oxygen in the original gas is then added, and the excess of oxygen is determined. If there is not an excess of oxygen, the exploded mixture will contain carbon monoxide, and the explosion must be repeated, using another portion of the gas residuum from the middle measuring tube, adding more air to make the explosion mixture. It is rarely that more than two explosions are necessary; but about 0.5 to 1 per cent. of oxygen must be in excess to get the best results. After absorbing the oxygen and measuring the remainder (the nitrogen), the nitrogen contained in the air used for the explosion is subtracted from the residual nitrogen; the balance being the nitrogen in the portion of the residuum of gas which was used for the explosion, and is calculated to the original gas residuum. The figures which we call "C" and "D" are used in calculation, by the following

formula:  $\frac{2 \text{ "C" } - 4 \text{ "D" }}{3} = \text{hydrogen.}$  The difference between the sum of the constituents determined and 100 is called methane. It will be found that the figure "D" will also equal methane if the work is properly done; and it serves as a check on results.

## SCOTTISH JUNIOR GAS ASSOCIATION.

### WESTERN DISTRICT.

A Monthly Meeting of the Western District Division of the Scottish Junior Gas Association was held in Glasgow on Saturday evening—Mr. D. CURRIE, of Stirling, the President, in the chair. There was a good attendance.

Mr. J. M. SMITH (Dumfries) read the following paper:—

#### THE MANUFACTURE OF SULPHATE OF AMMONIA.

In the course of it, the author said that the manufacture of sulphate of ammonia now played such an important part in modern gas-works that a description of plant and production, together with an exchange of views on the various systems, was not only beneficial but incumbent for an Association like theirs. He had therefore taken as an example for his paper the sulphate of ammonia plant at the Dumfries Gas-Works. The building and plant were erected in 1908. Previous to the plant being installed, all the ammoniacal liquor was sold to a local chemical works, and carted away daily in tank-carts. This method was at times very inconvenient, especially in winter, owing to the congested state of the yard in the older part of the works. It was got rid of by the Commissioners deciding to start a recovery-plant of their own.

The liquor or products of condensation were collected from the condensers in an underground tank along with the tar. The tar was pumped into an overhead tank for loading into tank-waggons; and then the suction-pipe (which was on a swivel-joint) was lifted, and the liquor was pumped into an overhead tank, from which it gravitated to the scrubbers. Then it went through a Livesey washer, working it up to about 5° Twaddel. This overflowed into another underground well, capable of holding about 25 tons, where a similar arrangement of suction-pipe was adopted for getting rid of the tar. The strong liquor was then pumped into an elevated tank capable of holding about 36 tons; allowed to settle; and any tar that might have been carried forward was run off by means of a bib-cock into a funnel and conveyed to the underground tar-well. The liquor from this elevated tank was pumped into another elevated tank of similar capacity, fitted also with a tar take-off. The tar was run off from the tanks after every pumping, to ensure none getting forward to the still. The storage tanks, when full, would hold about 100 tons of liquor.

The plant was erected by the Chemical Engineering Company, and the saturator and leadwork by Messrs. J. Taylor and Co., of Bolton. It had a capacity of about 2 tons of sulphate per 24 hours. The still was cylindrical, and of the continuous type, 3 feet diameter and 11 feet high, of fourteen sections; the upper section being 18 inches deep, serving instead of a catch-box on the ammonia pipe to the saturator. Though a catch-box was preferable, little or no trouble had been met with in their present arrangement—only syphoning over, and that was when the man in charge was not thoroughly conversant with the plant. The upper tiers formed the free ammonia still, and the lower the fixed ammonia still; milk of lime being admitted at the centre tier, and flowing along with the liquor from the upper still, overflowing through each section, until it reached the waste liquor outlet in the bottom. Each section, except the top and bottom, was fitted with inverted serrated edged hoods and liquor overflows. The main steam supply pipe, 1½ inches in diameter, entered at the bottom section, and, blowing through the serrated edged hoods, gave the liquor a proper boiling as it made its way to the top of the still. An auxiliary liming chamber, 4 ft. by 2 ft., was placed alongside the still, into which were steam agitators for keeping the milk of lime properly mixed up. This lime was slaked by the waste liquor from the still in a large rectangular tank, and brought to boiling-point by means of steam-jets. It was then pumped into the auxiliary liming still by means of a Wilton automatic pump, working at the speed of about one stroke per minute.

This was a very good means of getting a constant stream of

lime into the still, which was preferable to an intermittent supply, wherever the plant was large enough to permit it. Slaking the shell lime by means of waste liquor instead of water was an advantage, as it took a less amount of steam, and it would detect at once any fixed ammonia escaping; and great care should be taken to stop these leaks of ammonia. While the workman's sense of smell had to be depended upon to a certain extent, frequent tests of the waste liquor should be made; and if found to contain more than 0.02 per cent. of ammonia, the reason should be looked for at once. Forcing the liquor through the still was to be avoided, as by rushing matters they were only increasing the leakage, which it would more than recompense them to decrease. To the leaks of ammonia it was wise to give very careful attention, both in the storage tanks and fittings. Pipes should be examined as frequently as possible; and underground pipes, when being laid, should be arranged so that access to joints could be had without much trouble. Their pipes, where passing under the floors of buildings, were all laid in troughs built of old bricks, with a chequered plate on the top. Overhead storage tanks were both air-tight and fitted with a stand-pipe and 2-inch check-valves, set so as to allow of air being drawn into the tank when using the liquor, and also to allow it to escape while filling. The delivery-pipes into the tanks were sealed in the liquor, to cause as little disturbance of the liquor as possible, and so reduce the evaporation. The waste liquor from the still was regulated by an automatic float-valve, and was very satisfactory, allowing little or no steam to escape—which could not be said for an ordinary cock on the waste-liquor pipe, which required constant attention.

The still was also fitted with a pressure-relief pipe, which was essential on every still, in some form or other. The one supplied by the Chemical Engineering Company was very simple and efficient, consisting of a small cast-iron box connected to the bottom of the still. On the top of this box was fixed a length of 1-inch tubing to three-quarters the height of the still. A second length of 1-inch tubing was also fixed alongside the former pipe, but only half its height; the other half consisting of a glass tube—the height of the liquor in the glass varying with the pressure of the still. The effect of any alteration in the flow of either liquor or steam could be instantly noted.

On selecting any type of still, particular note should be made of access for cleaning. Hand-holes should be placed wherever possible, to allow of cleaning without taking all the still to pieces. It would be found that most of the sediment was in the bottom sections; the upper part of the still very seldom getting stopped up. Little or no trouble had been found with their type of still; easy access being obtained to all sections, and cleaning-doors placed to allow of the serrated hoods being withdrawn, and also to get at the overflows.

It was an advantage to have the still washed out periodically, though this did not lift any hard incrustation. If done frequently, however, it kept it from gathering to any extent. Their still was treated in this way, just after letting the plant down. After working about fifteen days, and on examining the bottom sections lately, by withdrawing the hoods, practically no incrustation on any of the serrated edges had taken place. The still was last cleaned out in June. On replacing the serrated hoods, care should be taken that the fixing was properly done; otherwise the efficiency of the still might be considerably decreased, and it might even stop working.

The saturator was of the hand-fishing type; the ammonia vapours passing from the top of the still over to the saturator, and being carried round each side by means of lead pipes perforated with holes, and sealed with sulphuric acid. The saturator was made up to a strength of about 62° Twaddel with acid, other liquor and water added, and then allowed to boil down to 57° Twaddel, when the salt was fished out and placed on the draining table—sufficient acid being added to keep up the strength during the fishing. This system was preferable to keeping the saturator liquor always at the salting point—especially in small plants, where one man had to attend to everything. The saturator was fitted with a perforated steam-pipe inside the apron. This was very convenient for blowing the salt forward when the saturator was salting heavily. By judicious application of the steam, a good, white salt could be obtained from the commonest acid; it being possible to boil all the dirt to the top, where it could be skimmed off. It was also very valuable in keeping the saturator sides in good condition and the holes in the ammonia pipe clear, and preventing the still gases from escaping at only one portion of the pipe, which might be the cause of blue salt being formed.

The saturator liquor was emptied into the mother-liquor well every time the ammoniacal liquor was all worked up, and filled with clean water—receiving a thorough boiling. For this purpose, he would advise as large a mother-liquor well as possible; the capacity of theirs being almost twice that of the saturator. The saturator base was covered with lead for a distance of 3 feet all round, and sloped so as to drain into the mother-liquor well. This saved the floor and kept acid from getting into the saturator foundations, should at any time the liquor boil over through back-pressure or temporary stoppage in the plant. The waste gases from the saturator passed through a catch-box into the super-heater; provision being made for testing, which should be done frequently, to see that the saturator was not alkalinized. These test-holes should be at a convenient position, so that the man in charge might be inconvenienced as little as possible by the gases, which were very poisonous indeed. The catch-box on the waste-gas



outlet was washed out regularly with water, to remove salt which might have been carried forward when the saturator was boiling vigorously. If this hard salt were allowed to remain, it stopped the effectiveness of the catch-box; and if acid vapour were carried forward to the condensers, trouble would arise through leaking joints—which was to be avoided.

The waste gases, on leaving the superheater, passed into the condensers. These were old oil-gas condensers that were in the works, and were more than sufficient for their requirements. The products of condensation—"devil liquor," as it is called—were passed back through the still; this being about the best way, in small plants, of getting rid of this obnoxious liquor, and obtaining the benefit of any ammonia that it might contain through irregular working. The purifier was built of brick, 18 feet square, with the gas-inlet in the centre, and a layer of oxide 12 inches thick resting on wood grids. This was protected from the weather by a roof on four columns. He liked this better than the ordinary heap purifier, as with an occasional turnover the oxide lasted for a considerable time. Owing to the acid contained in the oxide, it was bad to revivify. At first, they tried watering it with ammoniacal liquor; but this, besides being a waste of liquor, was unsatisfactory, as the oxide was usually wet enough, being exposed to the weather. The oxide was now mixed with lime—almost one-half; and it was not long in revivifying after being turned out.

The waste liquor from the still was run into settling and cooling tanks, and then into the main sewer. It was a source of trouble to gas managers to get rid of this liquor; and various methods of dealing with it with considerable success had from time to time been published in the Technical Press. In small works, any special treatment before them at present could not be said to be remunerative as regarded the recovered products; but some places had been compelled to purify their waste liquor, according to the Rivers Pollution Act.

Pyrites acid was used, of a strength of 1.44° Twaddell. This was delivered in tank-waggons in the works and syphoned out into an underground steel boiler of about 30 tons capacity. In places where acid was stored in underground steel tanks, these should be accessible all round, so that any leak could be detected. Acid getting into the foundations of a building would have very serious results. The acid was syphoned from the boiler into a pot made of a piece of 18-inch cast-iron pipe, sitting upright alongside the boiler, and lined with lead. The syphon connecting the two consisted of a piece of 2-inch lead pipe, with shoes on each end to keep it always sealed, even though the tank might be run empty. An elevator was fixed over the seal-pot, for lifting the acid into a storage tank inside the sulphate-house. This seal-pot was adopted so that it would not be necessary to fix the elevator over the boiler, as any hot acid from leaking flanges dropping on the boiler would soon eat it away. The storage tank inside the house was capable of holding 7 tons of acid, and was built of 3-inch pitch-pine battens, bolted together and lined with lead. There was no hole in this acid tank; the acid being syphoned over into a lead pot the same depth as the tank. From there it gravitated to the tundish of the saturator. This syphon was similar to the one previously mentioned, and was suspended by a chain and pulley fixed to the roof, so that it could be withdrawn should the bib-cock at the tundish ever require repair.

The following was the cost of production for the year ending May 15, 1909, though he might remark, in passing, that the expenses varied greatly with local circumstances—almost every gas-works producing different results.

	Per Ton of Salt.
	£ s. d.
Acid and oil, 17 cwt. . . . .	1 9 9
Lime, 1.70 cwt. . . . .	1 2'45
Wages, manufacture, including bagging . . . .	14 1
Cartage . . . . .	7
Steam and water . . . . .	3 0
Liquor, 11 tons 16.3 cwt., 2.1 per cent. ammonia .	4 17 6
Interest on loan, at 3½ per cent. . . . .	11 4'87
Depreciation. . . . .	13 0
Licence . . . . .	5'50
	£8 10 11'82

The sulphate produced per ton of coal was 25.5 lbs. The average price of sulphate for the year 1908-09 was £10 12s. 1.58d.

Discussion.

Mr. A. KELLOCK (Alloa) said he had been much impressed by the simplicity of the plant described in the paper. In the works at Alloa, when they started the plant in the morning, they always turned on the steam for an hour or two, and they had the plant thoroughly heated-up before the sulphate maker came on duty. Great care should be exercised in the matter of the size of the saturator box. With a large box they had always a difficulty in getting a boil-up at the commencement; and with a small box they had a consequent loss, by ammonia gases escaping, and they did not get the same amount of heat as they would otherwise do for heating-up the still. He considered it desirable to have the heater at a temperature of 190° Fabr. at the outset, because if it were properly heated, it lessened the work of the still afterwards. In regard to the still, it was most satisfactory to see that it had a regular and constant supply of steam, and that the steam should be at a constant pressure, because thereby they ensured a steady boil in the saturator box. Like Mr. Smith, he always advocated constant testing at the various points, so that they might be able

to check whether or not the men were doing their work as they should do. Mr. Smith mixed lime with the oxide—about half lime and half oxide. He (Mr. Kellock) thought this was a good idea, because it helped the oxide wonderfully. They found that the oxide could be very satisfactorily dealt with when it was put into the purifier with the lime; whereas before, when they were working without the lime, very often when the oxide was turned out it was quite useless. With regard to the question of the licence for sulphate plant, it did not matter whether the works were large or small, the licence was three guineas. This was a hardship upon small works. He thought there ought to be a graduated scale in this matter. The yield of sulphate which Mr. Smith obtained was, in his opinion, very satisfactory. It compared favourably with what they were getting.

Mr. T. W. SAVILLE (Thornliebank) asked if it would not be more profitable to work the liquor at (say) from 4° to 4½° in place of 5° strength. He also pointed out that Mr. Smith did not seem to lay much stress on the matter of the superheating of the liquor. It appeared to him (Mr. Saville) to be rather a crude manner of removing the liquor from the still. Had Mr. Smith ever tried some arrangement for taking the liquor from the top, or having two distinct stills, one set to fall into the other? The yield of sulphate was not up to the 28 lbs. or 30 lbs. some got; and the price of £10 5s. 6d. appeared to him rather low for last year.

Mr. J. FRASER (Provan) said the plant seemed to him to be very simple. He had been greatly interested at Mr. Smith's description of the valves for cleaning the still. This was an absolute necessity. As to the pump arrangement, it was a wonder to him that so simple a thing had been so long overlooked. He had been led to understand that intermittent liming in the still was very defective; but Mr. Smith had proved that the process could go on continuously by his method. The check valve being in the same relation as that of the suction and discharge of the pump, proved the simplicity of the whole thing. With regard to allowing the liquor to go away, he should fancy that, instead of its doing so with a great burst, it would simply dribble away, unless pressure of steam underneath lifted the float, in which case it would hold the thing in suspension. He should like to ask Mr. Smith how he got the syphon to retain the liquid when the tank was empty. Was the steam-tank under pressure, or what? It seemed to him that the liquid would syphon-out.

Mr. A. WILSON (Glasgow) said, as the members knew, in Glasgow they did not work up the bye-products themselves; they let them out by contract. Though they had the works, they had little to do with the treatment of the ammoniacal liquor and tar, as all this was carried on for them. The system saved them a great deal of trouble; and he thought they obtained as good financial results as managers who themselves had the trouble of operating the plant. He had thoroughly enjoyed the description of the plant, which he thought was quite suitable for small works; and the lucid way Mr. Smith had described all the details would, he was sure, be beneficial to the members.

The PRESIDENT, in closing the discussion, said they had at Stirling a similar plant and arrangement to that described by Mr. Smith; and he could heartily endorse all that had been said about the easy way in which it worked. He was much interested in the description of the storage-tanks—as to having them air-tight, and having the necessary valves for promoting the flow of the liquor into and out of them. He ventured to say there were not many gas-works in which they gave such minute attention to the prevention of the evaporation of ammonia as to have the tanks air-tight; but, at the same time, he considered it was the proper thing to do. Mr. Smith also referred to having the pipes sealed in liquor, to prevent agitation when filling the tank. This also was in the right direction, as a lot of ammonia was lost every day in gas-works through evaporation caused by having open tanks and by agitating the liquor. As to the waste-liquor float, he understood that both it and the liming-pump were patented, and that they were only fitted into the Chemical Engineering Company's stills. He considered this float-valve was one of the greatest improvements that they had in connection with sulphate plant. The old method, which he believed was usually practised, was to have a deep seal-pot, just like an ordinary one in either a scrubber or condenser, and, of course, it had to be about 6 or 7 feet deep, and underground. These were continually choking up with lime, and were difficult to clean. This arrangement of a float-valve worked automatically. Perhaps once every two or three years a new float was required to be put in. Formerly the float was made with a sort of joint in the centre; but now they were able to make it lap-welded by the oxygen and acetylene flame process. Mr. Smith stated that in the sulphate plant in Dumfries there was quite enough provision for cleaning purposes. He (the President) begged to differ from him. This was a point which he thought makers were ignoring altogether. In the plant they had at Stirling, the cleaning-holes were simply made large enough to get at the serrated hood. In fact, if there should be any sediment in the hood, there was great difficulty in getting it out. They could imagine the provision that was made for cleaning—or the want of it—in a hole (say) 6 inches broad with a rectangular nozzle. When the plant was new, it was all right, and worked for a long time; but eventually the incrustation grew to such an extent that it became troublesome. In Stirling, they contemplated this year taking down the still altogether to get it cleaned. He thought that makers, when they were designing stills, should give more consideration to the question of making provision for cleaning. There was a great



tendency among makers to cut down, for cheapness, the weight of the metal and the size of the still. He noticed, on the occasion of their visit to Bedlay, where there were sulphate stills, the provision made for cleaning them. There were big manholes, into which a man could get. This showed the difference between plant designed by a maker and that designed by the person who was going to pay for and work it. Mr. Smith commented upon the disposal of the "devil" liquor. He (the President) thought it was the usual practice in small works to put this liquor through the still, which was the best way to get rid of it; but probably easier methods were adopted in some places. He believed in conducting tests very often, to see that all the ammonia was being taken out of the liquor, which could only be done by strict supervision over the working of the plant and the frequent testing of the spent liquor. He believed also in testing the salt, to see that it was being kept up to the proper strength. The figures given by Mr. Smith showed exactly what it cost to make a ton of sulphate of ammonia. There was included in the figures the price of the liquor. He assumed that the price stated for the liquor was what Mr. Smith got for it before installing the sulphate plant; and if this were the case, then apparently they were making £2 more profit per ton of salt in Dumfries than they were doing before they had the plant. This proved conclusively that it paid to instal sulphate plant in any gas-works making (say) above 15 million cubic feet per annum.

Mr. SMITH thanked the members for the way in which they had discussed his paper; the remarks made upon it having, he said, been very gratifying. A question was raised about the strength of the liquor. It was thought that  $4\frac{1}{2}^\circ$  Twaddell would be more suitable. On account of the way in which they were placed for the storage of liquor, they could not very well come much below  $5^\circ$ , especially in winter. If they had more storage they could work with a smaller percentage, and he thought  $4\frac{1}{2}^\circ$  would be better than  $5^\circ$ . As to the suction-pipe on the pump, it was meant to do both the tar and the liquor with one pump. The yield of ammonia—25.5 lbs. per ton—might seem small; but with the class of coal they were using at Dumfries they were well up to the average of places getting 30 lbs. and upwards. From the attention they had paid to the escapes of ammonia, he did not think they would get much more than 25.5 lbs. A question was raised as to the discharge of waste liquor from the float-valve. What he meant to bring before the members was that when the liquor in the bottom chamber came to a certain height it lifted the float, and let the liquor away intermittently, in very large quantity. It was never absolutely shut off; but when the pressure became so great as to entirely lift the float out of its seat, there was a considerable discharge. The syphon was kept full of acid; the atmospheric pressure on both sides being the same. They were at equal pressure and dead-level; and both the pipes were sealed. It might be that hand-holes for cleaning out the still were sometimes found to be too small; but if attention were paid to the working of the plant, and good, clean lime used, attention being given to the liming, he thought it would be found—at least, he had always found it—that the present size of liming-door was ample for cleaning anything out which might be there. They could get in a small rake to bring anything forward, which, in their case, was very little, because they washed everything out about fortnightly, while the still was hot. If this were not attended to, they might get incrustation, which they did not. The price of sulphate of ammonia he had given was the average for this year. The profit on the plant for the past twelve months was £263. He hoped it would be considerably increased this year—as matter of fact, he had no hesitation in saying it would be.

On the motion of the PRESIDENT, a hearty vote of thanks was accorded to Mr. Smith for his paper.

**The Midland Junior Gas Engineering Association** will hold their fifth annual general meeting at the City of Birmingham Technical School next Saturday. In addition to the formal business, Mr. B. J. Bell will read a paper entitled "Competition and the Development of Gas Sales."

**Manchester and District Junior Gas Association.**—We learn from the Hon. Secretary (Mr. J. Alsop) that Professor Harold B. Dixon, F.R.S., has kindly consented to give the members a lecture, entitled "Some Theories of Combustion in Gases," next Saturday afternoon at the Victoria University, Manchester; and on the 30th prox. he will give another, on "The Explosion Wave in Gases."

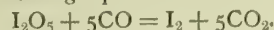
**The Scottish Junior Gas Association (Eastern District)** are to hold their seventh annual general meeting in the Heriot-Watt College, Edinburgh, next Saturday. After the formal business, Mr. A. Morton Fyfe, of Dundee, is to read a paper descriptive of the new luteless purifying system at the Dundee Gas-Works, and Mr. H. E. Doran, of the Granton Gas-Works, one entitled "The Formation of Coal."

**Gas and Electric Cables.**—A correspondent of the "Electrical Review," who is responsible for a system of underground mains, double steel armoured and lead covered, laid direct in the ground, has found the armouring, bitite yarn and lead, completely eaten through in places where he has also found leakages of gas. "There appears to be," it is remarked, "more than a chance connection between the two circumstances; and he would be glad of any information bearing on the point that any of our readers may be willing to furnish."

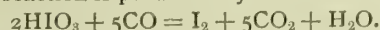
## DETERMINATION OF CARBONIC OXIDE IN ILLUMINATING GAS BY IODINE PENTOXIDE.

A recent issue of the "Journal of Industrial and Engineering Chemistry" contained an article on the above-named subject, by Messrs. AUGUSTUS H. GILL and EDWARD H. BARTLETT, from which the following are extracts.

The reaction made use of in this method for the quantitative determination of carbon monoxide is that first indicated by Ditte. He showed, in 1870, that if carbon monoxide was passed over iodine pentoxide at temperatures between  $150^\circ$  and  $200^\circ$  C., a reaction ensued by means of which the carbon monoxide was oxidized to carbon dioxide; this action being accompanied by a simultaneous reduction of the iodine pentoxide to free iodine, expressed by the following equation:



An analogous reaction is produced by iodic acid—



Apparently the first to actually make use of this reaction were De la Harpe and Reverdin, who used it in 1888 for the detection of carbon monoxide in the atmosphere. In 1898, both Nicloux and Gautier report having used this reaction quantitatively; both confining their attention to the determination of carbonic oxide in the small quantities in which it is met with in the air.

The problem of adopting the reaction for use in the determination of the carbonic oxide in the atmosphere, was taken up by Kinnicutt and Sanford in 1899. By way of premise, they say that all the methods which have been used for this purpose may be divided into two classes—viz., those employing the reaction between carbon monoxide and the hæmoglobin of blood by means of which carbon monoxide hæmoglobin is formed, and those in which carbonic oxide is oxidized to carbon dioxide. The processes of the first class are of but little value from a quantitative standpoint. The most suitable oxidizing agent for use in the processes of the second class has been found to be iodine pentoxide. They report that they experimented with the methods of Nicloux and Gautier, and failed in both instances to obtain accurate results. They then proceeded to devise a method of their own, which is a modification of that of Nicloux. They passed the air first through a tube containing pieces of stick potash and one containing sulphuric acid, in order to remove from it sulphuretted hydrogen, sulphurous acid, and similar reducing gases, and all unsaturated hydrocarbons. They then sent the air through a tube containing iodine pentoxide heated to a temperature of  $150^\circ$ , after which it was passed into a solution of potassium iodide, which absorbed the iodine. Finally, they tritrated this solution with a N/1000 sodium thiosulphite solution to determine the iodine. By measuring the carbonic oxide used in making up their samples in capillary tubes, they were enabled to read the volume to 0.001 c.c. The content of carbonic oxide varied from 1 part in 2440 parts of air to 1 part in 43,479 parts of air. They report the results of fourteen analyses, which show the method to have been very accurate. They found they could determine as little as 2.5 volumes of carbonic oxide in 100,000 volumes of air. They next made experiments to determine whether or not the presence of illuminating gas in the air would vitiate the accuracy of these results. They found that the presence of the gas had no disturbing effect whatever.

In 1900, Smits, Raken, and Terwogt, of the University of Amsterdam, proposed utilizing this oxidation of carbon monoxide for its quantitative determination in the analysis of illuminating gas. After reviewing briefly the work of Nicloux and Gautier, they say it is obvious that this "very sensitive" reaction, heretofore only used in the analysis of air, is also applicable to the determination of carbon monoxide in illuminating gas. They remark, however, that it is out of the question to think of placing the carbonic oxide determination in line in a complete gas analysis, if the exact method of either Nicloux or Gautier is used. They therefore modified Gautier's method, and proceeded as follows: The gas from which the carbon dioxide, the illuminants, and the oxygen had been removed in the ordinary Hempel scheme of analysis, was passed from a Hempel burette, through a U-tube containing iodine pentoxide heated to  $150^\circ$  C. by an oil-bath, into a Hempel pipette containing a solution of caustic potash. The caustic potash absorbed the carbon dioxide formed by the oxidation of the carbonic oxide, so that the contraction in volume after the absorption was complete gave the volume of the latter. The correction for the vapour tension of iodine was found negligible.

It does not appear from their article that they ever actually tried their method in an actual analysis of illuminating gas. They did, however, undertake to find out whether or not hydrogen or methane would undergo oxidation on being passed through the iodine pentoxide tube. To this end they made by their method an analysis of a mixture of hydrogen and carbon monoxide, and another analysis of a mixture of methane and carbonic oxide. They report the following results (in cubic centimetres):—

	Found.	Mixed.
Hydrogen . . . . .	72.7	72.6
Carbonic oxide . . . . .	8.7	8.8
Methane . . . . .	42.7	42.8
Carbonic oxide . . . . .	8.1	8.0

It will be noticed that they give results for two experiments only, and that neither of these properly represents the conditions



of practice, as in neither were both hydrogen and methane associated with the carbon monoxide. They do not hesitate, however, to say that their method is very exact, and much superior to that in ordinary use.

The method of determining carbonic oxide by cuprous chloride is so unsatisfactory that it was thought this promised well; and their work was repeated, with the following results:—

Absorption of Carbonic Oxide by Iodine Pentoxide.							
CO Used.	CO Found.	Loss.	Per Cent. Lost.	Bath Temp.	Time, Minutes.		
21'8	20'8	1'0	3'6	150	90		
23'2	22'2	1'0	4'3	150	150		
25'9	25'5	0'4	1'0	152	32		
25'6	25'6	0'0	0'0	154	29		
26'4	26'0	0'4	1'0	161	32		

In the last three results, the carbonic oxide was mixed with air. It will be noticed that after 2½ hours' passing of the gas through the tube, more than 4 per cent. of the gas remained unabsorbed. This would seem to show the impracticability of the method.

To still further test it, a mixture of carbonic oxide, methane, hydrogen, and nitrogen was made, of about the composition of that left after the carbon dioxide, illuminants, and oxygen had been absorbed from an illuminating gas, and passed through the iodine pentoxide. The results are shown in the following table:—

Absorption of Carbonic Oxide by Iodine Pentoxide from a Mixture of Gases.							
Hydrogen.	Methane.	CO Added.	CO Found.	Gain.	Per Cent. of Gain.	Bath Temp.	Time, Min.
24'1	44'8	25'6	28'5	2'9	11'3	157	24
24'4	42'3	26'4	31'3	4'9	18'6	152	29
23'6	46'1	25'6	27'1	1'5	5'9	152	28
26'1	46'2	24'1	27'1	3'0	12'4	152	51
24'6	53'5	25'7	28'1	2'4	9'3	152	75
20'4	43'7	27'8	31'5	3'7	13'3	148	30
24'0	46'0	26'1	26'9	0'8	3'1	150	26

It will be noticed from this table that the carbonic oxide found considerably exceeds the amount originally added. The errors of the analysis are not sufficient to account for this; and they show no regularity. Moreover, another observer a year previously had obtained almost identical results; the average error found by him being 7'8 per cent., whereas the average error of these results is 9'1. This, as was shown by two different observers working independently, is not due to the action of the iodine pentoxide upon either the methane or the hydrogen, nor to the number of times the tube had been used, nor to the length of time taken by the gas in passing through the tube, but may be due to breaking-up of the iodine pentoxide.

In conclusion, it may be said that the method of absorption of considerable quantities of carbonic oxide by iodine pentoxide is inaccurate, irregular in action, and tedious and troublesome to use.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills presented and read the first time: Abertillery and District Water Board Bill, Handsworth Urban District Council Bill, Maltby Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, Thorne and District Water Bill.

Bills presented, read the first time, and referred to the Examiners: Ammanford Gas Bill, Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Cambridge Water Bill, Farnham Gas and Electricity Bill, Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Gowerston Gas Bill, Great Grimsby Gas Bill, Havant Gas Bill, South Lincolnshire Water Bill, Southend Water Bill, Wicklow Gas Bill.

The opposition to the Ammanford and Garnant Gas Bills has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Bradford Corporation Bill, Egremont Urban District Council (Gas) Bill, Little Hulton Urban District Council Bill, Mallow Urban District Gas Bill, Middlesbrough Corporation Bill, Middleton Corporation Bill, Rhondda Urban District Council Bill, Warrington Corporation Bill, Worksop Urban District Council Bill.

Watford Gas Company.—At the half-yearly meeting of the Company on the 24th ult., the Directors reported a profit of £4207; the revenue having been £20,579 and the expenditure £16,372. The amount available for distribution was £7049; and the Directors recommended dividends for the half year at the rates of 7½ and 5½ per cent. per annum on the two classes of capital stock, less income-tax. The quantity of gas made in the half year was 121,497,590 cubic feet, of which 117,086,600 cubic feet were sold and 18,341,700 cubic feet accounted for. The report was adopted, and the dividends were declared.

LEGAL INTELLIGENCE.

RATING OF THE LIVERPOOL WATER-WORKS.

At the Preston Quarter Sessions last Wednesday, the CHAIRMAN (Mr. H. Worsley-Taylor, K.C.) delivered the judgment of the Court in a case in which the Mayor and Corporation of Liverpool were the appellants and the Assessment Committee of the Chorley Union and the Overseers of Withnell the respondents. The appeal was heard at a recent session (see ante, p. 49), and judgment was reserved.

The CHAIRMAN, giving judgment, said that, of the seventeen original items in dispute, sixteen had been abandoned; leaving only an assessment on "water-works, reservoirs, pipes, and appurtenances," and "land used as a gathering-ground for water," at a rateable value of £3672. It had been agreed between the parties that the water-works, &c., should be fixed at £2400; leaving £1272 as the assessment on the land. This land measured 1165 acres; and the actual valuation of it was £1165 net. Two questions were at issue: (1) Whether the Corporation were assessable at all, in respect of this gathering-ground, as being in occupation of it; and (2), if so, whether on the value of £1165 or what other value. The Corporation had originally acquired only the land necessary for their reservoirs, &c., enjoying the water which naturally flowed into them from the adjoining lands, belonging to other owners; but, many years later, in order to avoid possible pollution, they determined to acquire the lands so as to control their user. This they did at an average cost of £26 10s. per acre, though in other parts of the general watershed they had paid as high as £409 per acre. The whole area purchased was about 10,000 acres; and the average price was £45 5s. per acre. In regard to the land generally, the Corporation's policy had been to limit the occupation of it to sheep farming, forestry, and sporting; and of the land immediately in question they had devoted 306 acres to forestry. The remainder (859 acres) was moorland; and the sporting rights over the whole 1165 acres were let on lease. The facts as to the 859 acres were that the Corporation had simply left the land unoccupied; and Mr. Ryde (for the respondents) admitted that mere keeping the land vacant, excluding trespassers, or the retaining of a fence round it, could not *per se* involve rateability. He submitted, however, that the purpose of purchase, and the retention of control, were ample evidence of occupation. Mr. Macmorran, on the other hand, contended for the appellants that the obvious intention of the Corporation was to keep the land as unoccupied as possible. It did not appear to the Court that the exercise of a number of acts of ownership, no one of which singly amounted to occupation, amounted to it in combination, and it appeared to them that there was this fundamental distinction between this case and all others of which they were aware in which there had been held to be rateable occupation—that in all these cases there had been actual outward physical user of the hereditament, either existing or intended, and that in this case there was no such user. In all these cases absence of user would have meant failure of the purpose for which the hereditament was acquired. In the present case this was not so. [Reference was made to several cases in support of this view.] Here there was no intention in fact to occupy, but simply to control, and financially to be content with the measure of occupation of the shooting tenant. The Corporation undoubtedly obtained a benefit, in a sense, from the land, but not from user of it by them. The benefit arose from the power to prevent an injurious use of it. Therefore it appeared to the Court that the main case relied on by the respondents failed. With regard to the subsidiary point raised—that from the simple ownership of the land the Corporation enjoyed the flow of water from it—the Court held that the mere impounding of the water running from the land could not in itself convert their ownership into occupation, for they enjoyed that water before they bought the land, and simply took steps to secure its purity. The Court were therefore of opinion that the Corporation were not occupiers of the 859 acres of moorland so as to render them rateable, and the rate must be amended accordingly. As to the 306 acres of forestry land, the Corporation contended that they should be rated under the Rating Act of 1874 at their unimproved rental value, which they put at 2s. per acre, and a section of 9 acres used as a nursery ground at 15s. per acre. After considering a number of decided cases dealing with enhanced values, the Court considered that the contention of the respondents was an extension of the doctrine of enhanced value which was not warranted by the facts nor the principles of any decided case of which the Court were aware; and they therefore accepted the Corporation's figures. The result was that the Court decided for the Corporation on both points, and the appeal must be allowed, with costs. A case would be stated if the respondents so desired, especially as the Court understood this was a test case.

Mr. GORDON HEWART, on behalf of the Chorley Union, applied for a case.

A question was raised as to costs; and it was agreed that they should be taxed out of Court and a special case stated.

An Action Against Gas Directors.—In the "JOURNAL" for Dec. 1, 1908 (p. 644), there was a report of a motion on behalf of the defendants in the case of *Jones v. Aberystwyth Gas Company* to stay proceedings, on the ground that the action was frivolous and vexatious. It was stated that the action (which the High Court of Justice dismissed with costs) was taken by the plaintiff, on behalf of himself and other shareholders, against the Company and the Directors, with regard to whom certain allegation extending to mismanagement and the retention of moneys which belonged to the Company, were made. Evidently, this dismissal did not conclude the matter; for the report of the Directors on the past half-year's working of the Company contains a statement to the effect that the long pending litigation has been closed; the plaintiff withdrawing his claims and the Company their counterclaims—the several parties paying their own costs.



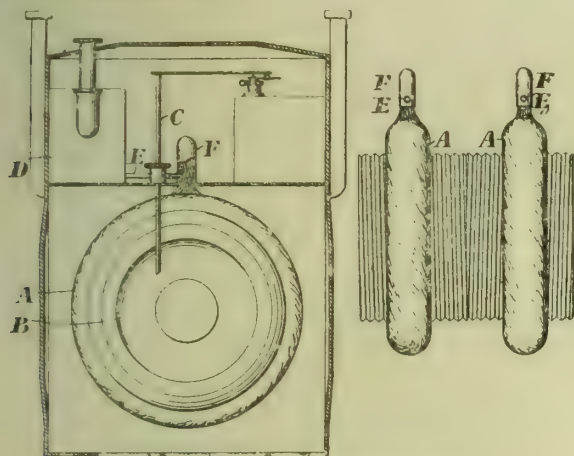
## REGISTER OF PATENTS.

### Automatic Oiling Devices for Gas-Meters.

DALY, J. R., of New Orleans, U.S.A.

No. 2118; Jan. 28, 1909.

This device is to provide means whereby the diaphragms of a gas-meter may be kept pliable.



Daly's Dry-Meter Diaphragm Lubricator.

In practice, the gas flowing through the meter brings into action the two diaphragms A, which operate the two discs B and the diaphragm shafts C. The oil reservoir D (which can be filled without opening the measuring chamber) is formed by the index chamber of the meter, and has two feeding tubes E connected with wick-holders F. The wicks form a brush through which the oil flows; and they impinge against the periphery of the diaphragm. "The oil in the reservoir supplies the wicks by gravitation and capillary attraction, and permeates the material of which the diaphragms are made; so that the same are lubricated in a satisfactory manner, and the fabric of the periphery of the diaphragms is kept pliable and does not become dry or crisp, as is usual in the ordinary dry meters now in use."

### Vertical Retorts for the Destructive Distillation of Coal—The "Coalite Process."

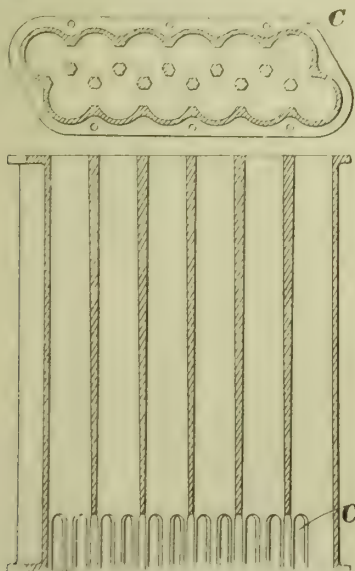
PARKER, THOMAS, of Wednesfield.

No. 3003; Feb. 8, 1909.

This invention relates to a battery of integrally cast vertical retorts for the destructive distillation of coal, and more particularly to patent No. 14,169 of 1908 ("Coalite Process.")

In the destructive distillation of coal in vertical retorts, the patentee points out, difficulty is in some cases experienced in the extraction of the gas from the retorts by reason of the melted coal in the upper part of the retort choking the upper part, and inasmuch as the outlet of the gas is at the upper end of the retorts, the gas accumulates in the lower part of the retort. This invention has for its object to avoid this defect, and to provide "means for completely withdrawing gas from either end of the retort throughout the period of distillation, and to avoid the temporary choking of individual retorts."

Accordingly, the inventor provides a slot substantially vertical or parallel to the axis at the lower end of each retort, by which communication is established directly between adjacent retorts or through connecting channels or passages, so that thus, in case of the temporary choking of any one retort of the battery, the outlet is available for gas accumulating through one of the adjacent retorts.



Parker's Vertical Retorts—Coalite Process.

The invention is shown in the illustration—a sectional plan of a battery of retorts, and a sectional elevation corresponding thereto.

The battery of vertical retorts is in a single and integral casting, and

the retorts are of small diameter in two series, alternating one with the other, united, and provided above and below with common flanges. The respective retorts are so arranged that each retort communicates with the next adjacent to it towards the lower extremity, so that an inter-communicating space or slot or passage C is formed at the lower end of adjacent retorts—all the retorts being free to deliver their gases into a discharge chamber at the upper end, common to the battery.

The specification concludes: It will be understood that the respective retorts are of relatively small diameter, and that they gradually taper outwardly towards their lower extremity—thus increasing in diameter. It will also be understood that an inter-communicating space or slot of any shape may be provided without departing from the invention. It has been previously proposed (in an arrangement of retorts in two rows) to connect the bottom mouthpiece of each retort to the bottom mouthpiece of the retort facing it in the next row, by means of a passage controlled by a valve.

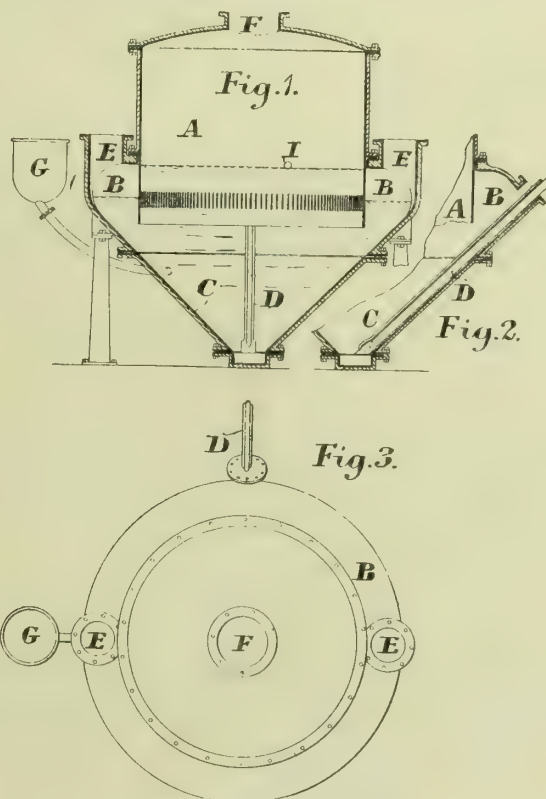
### Sulphate of Ammonia Saturators.

WILTON, G. &amp; N., of Mark Lane, E.C.

No. 3036; Feb. 8, 1909.

In the use of saturators of the ordinary construction, it is pointed out in the specification of this patent, the ammonia distributing pipes lie around the bottom of the saturator chamber (inside the walls), and if the saturators are used for producing sulphate of ammonia direct from gas charged with ammonia, the pipes become choked with tar, and sometimes a mixture of tar and sulphate becomes piled up on top of the distributing pipes. "It would not be a difficult matter to wash out the sulphate with water, but the tar is difficult to remove in this way. Again, in using saturators for making sulphate of ammonia from gas direct, the saturators are necessarily of much larger dimensions than usual, so as to secure a large bubbling area."

The object of this invention is to provide a construction of saturator wherein, among other advantages, a large bubbling area is provided in a comparatively small saturator, while no corners are provided in which the tar can become deposited with the crystals. Provision is also made for the ready removal of the tar.



Wilton's Sulphate Saturator.

Fig. 1 is a sectional elevation of one construction; fig. 2, a part section; and fig. 3, a plan.

The upper chamber A is circular, and is surrounded by an annular gas-channel B at its lower edge, forming the upper edge of the tank C beneath. This tank may be more or less conical, and formed with a recessed base in which the base of the usual sulphate of ammonia discharger or ejector will be placed. The discharge pipe D, with its air or steam pipe, is led upward through the side of the chamber C, or through the roof of the upper chamber A. Gas inlets E are provided in the upper part of the gas-channel B, and there is a gas-outlet F in the upper chamber. The inlet for the supply of solution is arranged in the usual manner, with an extension above the liquid level as at G.

The apparatus may be built of iron lined with lead; the lead lining being carried into the flanged joints. The part of the upper chamber A, which extends into the lower one to form the inner wall of the gas-channel B, is in the form of a circular apron made entirely of lead, copper, or other suitable alloy or substance. The apparatus may conveniently be built up of jointed sections—namely: (1) A cylindrical shell forming the walls of the upper chamber; (2) a cover jointed to it; (3) the upper part of the lower conical tank C and gas-channel B jointed by flanges at the upper edge to the cylindrical shell A; and (4) the base of the conical tank C flanged and jointed to the upper part. The sides of the conical tank are supported by brackets or standards from lugs on the upper part of the tank. I is a pipe for drawing off the tar.

If the saturator is to be employed for making a saturated solution



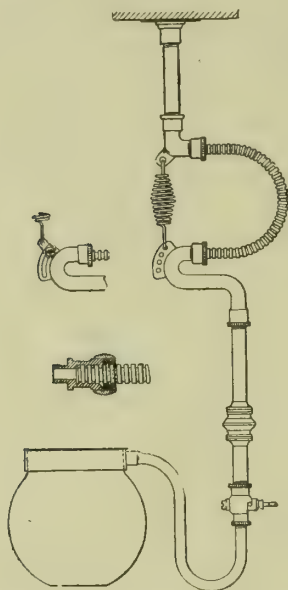
which is to be discharged and made into crystals in another vessel, the tank would be formed with a flat base; the saturated solution being run off as required by a suitable pipe.

### Anti-Vibrators for Incandescent Gas-Lights.

M'MILLAN, A., of Bolton.

No. 7153; March 25, 1909.

This invention refers to "anti-vibrators" made by connecting an upper elbow or bend to the usual gas-supply pipe; and to it is connected a lower elbow or bend by a flexible tube and a spiral spring. The inclination of the pendant portion which carries the burner is regulated by adjusting the spring through a suitable attachment to the elbows or bends. The jointing may be effected by stuffing-boxes and threaded nuts or bushes, or by soldering.



M'Millan's "Anti-Vibrator" Gas-Pendant.

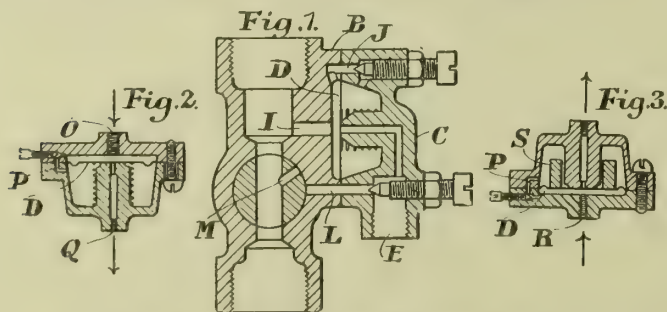
The illustration shows an elevation of the "anti-vibrator" gas-fitting; an alternative mode of connecting the suspension spring to the elbow or bend; and a sectional view of one of the stuffing-boxes for coupling the flexible tube to the elbows or bends.

### Bye-Pass Cocks for Incandescent Burners.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 4290; Feb. 22, 1909.

The invention consists in controlling the gas-outlet by means of a diaphragm which bears directly on a seat connected with the outlet—thus dispensing with the use of a separate valve connected to the diaphragm for controlling the gas-outlet, and "so permitting small quantities of gas to be dealt with under large variations of pressure."



Keith's Incandescent Burner Bye-Pass Cock.

Fig. 1 is a vertical section of a bye-pass cock with the governing device; figs. 2 and 3 show forms of the governing device.

The cock (of the usual plug-type) is formed at one side with a flange B, between which and the face of an adjacent casing C a metallic diaphragm D (preferably of silver) is interposed. The casing has an outlet E, to be connected to the pilot light or other supply pipe, and provided near the centre with a valve-seat against which the diaphragm bears in opposition to a helical spring. A port is led from the valve-seat to the outlet E. Gas is admitted from the inlet of the cock to one side of the diaphragm through a port I in the cock; while a bye-pass port J, adjacent the edge of the diaphragm and controlled by a screw, admits gas to the other side of the diaphragm. The bye-pass port communicates with the outlet E leading to the pilot light or other supply pipe.

The action of the device is as follows: A supply of gas is admitted to the side of the diaphragm nearest the body of the cock by means of the port I, and finds its way, by the port J, to the other side of the diaphragm, and thence, through the valve-seat, to the connection E, to which the bye-pass tube is attached. As there is always plenty of gas on the inlet side of the diaphragm, and as the port J leading to the other side of the diaphragm is checked-down, the tendency is for the pressure to push the diaphragm towards its seat, and thus partially

close the outlet on that side. This has the effect of immediately giving an increased pressure on the outlet side of the diaphragm, which, in conjunction with the pressure of the spring, brings about a state of balance. This balance is maintained whether the pressure on the inlet I is high or low; so that the difference of pressure between the inlet and outlet side of the diaphragm—in other words, between the inlet and outlet of the port J—is always the same. This being so, it follows that any fixed position of the regulating screw will always allow approximately the same quantity of gas to pass.

The casing C, with ports and diaphragm as described, may be adapted to operate independently of the cock; but when used in conjunction with it, an additional advantage is obtained, in that the cock is adapted to give a controllable flash on being operated to admit gas. This is provided for by forming in the barrel of the cock a port L communicating with the bye-pass outlet E leading to the pilot light, and forming a corresponding port M in the plug of the cock; so that when the last-mentioned port passes the port in the barrel, high-pressure gas is allowed to flow momentarily to the outlet leading to the pilot light, and at the same time gas is admitted to the burners.

As shown in fig. 2, the governing device is arranged to act independently of the cock. The gas supply enters at O and presses on the upper surface of the diaphragm, so that it tends to force it on to its seat against the action of the spring. P is the bye-pass connecting both sides of the diaphragm, and Q is the outlet to the pilot light, burner, or the like.

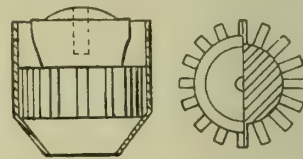
The construction shown in fig. 3 is similar to fig. 2, except that the gas supply enters at R, and for the spiral spring is substituted a sliding weight S.

### Incandescent Gas-Burners.

HEATON, C., of Skegness.

No. 10,309; April 30, 1909.

This invention relates to incandescent gas-burners in which the usual gauze diaphragm, or its equivalent, is dispensed with, and an annular passage is arranged for the mixed air and gas by placing the block for holding the mantle support in the enlarged upper end of the mixture-tube in such a way as to leave a space between it and the



Heaton's Upright Incandescent Burner Head.

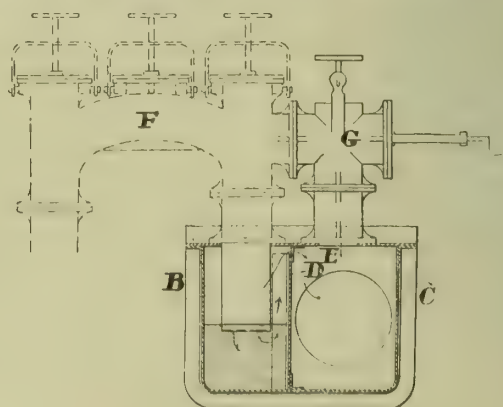
mixture-tube. The block is, as heretofore, provided with radial projections, which rest above the flange in the mixture-tube where the enlargement commences; but, in addition to being arranged radially, the projections run axially of the block, so as to form a series of passages for the mixed air and gas in a direction axially of the block.

### Hydraulic Mains.

WRIGHT, J. C., of West Ham.

No. 11,059; May 10, 1909.

This invention has for its object to so construct and arrange hydraulic mains that they can be used as wet or dry mains at will by operating a bye-pass valve or some equivalent device attached to the arch-pipe, with the result that, when working as dry mains, there obtains the separation of denser tars quickly, allowing the gas to go forward with the lighter hydrocarbons, and leaving them free to be carried forward with the gas, and at the same time keeping the tar warm.



Wright's Hydraulic Mains.

The main as a whole is divided into wet and dry mains B and C by a baffle-plate D extending from the bottom of the main to within a short distance from the top, leaving a longitudinal space E for the passage of gas from B to C.

When working as a dry main, the bye-pass valve G, which is attached to the arch-pipe F, is opened, with the result that the heavy tar falls into the main B, leaving the lighter hydrocarbons free to pass through the valve G with the gas into the dry main C. When employed as a wet main, the valve G is closed; the gas, tar, &c., flowing together down the usual dip-pipe, and through the ammoniacal liquor seal—leaving the tar within the main B. The gas escapes into the main C by way of the opening E.

The tar from the main B can be drawn off in any suitable manner,



and the main C must be kept drained; so that the gas does not flow along the hydraulic main together with the tar and the other denser products.

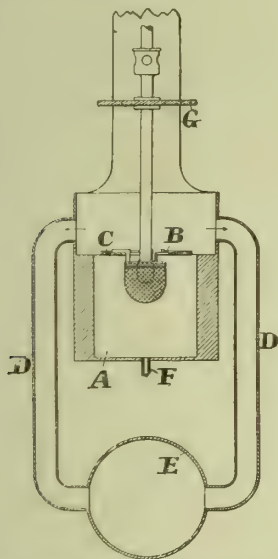
A quick separation of all dense tarry matters from the gas is thus effected, as it is made, and the gas is allowed to flow away along the dry main free of these, and, further, by reason of the hot gas passing along the dry main, the tar within the wet main is kept warm, and prevented from becoming thick.

### Forming and Hardening Inverted Incandescent Mantles.

NEUE KRAMERLICHT G.M.B.H., of Charlottenburg, Germany.

No. 12,579; May 27, 1909. Date claimed under International Convention, May 29, 1908.

This invention—relating to “forming and hardening incandescent bodies for downwardly burning incandescent gas-lights and means for carrying this process into practice”—consists in heating the incandescent fabric very highly during the hardening period (in order to obtain a more complete sintering of the metallic oxide in a short time). This object is “attained owing to the fact that, during the forming by means of the burner fed with compressed gas, the incandescent body is enclosed in a chamber from which the air is largely excluded; the transmission of heat being thereby prevented as far as possible.”



The New Kramer Light Company's Inverted Mantle Machine.

The arrangement for carrying the process into practice is illustrated in vertical section. It consists of a trough-shaped receptacle A lined with refractory material; the mantles being suspended in recesses B in a strip C resting upon it. A number of tubes D are fitted to the upper widened part of the receptacle on both sides; their other ends opening into a chimney E, by means of which the products of combustion are drawn away by natural or artificial draught. In the bottom of A passages F are provided, through which fresh air can be introduced into the chamber and flow in counter-current to the flame, or compressed air can be introduced when this is necessary for the purpose of effecting complete combustion. The burner-bench G, carrying all the compressed gas-burners, is movable upwards and downwards, as usual, by means of guides.

The hardening of the mantles is effected in the following manner: After the incandescent bodies have been inserted in the recesses B of the strip C, the latter is arranged as shown, whereupon the burner-bench G is moved upwards and downwards in the usual manner, and simultaneously the exhaustor, or other suction device used, is operated and connected with the tubes D E. The kindled compressed gas-burners, owing to their movement, “sinter the incandescent bodies throughout their entire length, and at the same time impart the permanent arched form to them.”

While in the usual processes the time required for hardening amounts to three minutes, the operation is said to be effected in two minutes by the present process, with the further advantage of increased strength of fabric; also the “duration of the operation is reduced and the gas economized.”

### Inverted Burners for Incandescent Gas-Lamps.

KIRSCHKE, E., of Charlottenburg, Germany.

No. 16,091; July 9, 1909. Date claimed under International Convention, July 31, 1908.

This invention relates to an inverted incandescent burner for lighting railway vehicles. The essence of the invention resides in the fact that, by the removal of the mixing-tube of the bunsen burner (which is detachable in the usual manner), the nozzle is simultaneously moved into such a position that it is readily accessible—thus presenting the advantage that the clearing of the discharge aperture can be conveniently effected without risk of widening the nozzle aperture. In the operative position, the arrangement is such, however, that the nozzle and the mixing-tube constitute a rigid whole, in order to prevent any current of gas and air being drawn into the mixing-tube and being deflected owing to an alteration in the relative positions of the several parts of the burner.

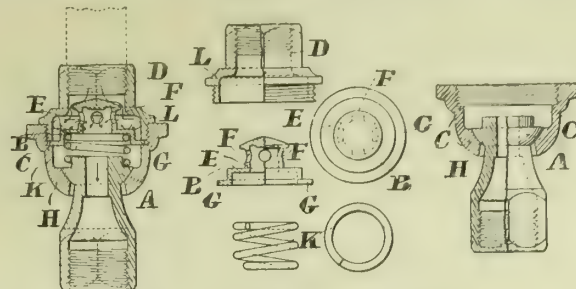
### Ball-Joints for Gas-Fittings.

LYNES, W., of Birmingham.

No. 17,158; July 23, 1909.

The object of this invention is to provide ball-joints with means for intercepting the solid particles in suspension in the gas, so as to prevent them being deposited on the surfaces of the joint.

The trap or interceptor is carried by a diaphragm or plate arranged transversely across the interior of the fitting, above the spherical members of the joint, so as to separate the latter from the incoming gas—the dust being deposited upon the upper side of the diaphragm.



Lynes' Ball-Joint for Gas-Fittings.

A vertical section through the joint is shown; the several parts of the joint being separated.

A represents the ball element of the joint, above which is the trap or interceptor. This consists of a plate or diaphragm B supported upon an annular shoulder or collar C formed around the interior of the body H of the fitting, between the inlet D and the outlet through the ball part of the joint. The middle part of the plate carries a boss or raised part E, pierced around its sides with a series of holes or gas-ways F, which make communication between the one side of the plate and the other. The top of the boss is formed as a deflector cone or crown baffle with base larger in diameter than the boss, while its apex is presented to the centre of the inlet D; whereas the outer part of the plate is formed with a set-down shoulder G, so that, when the plate is inserted upon the collar C in the cup H, an annular recess is formed, which serves as a trap or receptacle for the intercepted dust. The arrangement is such that the stream of gas, on entering the inlet, impinges against the cone or crown, and is thereby deflected towards the interior walls of the body of the fitting, which cause any solid particles that may be in suspension in the gas to be deposited in the groove formed by the shoulder G, after which the gas, deprived of the intercepted solid matter, passes through the gas-ways F in the sides of the boss to the underside of the interceptor, and proceeds thence, through the ball part of the joint, to the burner. The plate B is held in position by clamping it between the shoulder C of the cup and the lower edge of the cover or top portion L of the fitting. In order that the joint may not work too freely, and so be liable to move inadvertently, a spring K is interposed between the top of the ball part and the interceptor plate; the downward pressure of the spring on the ball part causing a stiffness between the bearings of the joint.

### Filaments for Mantles of Incandescent Gas-Lamps.

LAIGLE, R., of Paris.

No. 17,771; July 30, 1909. Date claimed under International Convention, Aug. 1, 1908.

This invention relates to the manufacture of refractory filaments for incandescent gas-lamps, of the kind in which oxides of thorium and cerium are employed in the mixture of the oxides that is intended to constitute the filament.

The patentee remarks: Hitherto these oxides of thorium and cerium derived from their rare earths have been employed in the powdered form; but it has been found that, when employed in such a form, they do not adhere sufficiently together, so that the resulting filament does not possess the desired strength and durability in use. It has hitherto been proposed to manufacture porous incandescent baskets by impregnating some organic substance having cellular structure—such as cotton—with solution of a salt of refractory earth, incinerating it at as low a temperature as possible, and reducing it to powder, mixing the powder thus obtained with an organic agglutinating substance impregnated with solution of salt of refractory earth in order to form a paste, heating the baskets formed from the filaments obtained from the paste, so as to carbonize the organic ingredients, and then baking them at a high temperature in an oxidizing medium or flame so that the carbon is burnt off.

According to the present invention, the oxides of thorium and cerium employed in the manufacture of filaments of the kind first above referred to are used in the state of a powder, having a fibrous texture, and obtained by first immersing cotton or the like in solutions of thorium and cerium salts and then burning this impregnated product, after drying, at such a high temperature that the carbon of the treated cotton is consumed by the oxygen of the air, and the salts of thorium and cerium are converted into oxides. The powder particles thus obtained possess minute hooks or projections, which engage effectively with the other substances employed in the manufacture of the filament, thereby rendering the latter much stronger.

The process is carried out by using solutions of nitrate of thorium and nitrate of cerium, and immersing the cotton therein. The cotton is thereby impregnated, and when dried it constitutes a sort of gun-cotton, which is then burned in the presence of air. The oxygen of the air consumes the carbon of the treated cotton and converts the nitrate into oxide, which remains over as a residue. This oxide, however, retains the fibrous form of the cotton; and this fibrous form remains also after the filament is ignited.

Instead of cotton, the waste of mantles possessing a similar texture may also be used for this purpose.



## MISCELLANEOUS NEWS.

### AMMAN VALLEY GAS-WORKS PURCHASE.

#### The Arbitration Proceedings.

Arbitration proceedings were commenced before Mr. CHARLES CARPENTER, at the Surveyors' Institution, on the 28th ult., between the Amman Valley Gaslight and Coke Company and the Ammanford Gas Company with respect to the purchase by the latter of the undertaking of the Amman Valley Company.

Mr. EDWARD MORTON appeared for the Amman Valley Company; and Mr. F. N. KEEN represented the Ammanford Company.

Mr. MORTON, in opening, said that many of the differences had been agreed with regard to the structural value of certain properties, and, in fact, they were agreed on everything but the buildings and mains. There had been considerable correspondence between Mr. Broadberry and Mr. Stevenson, most of which was read. The total amount of the claim was for £5365.

Mr. A. E. Broadberry, on behalf of the claimant Company, said the retort-house was a substantial building, and its value at least 2½d. per cubic foot. For the 6-inch pipes, he said that 7s. 6d. a yard was the usual price. He was afterwards told that these pipes were second-hand; and he therefore reduced his figure from 7s. 6d. to 6s. For the 3-inch pipes, 4s. a yard was the customary price, which he considered a fair value. With regard to the Yarrow pipes, when he first heard the system of joining explained to him it did not strike him as being good; but subsequently he altered his opinion. He now thought the principle was quite good. If he were responsible for carrying on the works he would not think of scrapping the pipes, because he thought the pitch which had been used could be removed at a cost of about 4s. per joint—amounting in all to about £200.

In reply to Mr. KEEN, witness said that the correspondence which had taken place between himself and Mr. Stevenson had been in order to deal with structural valuation only, and so as to save the time of the Arbitrator. In this particular case, the award should be on the basis of structural valuation for the detailed properties rather than on the valuation of the undertaking as a whole, because no gas had been supplied. It was therefore impossible to estimate the value of the works and plant as a going concern or the profits.

Mr. KEEN: Would it be possible for the purchaser to give a supply of gas by means of the property as it stood on the date the transfer took place—Aug. 16, 1909?

Witness: There were certain finishing touches to be put on both plant and mains.

Mr. KEEN: Taking the whole of the works together, could they be run so as to yield a profit?

Mr. MORTON: We have nothing to do with that.

Witness said he thought the works could be carried on at a profit—certainly, when the faults had been corrected. It all depended, however, on the price at which gas was sold, and the extent of the demand. There was nothing in the nature of goodwill in the claim, because this point had been agreed between him and Mr. Stevenson. He thought that possibly the goodwill counterbalanced the badwill. He valued the works in accordance with the Act of Parliament, which required that they were to be taken over by the statutory Company at a valuation. The limited Company could not carry on the work at all, because the Local Authority had taken proceedings against them with regard to the breaking up of the streets. He certainly thought the undertaking as a whole had a value, and that value lay in the fact that the statutory Company were ordered to take it over at a valuation. Apart from this, there would be little value in the works. He agreed that the figures for a certain period of carbonizing showed a bad condition of the plant or bad working. He thought they began to make gas before the works were in proper order. With regard to the Yarrow joints, he said he would have been inclined to join them with pitch or cement, but he thought lead would make a very fine joint. The pitch at present in the joints could easily be got away by heating. If a certain amount of the pitch still adhered, it would not interfere with the lead filling. It was a common practice to pour lead on to a pitch-covered surface; but this was certainly more in the case of water joints than gas joints.

Mr. KEEN, in addressing the Arbitrator on behalf of the Ammanford Company, drew attention to the Act of Parliament, which provided that the price to be paid was to be ascertained only by arbitration, and by one Arbitrator to be appointed by the Board of Trade, which was altogether unusual. The make of gas per ton was very small; and there was considerable loss. It was perfectly clear on the figures that there could be very little advantage in the property, and it would seem that the purchasers would be better off in laying down works of their own.

Mr. W. N. Jones, the Chairman of the Ammanford Company, said that for a short time he was also a Director of the limited Company. Practically the whole of the plant was purchased second hand. No gas was ever supplied by the Company; and proceedings were taken by the Urban Council to prevent the breaking-up of streets. At about the time when the Act was passed, an electric light undertaking was started in Ammanford. The works of the Amman Valley Company were in a disgraceful state.

Mr. Hubert Russell, the Manager of the Ammanford Company, said the works were in a very bad condition. The gas-engine was thoroughly rusted. Several portions of the brickwork supporting the retorts had fallen into the combustion chamber; and it was useless. The leakage on a particular occasion was at the rate of 135 cubic feet per hour. When the Ammanford Company took over the works, they were in such a condition that it was impossible to supply gas—"every bolt and nut was leaking."

When the hearing was resumed on the following day, evidence was given by

Mr. E. H. Stevenson on behalf of the Ammanford Company. He said he had inspected the works and the district of the limited Company.

He found a great many leakages in the apparatus; and it was impossible for the Company to make anything like the proper quantity of gas per ton of coal. In all his experience, he had never known works thrown together in such a way. The make of gas worked out at 4800 cubic feet per ton; whereas the production ought to have been 9000 feet without an exhauster, and 10,500 feet with an exhauster. The coke made had to be consumed in the furnaces—there was none for sale. As to the structural valuation, he had agreed with Mr. Broadberry on several items; but that was with regard to structural valuation alone. There were no negotiations as to the valuation as a whole, nor as to the principle of valuation. His principle of valuation had always been, under the Lands Clauses Act, the value to the seller. It had nothing to do with the value to the purchaser. With non-statutory companies, and sometimes with statutory concerns, it was usual to prepare a structural valuation. Since he agreed certain figures with Mr. Broadberry, he had again inspected the works, and was of opinion that some of the figures should be reduced. Some of the plant was now absolutely useless, and the using of it would involve much loss of money. He thought the fair value of the mains was £678. In his opinion, the Yarrow joint was not, in itself, a good one. In these particular circumstances, it would be impossible to extract from the joints anything like the full quantity of pitch which had been run in. Even by lighting a fire under every joint, he very much doubted whether the greater quantity of the pitch could be made fluid enough to cause it to run out; and to light such fires under the joints would be a most dangerous experiment to try. If it were possible to run out the greater quantity of the pitch, the whole of the joint inside would be thickly coated with pitch, and there would be some solid pitch at the bottom of the joint. Whatever these pipes might have been in the first instance, it was a practical impossibility to make good joints of them now. They ought to be taken up. He had therefore treated them at their scrap value—20s. per ton. The total structural value of the works was £3283, since they began to supply gas. But he had always been of opinion that there were other factors to be taken into consideration. They had to consider whether it was possible to manufacture gas, and whether the Company's dealings with the people in the neighbourhood were satisfactory. If their relations were good, there might be much more than the structural value in the undertaking; if they were bad, there would be less than the structural value. The undertaking was a thing quite different from the structure. In this particular case, the drawbacks dominated the benefits. In the absence of powers to break up the streets, the possibility was strongly against the limited Company being able to operate the works. The only thing which they could have sold were the meters and stoves in the houses, and the stock-in-trade and tools. It would not pay anyone to take up the pipes.

Mr. KEEN: Taking the undertaking as a whole, with all its benefits and all its drawbacks, at the date of the transfer what was its value?

Witness: I am perfectly convinced that anyone would not have given more than £1000 for it; and in paying this sum, there would have been considerable risk.

Replying to the ARBITRATOR, witness said he objected to the use of the Yarrow pipes in a mining district of this kind, because of the way in which they were jointed. He would never use them himself under these conditions. They were too rigid; it was not at all an elastic joint. He also thought it would be an improper joint if used with lead in a mining district. The only way out of the difficulty in this case would be to take the pipes up and relay them properly; but the cost of doing this would be very nearly as much as the cost of having entirely new pipes laid down.

Mr. MORTON, in addressing the Arbitrator on behalf of the claimant Company, remarked that their Bill went through Parliament without opposition from the limited Company. Then the question was raised of structural value. According to the Gas-Works Clauses Act, "the undertaking" meant "the gas-works and the works connected therewith." The whole of the correspondence indicated that Mr. Stevenson and Mr. Broadberry were to agree as far as they could, and that where they could not agree, the matter should be left to the Arbitrator.

### STOCKPORT GAS PROFITS AND THE RATES.

At the Meeting of the Stockport Town Council at which the "budget" was presented, some discussion took place with regard to the allocation of gas profits in aid of the rates.

Alderman Bell, the Chairman of the Finance Committee, submitting the estimates, said he was glad to find that, though they were short of electricity profits, the Gas Committee had been able to increase the amount they contributed in relief of the rates; and instead of £15,000 as last year, they would contribute this year £18,000. This contribution would allow the Corporation to maintain the rates at 6s. in the pound.

This statement was greeted with applause; but nevertheless one or two members urged the adoption of a different policy—namely, that of reducing the price of gas. Alderman Lees expressed the opinion that the price of gas to the consumer should be reduced. The gas was, he said, not so good, and did not cost so much to make, as in former years. He understood the profits were £22,000 after appropriating £10,000 to the sinking fund. He agreed with the policy of maintaining the sinking fund; and he believed the gas-works now stood on the books at half the actual value. But the profits amounted to about 10 per cent.; and this he thought was too much for the consumers to pay. It was not right that the large consumers should have to pay so much, and that those who did not consume gas should share in the profits. It was very important that the rates should be kept down, in order to bring industries to the town; but high charges for gas were a deterrent in this latter respect. Mr. Brewster also thought consumers should benefit, through a reduction in price. He pointed out that those who were not consumers were benefiting to the extent of a shilling in the pound at the expense of the consumers.

The Chairman of the Gas Committee (Mr. James Fernley) said that once more he would reply to the question of the reduction of the price of gas—a question which had been brought up by some people each year, and which he had had the pleasure of replying to for three or



four years. He knew Mr. Brewster was very strong on the matter; but he was in a great minority on the Gas Committee. The money which the Gas Committee made was at the disposal of the Council; and it was immaterial to the members of the Committee whether the price of gas was reduced or whether they made a contribution towards the reduction of the rates. Many members of the Committee certainly thought that money given to the relief of the rates was better spent than in the reduction of the price of gas. It could not be said they charged an excessive price for the gas, otherwise there would probably be justification for the outcry. Their price was 1s. 3d. to 2s. 4d. per 1000 cubic feet. That at Birkenhead was 1s. 9d. to 2s. 6d.; Birmingham, 1s. 6d. to 2s. 4d.; Manchester, 1s. 9d. to 2s. 4d.; Ashton, 2s. 4d.; Bollington, 2s. 4d.; Macclesfield, 2s. 3d. to 2s. 6d.; Runcorn, 2s. 4d. to 3s. 2d.; Warrington, 1s. 6d. to 3s. 4d.; and Middleton, 1s. 3d. to 3s. 3d.

Alderman Bell, replying to the discussion, remarked that it was not the first time they had been told in the Council that the profits had now assumed such a figure that it was time the price of gas should be reduced. They must consider the amount of capital which they had invested in the gas-works. The works had cost from their inception in capital expenditure over £453,000; and the present capital was £258,000. They must look at the gas-works as a commercial undertaking. Capital was invested, and capital must give a certain return to the shareholders, who were the ratepayers of Stockport. On the present capital of the gas-works, the £18,000 profit was only equal to about 7 per cent.—not a big profit for such a large undertaking.

### GAS PROFITS AND THE RATES AT BELFAST.

At a Special Meeting of the Belfast Borough Council, Mr. J. A. Doran, the Chairman of the Gas Committee, said a deputation from the Finance Committee came before his Committee to ask for a grant of £15,000 from the gas profits. The Gas Committee thought it was time to come to a halt in this matter; but the deputation made such strong representations to them that they decided it would be wise to give something like £12,000 towards the reduction of the rates. They were told that if they did not give a grant, the rates would have to be increased by 3d. or 4d. in the pound; and they certainly considered they were high enough at present. The Gas Committee had given about £24,000 altogether during the year. They were still paying the sinking fund on the City Hall, which amounted to something like £12,000 per annum, so that the building was not costing the public a penny. He thought, however, it was really time something should be done to face the question boldly; and he would advise the various Committees who were always looking to the Gas Committee for assistance to be more careful in the future.

Mr. McCusker moved that the proposed grant be referred back to the Committee. It would be argued that the gas-works belonged to the ratepayers; but if they were not paying, would the ratepayers be asked to make up the difference? He maintained that the consumers of gas would have to do so; and it was not fair that the profits of the concern should go towards paying the rates of other people. They had 24,000 odd prepayment meters, mainly used by the working classes. Why should some consideration not be given to these people, so that they might be supplied with gas as cheaply as possible? Then they had 44,000 ordinary consumers, and no consideration was shown to them. Neither the Tramways Committee nor the Market Committee proposed to devote any profits to the relief of the rates; and he did not see why the Gas Committee should adopt that course.

The amendment was defeated; and the proposal to hand over the sum named was agreed to.

### GAS PROFITS AND RATE RELIEF AT WEST BROMWICH.

At the Meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Wilson) proposed that £1000 should be allocated out of the profits of the gas undertaking for the past twelve months in relief of the rates of the borough for the coming year. He said the Committee had very reluctantly come to the conclusion to hand over £1000, because recent legislation would probably cause an increase in the price of coal; and he was afraid that, by taking £1000 out of the profits, they would be running the thing very close. Considering, however, that an effort should be made to help the rates, the Committee asked the Council to accept the grant. Having regard to the keen competition the gas undertaking had to contend with, and the diminished sales of gas, he at first voted against the grant; and he now supported it with very great reluctance. He thought they should husband the resources of the gas undertaking a little longer. Alderman Salter said everybody sympathized with the Chairman of the Gas Committee in his present position. Some eight or nine years ago, a resolution was passed by the Council with the idea of strengthening the gas undertaking by preventing the grant of sums of money annually out of the profits in relief of the rates. But every year since the Council had suspended the resolution; and the rates had benefited. In view of what the Chairman of the Gas Committee had stated, the position of affairs should be taken into serious consideration, and the expenditure of the Council kept down, so that another year there would be no necessity to ask for help from the Gas Department. Mr. W. Lawley pointed out that there had been a great decrease in the consumption of gas in the borough owing to changes going on. Still, he was hoping the gas undertaking would survive all competitors, and that gas would regain the position it formerly held in the town, when they were able to show an increase every year. He did not know that they need be particularly downcast about the outlook. Mr. J. Lawley thought they must not take too gloomy a view of the position of the gas undertaking. The Mayor (Mr. J. Brockhouse) said that he had always been opposed on principle to relieving the rates out of the gas profits; but he did not object to it very strongly this year. The motion was agreed to.

### THE STANDARD BURNER QUESTION AT PLYMOUTH.

#### Correspondence between the Gas Company and the Corporation.

In accordance with a suggestion made at the special meeting of the Plymouth and Stonehouse Gas Company at which sanction was given to the promotion of the Gas Companies' Standard Burner Bill, communications have passed between the Company and the Plymouth Corporation, who are among the opponents of the measure. Sir Joseph A. Bellamy, the Chairman of the Gas Company, has talked the matter over in an informal way with the Town Clerk, with a view to seeing whether the objections of the Corporation can be met; and more formal steps have been taken in correspondence between Mr. H. B. Heath, the Secretary of the Company, and the Town Clerk. Although it is improbable that the Corporation will withdraw their opposition, the correspondence has had the effect of placing the case for the standard burner clearly before the public. As Mr. Heath points out, an entire misapprehension prevails in the minds of people as to the circumstances which have led to the promotion of the Bill; and the publication of his letter in the local Press has, no doubt, contributed to the enlightenment of the inhabitants of Plymouth.

In his statement of the general reasons for proposing the adoption of the "Metropolitan" No. 2 burner for testing the illuminating power of the gas, Mr. Heath goes over ground familiar to readers of the "JOURNAL." The local application of the facts is not, however, so well known. It appears that the Gas Company were originally under an obligation, by their Act of 1855, to supply gas of only 10-candle power. As a matter of fact, the gas sent out was of about 14-candle quality; and when the Company went to Parliament for further powers in 1879, the standard was raised to this figure. In 1894, on the Company again going to Parliament, the Corporation succeeded in getting the illuminating power increased to 15 candles; but after nine years' experience, this was reduced, on the Company's last appearance in Parliament in 1903, to 14 candles. The Corporation assented to this decrease of a candle; but the Town Clerk now says the illuminating power is greatly complained of, and urges this as a reason why there should be no further reduction of illuminating power, such as would result, he contends, from the substitution of the proposed standard burner for the one now used for testing the gas. Mr. Heath meets this statement with a reference to facts within the Company's knowledge. "Our own records," he says, "show that complaints from gas consumers in our district have enormously decreased during the past few years. The increase in the number of consumers since 1905 has been 16 per cent., while the number of complaints from all causes, as compared with that year, has decreased 60 per cent."

The Town Clerk suggests that, in order to remove the objections to the change in the burner, the Company ought to either increase the standard of the illuminating power or reduce the price of the gas. Dealing with the second of these proposals first, Mr. Heath points out that the standard price in Plymouth is 2s. 6d., and the price at present charged is 1s. 9d. per 1000 cubic feet. Under the sliding-scale, the consumers are the chief gainers from any reduction in the price, as is shown by the fact that out of the sum of £4000, which a reduction of 1d. per 1000 cubic feet represents, the shareholders get £445 and the consumers save £3555 in their gas bills. "Put in another way," remarks Mr. Heath, "the business of this Company, after clearing 5 per cent. on the capital, is being carried on for the benefit of the consumers, who allow our shareholders a bonus of about 10 per cent. on the surplus profits earned for them, the consumers." These being the conditions, it is to the interest of the consumers and the ratepayers that the Corporation should assist the Company in effecting every possible economy. As to the illuminating power of the gas, Mr. Heath points out that the introduction of the incandescent mantle has entirely altered things. There are, of course, still users of flat-flame burners, whose interests would be affected by a lowering of the candle power, while those who have incandescent burners would not. But the gas consumed with flat-flame burners represents only 15 cent. of the total consumption; and at least one-half of these burners might be changed to incandescents with advantage to the consumer, while in many cases a much better light could be obtained by more attention to the burners than is usually given. On the subject of the heating power of gas, Mr. Heath says that a great number of tests have been made at the gas-works during the past two years; and the results prove conclusively that between gas of 14 and gas of 15½ candle power there is no appreciable difference—the variation in the heating power not reaching 1 per cent. As regards the light and heating power, the Company therefore contend that the consumers will not be prejudiced, while they will benefit by any economy which may result from the adoption of the new test-burner.

### HARROGATE CORPORATION AND ELECTRIC LIGHTING.

#### Proposed Adoption for the Public Lamps.

It appears that the Harrogate Corporation are likely to have under consideration very soon the subject of the public lighting of the town; the Electric Lighting Committee having proposed to the Committee who have control over the street lighting to convert into electric lamps the whole of those at present supplied with gas, which are owned and maintained by the Corporation. The matter was referred to at the annual meeting of the Gas Company on Monday last week, as noticed elsewhere. The Chairman (Mr. F. Barber) said the extension of the rights of the Corporation to supply electricity outside the borough, under the Electric Lighting Act of last year, was a fact which must be considered; but so long as business principles were adhered to in the administration of the undertaking, the Gas Company had nothing to fear. The trouble would arise, he thought, if any attempt were made by unfair means to develop competition in this direction which would be likely to affect the position of the Company as very large ratepayers within the borough. Every attention would be paid to the conduct of the Corporation in this direction. He noticed that there was a proposal



to convert into electric lamps the whole of the lamps at present supplied with gas. It was not possible, from the published accounts of the Corporation, to give the corresponding cost, lamp for lamp, between electricity and gas, without knowing the varying cost of the electric lamps at present used. Taking only the number of gas and electric lamps, it would appear, from the accounts, that while gas cost about £1 4s. per lamp per annum, electricity cost £4 2s. In making this rough calculation, some of the charges against gas might really be charges against electricity. The question was one upon which the public of Harrogate would require to be satisfied. Unless the Electric Lighting Committee could show the ratepayers that their proposed change would result in equal efficiency and economy, he felt sure that it would not be sanctioned. But he knew that no such result could be shown by the Committee; and the Company must therefore have confidence that the representatives of the people would see that no such step was taken to the detriment of the ratepayers. The Company were quite ready to accept any challenge in this matter of public lighting, and, if given equal opportunities with the Electrical Department, he did not hesitate to say that the Company would be able to offer terms for the whole of the public lighting which would enormously reduce the cost at present incurred by the Lighting Department. This matter would not be lost sight of, and every legitimate claim would be put forward on behalf of the Company for fair treatment. Everything that was done in the direction of increased public expenditure, either for street lighting or for any other purpose, only meant increased rates to the people; and the question of their ever-increasing rates was now uppermost in everyone's mind, and was really becoming a most serious matter. During the last ten years, the rates within the borough had increased by no less than 1s. 11d. in the pound, 5d. of which was due to the calls of the County Council.

### LECTURES ON AIR PURIFICATION IN GLASGOW.

Readers are aware that the Gas Committee of the Glasgow Corporation some weeks ago arranged for the delivery of a series of lectures having for their object the enlightenment of the public on the subject of the prevention of air pollution by smoke. The first was delivered on the 9th ult. by Mr. A. Wilson, the Gas Engineer of the Corporation, and he was succeeded two days later by Professor J. W. Graham, of Dalton Hall, University of Manchester; both lectures being noticed in the next issue of the "JOURNAL." The following Wednesday, Mr. Walter Grafton, the Assistant Manager, lectured on "The Domestic Uses of Gas;" and an epitome of his discourse has already been published (*ante*, p. 525).

Mr. G. B. Langlands, the Chief of the Public Lighting Department, speaking upon "Gas Appliances and the Problem of Air Purification," described in detail the many appliances for the employment of gas for domestic and trade purposes. He strongly appealed for the more general adoption of gas-fires for the heating of the home, and laid stress upon their convenience and cleanliness. He also commended the life-saving crusade in favour of clean air as an object quite as important as even such splendid movements as the lifeboat work.

Mr. J. McGehee, the Superintendent of the Works Department of the Corporation gas undertaking, in a lecture on "Coal Gas and How to Obtain the Best Value from It," described various appliances for the use of gas, and combated a number of objections which are frequently put forward with regard to gas for both lighting and heating.

Mr. W. M. Mason, of the Central Gas Office, dealt with the subject of "Modern Necessities: Gas for Light and Heat." He showed the substitute that might be offered in lieu of what he described as the barbarous method of producing heat by consuming raw coal. His solution was the use of gas for all lighting, heating, and cooking. He said the critics of to-day told them that gas was too dear, as against the price of coal, to be advocated as a means towards air purification. He quoted figures showing the gradual decrease in the price of gas from 1869, when it was 4s. 7d. per 1000 cubic feet, to 1910, when it was 2s.—the lowest price ever recorded in the history of the Glasgow Gas Department. He informed his audience that an interesting census had just been completed showing the growth of incandescent lighting in the Glasgow area of gas supply. In the last five years, the use of incandescent lighting in houses of less than three apartments had increased 215 per cent., in houses of four apartments and upwards 160 per cent., and in shops, warehouses, &c., 188 per cent. Dealing with the very important question of ventilation in connection with public buildings, Mr. Mason referred to a gas-burner which had been evolved in Glasgow which was meeting a felt want in connection with the lighting of large halls, churches, theatres, &c. It was designed to supersede the old style of circular pendant, and had a circle of 28 inverted incandescent burners fitted under a reflector. The main feature of the appliance, which gave an illumination of nearly 2000 candles for a consumption of only about two pennyworth of gas per hour, was that it was fitted with ventilating shafts through which the hot air passed out of the building, carrying with it the products of combustion, and materially helping to keep the hall free from foul air. Various systems of shop lighting were referred to; and interesting statistics were quoted relating to the progress made in Glasgow as regarded street lighting since the first public lamp was lit in the City in the year 1818. Mr. Mason said there were now upwards of 22,000 lamps, lighting 320 miles of street, on the incandescent gas system. The second part of Mr. Mason's lecture was devoted to the subject of heating by gas, and the great convenience of the gas-fire. The usual questions asked about this style of heating—"Is it healthy?" and "Is it economical?"—were answered with an emphatic "Yes;" and the lecturer supported his affirmation by quotations from leading authorities. Cooking by gas was also dealt with, and the immense improvements which have been made in appliances since they were first put on the market in 1850 were shown. It was estimated there were now considerably over 2 million gas-cookers in use in the United Kingdom, which meant that more than one-fifth of the inhabitants of the British Isles were fed with gas-cooked food. The lecturer referred to the new washhouse boiler, which, at the cost of about 1d. for gas, could bring 12 gallons of water to boil within an hour.

### AUSTRALIAN GASLIGHT COMPANY.

#### Gas Supply during the Coal Strike.

The Half-Yearly Meeting of this Company was held at the Head Office, No. 163, Kent Street, Sydney, on the 27th of January, under the presidency of Mr. G. J. COHEN, the Chairman.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was presented. They stated that the profits for the six months ended Dec. 31 last, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, with the balance brought forward, amounted to £71,663; and they recommended the payment of a dividend for the six months of 9s. per share on the old shares, and in proportion on the new ones, free of income-tax. This would absorb, in round figures, £60,000, and leave a balance of £11,663 to be carried forward. The Directors stated that the coal strike was causing the Company much anxiety. The supply of gas was being maintained, but at a serious extra expenditure for coal, shale, and oil, which would have to be provided for during the current half year. The Engineer (Mr. Thomas J. Bush) reported that the whole of the Company's plant had been efficiently maintained.

The CHAIRMAN, in moving the adoption of the report, said the steady increase in the consumption of gas which had been reported for some time past had been considerably augmented, particularly during the month of December, owing to the coal strike at Newcastle. Under ordinary circumstances, the Directors would gladly have welcomed such an increased demand, but could hardly do so under existing conditions, as it was costing so much more to make gas than the price charged; indeed, if they doubled the rate it would not recoup them for the enormous outlay incurred. But they had all through considered that they were in duty bound to do their utmost to keep up the supply of gas at any cost, rather than that the city and suburbs should be in darkness, and the consumers inconvenienced thereby—so many of them depending upon gas for both domestic and manufacturing purposes; and he was satisfied that the general public would value the success of the Directors' efforts on their behalf. The Company were able to hold out for more than six weeks before having to consider seriously the purchase of coal at the high rates ruling. When, however, it became necessary to secure supplies at the enhanced prices, the Board did not hesitate to incur the extra heavy expenditure, which had not ended. In this connection, he wished to acknowledge the valuable help rendered to the Company by the Chief Railway Commissioner in meeting the Directors in the matter of railway haulage at a time when such assistance was of the utmost importance. The action of the miners in ceasing work without notice had done serious injury to companies like theirs who served the public, and upon whom so many thousands depended. The past half year had not suffered to any great extent, as the major part of the additional expenditure for coal, shale, and oil, would have to be included in the current six months. The consumers had certainly not assisted the Company in the crisis; for, instead of being economical in the use of gas, they had in many cases reserved their stocks of coal, or refrained from replenishing them, and had used gas exclusively—thus making it all the harder for the Company; stocks of coal being small, and the cost of production so much heavier. However, he was pleased to state that there had been no curtailment in the gas supply throughout the city and suburbs, other than a slight diminution in the hours of lighting the public lamps, which had been partly restored. So that practically the only inconvenience the public were being subjected to was in the matter of extensions; the Board considering that, in the interests of the present consumers, they were justified in suspending all new work. The Balmain Municipal Council terminated their lighting agreement with the Company in September last; and Newtown and Annandale had intimated their intention to do so at the end of the present year. He understood that special inducements had been held out to these Councils with a view to the adoption of electric lighting for the public streets; but he could only again repeat what he had said on previous occasions, that, taking light for light, gas was the cheaper illuminant. Referring again to the Company's operations for the past half year, the quantity of gas sold was 1,293,286,000 cubic feet; showing an increase of 87,211,000 cubic feet, or 6·7 per cent., when compared with twelve months ago. The number of lamps in use was 11,026; and the gas-cookers sold by the Company during the half year amounted to 824—the total sold to date being 19,099. The consumers numbered 90,238, or an increase of 1591 for the six months. The additional mains and services laid were equal to 43 miles; the total length now being 2419 miles. In conclusion, he might say that the general outlook for gas was still very satisfactory. The popularity of the inverted incandescent gas-burner was well maintained, and nowhere more so than in Sydney. It had already been the means of inducing many to revert to gas after a trial of the electric light; it being found less expensive to use, while the illumination afforded by it was superior, and less trying to the eyesight.

The DEPUTY-CHAIRMAN (Mr. J. H. Storey), seconded the motion, and it was unanimously adopted.

A hearty vote of thanks was passed to the Directors and officers for their services during the past half year.

**Barking Gas Company.**—At the half-yearly meeting of this Company last Wednesday, the accounts presented showed that the revenue in the six months ended Dec. 31 was £16,634, and the expenditure £11,013; leaving £5621 to go to the profit and loss account. The balance available for distribution was £8042; and the Directors recommended the payment of the full statutory dividends on all classes of shares, as well as £300 on account of back-dividends on the original shares (all less income-tax). This absorbed £3910, and left £4132 to be carried forward. The Directors reported that the business of the Company was progressing satisfactorily; the sales of gas for the six months showing an increase of 11·5 per cent. over those in the corresponding half of 1908, while 412 additional consumers came upon the books.



## HARROW AND STANMORE GAS COMPANY.

### A Satisfactory Report.

The Ordinary Half-Yearly Meeting of this Company was held at the Holborn Restaurant last Friday—Mr. A. H. BAYNES, J.P., in the chair.

Mr. W. CADY read the notice convening the meeting; and the report and accounts were taken as read. The former stated that the business of the Company continued to prosper; but the heavy fall in the value of coke had adversely affected the revenue for the half year to Dec. 31. The Directors, in conjunction with other gas companies, were promoting a Bill in Parliament to alter the present standard burners as fixed by the different Acts to one standard burner of later date, which was now in statutory use in many companies, and was in accordance with the Model Bill of the Houses of Parliament. A resolution to approve the contents of this Bill would be laid before the proprietors at a special general meeting. The balance of profit and loss account was £9720; and the Directors recommended the declaration of dividends for the half year at the rate of 10½ per cent. per annum on the original "A" capital, £7 7s. per cent. per annum on the additional "C" capital, and 7 per cent. per annum on the additional "B" capital and guaranteed shares—all less income-tax. This would leave £4570 to be carried forward to the next half year.

The CHAIRMAN, on rising, said it was with sincere regret that he had to report the absence from the meeting of Mr. Horace J. Rydon, J.P., one of the Directors, who for many weeks past had been suffering from grave illness, from which he was only slowly recovering. Then a few days ago their Engineer and Secretary, Mr. J. L. Chapman, had the misfortune to contract a very severe form of influenza, and was by medical orders confined to his room. He felt sure the shareholders would join with the Board in expressing their sympathy with these gentlemen, and in hoping that they would both make a speedy recovery. Proceeding to move the adoption of the report and accounts, he remarked that it would not be needful to detain the shareholders by any lengthened statement. It must be satisfactory to them to know that during the half year just closed there had been an increase of nearly 10 per cent. in the sale of gas, as compared with the corresponding period of 1908. A very considerable amount of difficulty during a portion of the six months had arisen from the fact that the Middlesex County Council had been putting down tramway lines in the parish of Wembley. The works now in progress seriously interfered with the comfort of the population, as the whole of the road was broken up and the traffic displaced—the roads and paths being in a very unsatisfactory condition. As a consequence, many houses were at present unlet. But as soon as the works were completed, and the tramways were in operation, there was every prospect of a very considerable increase in the number of consumers and new residents. It was also somewhat unfortunate that the London and North-Western Railway Company had just now several bridges under alteration, and highways were being widened and diverted—this work greatly interfering with the letting of houses. As soon, however, as the short electric line was completed, there would be two new stations opened, and a continuous service of trains, passing through pleasant country districts, which would also, without doubt, bring new residents, and further customers to the Company. The Harrow Metropolitan station had lately been enlarged and improved, and the number of trains increased; and this, too, was proving beneficial to their undertaking. The Engineer was at present proceeding with the erection of the new gasholder, which was to hold about 1¼ million cubic feet of gas. The tank had been completed; and the gasholder Contractors, Messrs. Cutler and Sons, were under agreement to finish their work by Aug. 1 next, as it would be necessary, on account of the continued increase in the sale of gas, to be fully equipped with this additional holder before the autumn set in. Satisfactory arrangements had also been made to secure a junction line from the gas-works to the Metropolitan Railway. This, it was anticipated, would be completed by Oct. 1, when all the traffic, amounting to nearly 18,000 tons annually, would pass direct to and from the works by rail. All materials—including coal, coke, and other goods—had at present to be carted to and from the Harrow Metropolitan Station, which was about 1¼ miles from the works. The Directors confidently expected there would be a very considerable saving when the new gasholder and the railway connection were brought into working order, and the heavy cost of cartage saved. The past half-year's results did not show quite so large an increase in the profits. This was partly due to the lower price obtainable for coke in the Company's district—large quantities being brought in at low prices from works outside their area—and partly to the writing-off of a considerable length of old main-pipes which had been cut out—larger ones having been laid in their place. The Directors deemed it wise to incur this latter somewhat heavy expenditure at the same time as the operations for the laying down of the tramway lines were in progress. The results per ton of coal and per gallon of oil were about the same as they had been for the last two or three years; and the unaccounted-for gas for the whole twelve months now stood at 5½ per cent. The net profit for the half year was £6230; while the dividends recommended and the interest on the debenture stock would require £6004, which would leave a balance of £226 to be added to the sum of £4344 brought forward; making a total of £4570 to be carried to the next account. The Board felt that it ought to be pointed out to the shareholders that the past half year had been a specially onerous one for Mr. Chapman; the alteration, extension, and improvement of the works having involved a large amount of care, anxiety, and time. They were convinced that the shareholders would join with them in a special assurance of hearty appreciation of the Engineer's untiring and thoroughly successful efforts to make the works of the Company second to none. The Directors confidently anticipated that, as the result of the special expenditure on the works during the past half year, there would be a very considerable increase in the business of the undertaking during the current six months.

The DEPUTY-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion; and it was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Dr. GLAISHER, the dividends recommended were declared.

Subsequently, on the motion of Mr. A. F. PHILLIPS, J.P., seconded

by Dr. GLAISHER, the retiring Director (Mr. Baynes) was re-elected; and the retiring Auditor (Dr. C. E. Goddard) was also re-appointed, on the motion of Mr. F. LENNARD, seconded by Mr. F. H. PILLEY.

Mr. PHILLIPS said they were all exceedingly sorry that the Engineer was not with them; but he was sure Mr. Chapman himself was quite as sorry to be absent. The shareholders had heard of the excellent services he had continued to render the Company; and these services became the more onerous in consequence of the alterations and additions that had continually to be made to the works to meet the increase in consumption. They were much indebted to him and to the staff for the accounts presented that day; and he had much pleasure in proposing a vote of thanks to Mr. Chapman and those under him.

This was cordially agreed to; and the Chairman and Directors were also thanked for their services, on the motion of Mr. F. R. SMITH, seconded by Mr. LENNARD.

### The Standard Burner Bill.

A Special Meeting was then held for the purpose of considering the Standard Burner Bill, in the promotion of which the Company are joining.

The CHAIRMAN said the object the gas companies had in promoting the Standard Burner Bill was to secure uniformity in the testing of their gas. The burner at present used in testing the Company's gas was prescribed in their original Act of 1873, and was the burner generally used throughout the country at that time. It would give fairly consistent results when testing plain coal gas of a uniform specific gravity and a quality of 16 candles. Owing, however, to the difficulty of obtaining cannel and its increased cost during the last fifteen years, most gas companies had adopted oil as a means of enrichment, in conjunction with water gas. Such gas had a higher specific gravity, and required less air for its combustion—that was to say, that the same quantity of light was obtained from a smaller flame—and, consequently, in order to secure uniform results, it was necessary to have a burner to which the air supply for the combustion of this gas could be adjusted. These facts had been recognized for some years, and formed the subject of an inquiry by a Departmental Committee, who reported to the Board of Trade the advisability of the substitution of the No. 2 argand for the old No. 1. Since that report in 1905, this had been the burner named in the Model Gas Bill; and it had been introduced into all the Acts of Parliament which had been passed subsequent to that date. The gas supplied by all the London Companies and about sixty other companies in the Provinces, as well as by sixteen local authorities, was now tested by the No. 2 burner. The gas companies had no desire to take any advantage of their consumers; but it surely was unreasonable to put the companies to the expense of supplying an article from which the consumer obtained no benefit. If the introduction of the new burner was the means of reducing the cost of gas, the price would be lowered; and for every penny reduction, the consumers would have the benefit of £750, while the shareholders would only receive £230. The Bill which had been deposited in Parliament had no other object. But for some reason, advantage had been taken of it by many local authorities to get up extraordinary opposition; and they had deposited petitions requesting the introduction into the companies' various Acts of clauses quite foreign to the intention of the Bill, and to which the companies would certainly not agree. He ventured to think that the shareholders in the Harrow Company would at once say that it was to their interest to support the Bill; and he therefore begged to move—

That this meeting having considered the Bill now pending in Parliament, intitled "A Bill to provide in the case of certain gas companies for the adoption of the 'Metropolitan' argand burner No. 2 as a standard burner, in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them and for other purposes," hereby approves the same, subject to such additions, alterations, and amendments as Parliament may see fit to make therein.

The resolution was unanimously passed without discussion; and this brought the proceedings to a close.

## ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

### Increased Business in Both Departments.

The Ordinary General Meeting of this Company was held on the 22nd ult., at the Offices, No. 50, Cannon Street, E.C.—Mr. JOSEPH MANWARING in the chair.

The SECRETARY (Mr. W. A. Schultz, F.C.A., J.P.) read the notice convening the meeting and the minutes of the previous meeting; and the report and accounts were taken as read. These showed, for the year ended Dec. 31, a profit on the gas account of £4722, and on the electricity account of £374. After providing for every charge against the year's working, and interest on the mortgage debenture stock, and the payment of an interim dividend at the rate of 5 per cent. per annum for the half year ending June 30, and setting aside a sum of £225 for reserve for renewal of plant, there remained a balance of £2284 at the credit of profit and loss account, out of which the Directors recommended the payment of a dividend at the rate of 6 per cent. per annum for the six months to Dec. 31, making 2½ per cent. for the year, and leaving £102 to be carried forward. The demand for gas and electricity continued to progress satisfactorily.

The CHAIRMAN, before referring to the business of the Company, made feeling allusion to the loss which had been sustained by the death, last May, of Mr. Frederick Bridges, who, besides being one of the earliest shareholders in the undertaking, had since 1902 occupied a seat on the Board. The Directors felt that, to fill up the vacancy created, they could not do better than invite Mr. Samuel Spencer (who had been for many years connected with the gas industry, and was a shareholder in the Company of many years' standing) to join the Board; and the shareholders would later on be asked to confirm this appointment. Turning to the report, he remarked that the Board were that day presenting to the proprietors for their approval accounts which he thought he was fairly justified in describing as most satisfactory; and he was glad that the action of the Directors (supported by the share-



holders) in embarking upon the scheme of adding the production of electricity to that of gas, had met with a considerable amount of success. It was impossible to foresee at the commencement exactly in which direction the greatest consumption for electric energy would eventually be manifested; and consequently various mains had to be laid into the districts in which such demand might have been expected. There had, however, been an exceptional demand in the immediate neighbourhood of Sunningdale at the extremity of the main which was laid the previous year—so much so, that it was found necessary before last Christmas to lay down another main from the works to Sunningdale. This work was carried out, and consumers in the neighbourhood were obtaining a satisfactory supply. It would be noticed from the accounts that the sale of electric current had more than doubled itself in the past year, as compared with the figure for the previous twelve months. Applications were still coming in; and the revenue was steadily increasing at a very satisfactory rate. The profit from electricity was shown at £374, as against £32 for the preceding year; but it must be borne in mind that those charges which were common to both gas and electricity had to be allocated under the Act considerably to the disadvantage (for the time being) of the Electrical Department. Otherwise a larger profit would be shown in this respect. It might have been expected that, with the advent of electricity, the gas output would have suffered; but the Directors were pleased to be able to say that, not only had the output of gas not diminished, but it had actually increased to the extent of 1,150,000 cubic feet. On the other hand, the revenue charges had decreased by the amount of £266, leaving the profit on the gas undertaking £288 more than was that of the previous twelve months. The Directors thought it wise at the close of the June half year to be cautious; and they consequently declared an interim dividend at the rate of only 5 per cent. per annum for the six months. There was, however, sufficient profit to enable them to recommend that 6 per cent. be paid for the second half year, making the dividend 5½ per cent. for the year, and thus maintaining the dividends at what they have been since 1905. The capital expenditure on the gas account had been £1871, and on the electricity account £3500. The Directors did not anticipate that there would be much further need of capital outlay, except in regard to the retort-house accommodation, and any necessary extensions where an increased supply might be demanded. The siding from the London and South-Western Railway on to the works had recently been extended. Further shares had been offered to the public during the past year, and also some 4½ per cent. perpetual mortgage debentures, producing a slight premium. The Board proposed to issue shortly after Easter sufficient capital to enable them to clear off the present bank loan and overdraft, and to provide enough money for any necessary extensions. There was no desire on the part of the Directors to shut their eyes to the fact that the present prosperous state of the Company could not have been possible without the loyal and hearty co-operation of the Engineer (Mr. A. E. Brooks) and the Secretary. The Board had recognized this by advancing the salary of the Engineer from Jan. 1 last. They were indebted to Mr. Schultz to a great extent for the successful initiation and carrying through of the electric lighting scheme, whereby the Company had been enabled to maintain the profits of the Gas Department unimpaired. He concluded by moving the adoption of the report and accounts.

Mr. H. W. SMITH seconded the motion; remarking that the report was very good—indeed, almost better than they might have expected. When electricity was introduced as a part of the business, he was rather opposed to the scheme, because he feared that it would somewhat cut into the profits of the Gas Department. The accounts now before them proved, however, that the electrical business had been more of an advantage to them than otherwise.

The resolution was then carried unanimously.

On the proposition of Mr. H. C. WALKER, seconded by Mr. H. W. SMITH, a dividend for the half year at the rate of 6 per cent. per annum, less income-tax, was declared.

Mr. F. R. SMITH moved the confirmation of the appointment of Mr. Samuel Spencer as a Director, in place of the late Mr. Frederick Bridges, and also his re-election. Mr. Spencer, he said, had had so long an experience of gas affairs, that the Company were extremely fortunate in having him on the Board.

Mr. H. W. SMITH, in seconding, remarked that Mr. Spencer was associated with a good many companies, and probably there was scarcely anyone who knew more of the ramifications of a gas undertaking than he did.

Mr. SPENCER, in returning thanks, said he had recently visited the works, which he had never done before, although he had been a shareholder since the inception of the Company. He found the works capable of meeting all requirements; and he was delighted with them. The electrical portion was equal to anything that would be needed for a long time, except perhaps some trifling additions. The only thing he regretted was to see the neighbourhood so sparsely populated; but no doubt even this would right itself in time. Originally, he was somewhat against the taking up of electricity; but there was no doubt that in the future they would derive a great amount of benefit from it, because their possession of both gas and electricity would prevent opposition. It was gratifying to see that, in the second year of working the electrical plant, the receipts from the sale of current were two-and-a-half times as much as in the first year; while the profit was ten times greater. They could not expect this rate of increase to be continued; but he felt that the figures would go on satisfactorily growing until they had secured all the likely customers. Altogether he looked forward to a prosperous future for the Company.

The Auditors (Messrs. T. W. Welton, F.C.A., and Dr. H. J. Strong, J.P.) having been re-appointed,

A vote of thanks to the Chairman and Directors was accorded on the motion of Mr. WALKER, seconded by Mr. C. COMINS, and was duly acknowledged by the CHAIRMAN.

Similar recognition having been made of the services of the officers and employees, on the proposition of Mr. COMINS, seconded by Mr. F. K. SMITH,

Mr. SCHULTZ returned thanks. He said the Chairman had referred to the loyalty with which the Engineer and Manager, Mr. Brooks, had served the Company during the past year—and, in fact, ever since he had been appointed.

## BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week at the Holborn Restaurant—Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, briefly touched upon some of the features of the working of the half year. He said it would be seen that only £978 had been expended on gas capital account; and this had been entirely for new mains and services. Turning to the gas revenue account, it would be noticed that private lighting had brought in about £1000 more than in the corresponding period of last year. The increased consumption was due to a better supply having been afforded to the outlying districts, and to the active policy that had been pursued in the gas-fittings and show-room department. The Company had not only been authorized to supply gas, but they had been entrusted by Parliament with power to supply fittings and apparatus necessary to consumers for obtaining the best results in lighting, heating, and cooking. Until recently these powers had been undeveloped. But the Directors found that the consumers were not obtaining the best results; and to prove the suitability of gas for all purposes connected with domestic and trade supplies, expert men had been engaged to advise consumers, and to execute the necessary fittings, with (he was glad to say) very pleasing results. During the half year, the Company had supplied, excluding cookers, more than 1000 gas-fires, burners, pendants, &c., giving the consumers the best value for money, as well as developing the business. At the present time, they had, practically speaking, no complaints; and those they had had were invariably proved to be due to some local defect, such as an obsolete burner or defective fitting. In convincing consumers that the gas supplied by the Company was of good quality, it was satisfactory to report that they had had the assistance of the East Barnet Valley District Council, who had recently appointed a gas examiner to test the gas; and he had certified the gas free from impurity and of 16½-candle power, or about 16 per cent. higher in illuminating power than was required by Act of Parliament. The receipts from residuals showed a slight increase, due entirely to the better return from sulphate; and there was a satisfactory increase in the rental of meters, stoves, and fittings. With respect to the expenditure on revenue account, the proprietors would be pleased to notice that coal had cost considerably less in the half year than in the corresponding period of 1908. This was due to two causes: (1) On the advice of their Engineer (Mr. F. J. Bancroft), they had been using a different character of coal which, while yielding a good supply of gas of high illuminating power, had cost the Company less per ton. (2) The regenerative furnaces recently installed, at considerable expense, had fully justified the Directors in pulling down the old retort settings and replacing them with modern ones, and had enabled them to make a greater quantity of gas per ton—the result being that they had sold upwards of 5 million cubic feet of gas more in the half year with a decreased cost for coal of over £600. Early last year, the Engineer made a very favourable contract for coal; but, as the proprietors were no doubt aware, there was now considerable unrest in the coal trade. The Directors therefore thought it advisable to make the contract for next year early; and although they had not been able to obtain as good terms as last year, they had, he thought, done very well considering the labour disturbance. The item of repair and maintenance of works, &c., had been reduced by more than £1000; for it would doubtless be remembered that last year they had considerable outlay in the reconstruction of the works, one of the results of which was the advantageous working to which he had referred. Under the heading of distribution, the principal item was an increase of expenditure of £1100 on repair and maintenance, &c., of mains. It was found that, in one or two districts, the consumers were short of gas, owing to the inadequacy of the mains. They had therefore laid new mains, and had disused old mains in these districts. They had also examined, and thrown out of use, other old and duplicate mains; and the cost of this work had been charged almost entirely to revenue. The two-fold benefit of this mainlaying work was that consumers who were formerly complaining had now a satisfactory supply; and the unaccounted-for gas had also been much reduced. Repairing, renewing, and refixing of meters was responsible for an additional £200 expenditure; and £1000 had been spent in the half year for repairing, renewing, and refixing stoves and fittings. The other items varied very little from those in the corresponding half of 1908; and the net result was that the profit was £3405, against £2730 for the corresponding period of 1908. It would be thought by interesting to the proprietors to know that the quantity of gas made during the six months had been 82,584,000 cubic feet—an increase over the make in the corresponding six months of 1908 of 4,898,000 cubic feet. The quantity sold was 75,905,300 cubic feet—an increase of 4,542,300 cubic feet. The gas made per ton of coal exhibited an increase of 898 cubic feet, compared with the December half of 1908. The coal carbonized, notwithstanding the greater make of gas, decreased by 99 tons—the total quantity being 6717 tons. The sulphate of ammonia made was 53½ tons; coke made, 6397 chaldrons; coke sold, 5103 chaldrons—the last-named figure having increased by 343 chaldrons. In all, 243 new gas service-pipes were laid.

Turning to the water department, the gross revenue showed the pleasing increase of upwards of £1000. But in common with other companies, they had to record a large number of empty houses; so that the allowances under this heading were £100 more than last year. In respect of maintenance, £350 more had been spent on works; and £300 more for repairs of mains and services. Here, again, the increased cost had been due to the disusing of old duplicate mains. The other items of expenditure were practically normal; and the net result was that they had a profit of £10,134. It was gratifying to note that, although the average population supplied with water in 1909 showed a considerable increase, the consumption had been reduced. This was probably due to the wet autumn and winter; and to the vigilance which was now being exercised to stop small leaks, and to obtain the prompt repair of defective service-pipes and fittings. The Directors confidently looked to the consumers for assistance in these matters, which were necessary for the prevention of waste and misuse



of water. The aggregate profit for the past half year was £13,632, which would enable the Directors to place £1000 to the contingency fund, in accordance with the resolution of the proprietors, provide for the interest on temporary loans, mortgage bonds, and debenture stock, pay the dividends, and also carry forward an increased balance. Adverting to the report, it was with pleasure that he drew attention to the fact that the appeal, in regard to the sinking of a well, of the Company against the judgment of Mr. Justice Ridley resulted in the Company's favour; but the Marquis of Salisbury had given notice of appeal to the House of Lords, which it was anticipated would be heard very shortly. In the opinion of the Directors, it certainly seemed anomalous that a Company specially created with parliamentary sanction for the purpose of supplying water in a large and growing district should be deprived of the means of affording that supply, and should have to spend very large sums of money in endeavouring to secure the rights which it was certainly the intention of Parliament to grant to them. The Company had never hesitated to spend their money freely in their efforts to afford a full and satisfactory supply of water. He was pleased to say that, at the present time, there were practically no complaints; and the Company were on good terms with all the local councils. Finchley had been given a constant supply in accordance with the Company's Act; and to meet the wishes of the Barnet District Council, an extended supply had been afforded to that district.

The financial outcome for the half year, as contrasted with that of the corresponding period of 1908, had been: Profit on gas, £3405; profit on water, £10,134; profit on fittings, £93—making a total profit of £13,632. This represented an increase of profit on gas of £675, and on water of £224. From the total of £13,632, they had to deduct interest and income-tax £2230; the dividends recommended, £9846; and to transfer £1000 to the contingency account. This would leave £555 to be added to the balance brought forward (£17,687); making £18,243 to be carried forward. Some of the proprietors present would doubtless remember that, at the half-yearly meeting in March last year, he stated that the Board had unanimously appointed Mr. F. J. Bancroft, B.Sc., M.Inst.C.E. (for several years Engineer and Manager of the Hull Corporation Gas and Water Works), to the then vacant position of Engineer and Manager of their own Company. He then further congratulated the Company on this appointment, and stated that it was, in the judgment of the Board, an appointment that would be of signal advantage to the Company—resulting in increasing progress and prosperity. On this occasion, he (the Chairman) felt that, in the report before the proprietors, they had abundant proof of the wisdom of the appointment; and he was confident that he expressed the feelings of all the Directors when he said that, in their opinion, no better selection could have been made. The satisfactory results of the half-year's working were mainly due to Mr. Bancroft's untiring efforts and administrative ability, aided by a most efficient staff; and this constituted a very sure guarantee of still further success in the future. He could not doubt that the shareholders would cordially agree in this expression of appreciation of the past half-year's management.

The DEPUTY-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion.

Mr. DYER heartily congratulated the Board on the balance-sheet, and the excellent results of the working of the half year. It was apparent from the accounts and the Chairman's remarks that the Directors had not in any way starved the concern.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared, less income-tax for the half year, at the rates per annum of  $7\frac{1}{2}$  per cent. on the "A" and "C" stocks,  $6\frac{1}{2}$  per cent. on the "B" stock, and  $5\frac{1}{2}$  per cent. on the "D" capital, gas and water stocks.

On the motion of Mr. ALFRED LASS, seconded by Mr. FREDK. LENNARD, the retiring Directors (Mr. A. H. Baynes and Dr. Glaisher) were re-elected, as was also the retiring Auditor (Mr. B. Dennett Holroyd), on the motion of Mr. SAMUEL SPENCER, seconded by Mr. DYER.

On the proposition of Mr. A. F. PHILLIPS, seconded by the DEPUTY-CHAIRMAN, a cordial vote of thanks was passed to the Secretary (Mr. Drew), the Engineer (Mr. Bancroft), Mr. Wright, the staff, and workmen generally.

A similar compliment was also paid the Chairman and Directors, on the motion of Mr. SPENCER, seconded by Mr. W. TIBBS.

### Extensions of Retort-House Machinery.

Sir William Arrol and Co., Limited, of the Dalmarnock Iron-Works, Glasgow, have just received from the Sheffield United Gaslight Company an order for a complete installation of hydraulic stoking plant for their Neepsend works. This includes the Arrol-Foulis charging machine and the Hunter-Barnett patent coke-pusher, besides pumping engines, accumulator, and accessories. The Brighton and Hove General Gas Company have also decided to instal the Hunter-Barnett coke-pusher at their Portslade works; and Sir William Arrol and Co. have this contract in hand at present.

**London County Council.**—The final meeting of the Council as constituted by the election in 1907 was held last Tuesday, when the report of the Local Government Committee on the financial position of the Metropolitan Water Board, given in the "JOURNAL" for the 15th ult. (p. 456) was adopted after a short discussion; and that of the Parliamentary Committee on the Gas Companies Standard Burner Bill, noticed last week (p. 604), was agreed to without comment.

**Co-Partnership at Watford.**—At the recent half-yearly meeting of the Watford Gas Company, the Secretary and General Manager (Mr. J. Duncan Royal), in responding to a vote of thanks passed to the members of the staff for their assiduity and zeal in the interests of the Company, referred to the co-partnership scheme which has been introduced, and said he thought that nothing the Directors could have done could be so much for the good of the men. The scheme was only in its infancy at present; but the whole-hearted way in which it had been taken up, augured the very best for it in the future.

## PROVINCIAL GAS COMPANIES.

### A Good Increase at Brighton.

The report presented at the half-yearly meeting of the Brighton and Hove Gas Company on the 25th ult. opened with the statement that, in comparison with the figures for the six months ended the 31st of December, 1908, the sale of gas in the corresponding half of last year showed an increase of 35,802,300 cubic feet, or 5.9 per cent.; but the sale of residuals again yielded less. The revenue from the sale of 633,284,300 cubic feet of gas was £93,360; and the total revenue came to £118,777. The expenditure having been £90,743, there was a balance of £28,034 to go to the profit and loss account. Adding the balance brought forward (£13,364) and a small amount received for interest, produced a total of £41,434. After charging interest on debenture stock, &c., and transferring £2000 to the insurance fund, there was a sum of £36,610 available for distribution; and the Directors recommended the declaration of dividends at the statutory rates of 6, 4, 11, and 8 per cent. per annum on the several classes of stock. These payments would amount to £23,652, and leave £12,958 to be carried forward.

### Progressive and Eventful Year at Eastbourne.

The half-yearly general meeting of the Eastbourne Gas Company was held on Monday last week, when the Directors reported that there was a profit of £8525 on the revenue account for the six months ended Dec. 31, and a balance of £16,600 available for distribution. The Directors therefore recommended the declaration of a dividend for the half year at the rate of  $15\frac{1}{2}$  per cent. per annum on the original capital, and on the capital raised on "C" shares; at the rate of  $12\frac{1}{2}$  per cent. per annum on the capital raised on "B" shares; and at the rate of 5 per cent. per annum on the 5 per cent. preference stock. These payments would absorb £8472, and leave £8128 to be carried forward. The Directors added that, under the provisions of the Act obtained last session, the necessary mains had been laid to convey a supply of gas to Polegate and Hailsham; and this extension of the Company's area was proving satisfactory to all concerned. The Chairman (Dr. G. A. Jeffery, J.P.), in moving the adoption of the report, said the past year had been a progressive and eventful one. The sale of gas had gone up from 220,124,000 cubic feet this time last year to 235,652,000 cubic feet—an increase of 15,528,000 cubic feet, or 7.05 per cent. The number of consumers was now 4781 ordinary and 4642 prepayment—together, 9423, or a gain in the year of 569. The leakage was reduced to 5.65 per cent., against 6.94 per cent. before—a decrease of  $1\frac{1}{4}$  per cent. The net profit was £8525, against £8369 last year; being more by £156. This profit was £52 14s. 2d. above the amount required to pay the dividend. Having dealt with various items in the accounts, the Chairman reminded the shareholders that at the beginning of the year the Company lowered the price of gas 2d. per 1000 cubic feet, from 2s. 8d. to 2s. 6d.—entailing a loss for the half year of nearly £2000. This was a loss for the year of about £4000, which practically represented a free gift to the gas consumers of Eastbourne. At the meeting in August, he thought that before the year was out there would be, at this low cost, an increased consumption of gas. His opinion had proved to be correct, for already they had nearly overtaken the loss of the £2000, and secured a profit of £8525, which not only enabled them to pay dividends of  $15\frac{1}{2}$  and  $12\frac{1}{2}$  per cent., but to carry forward an almost similar sum (more than £8000) to the account for the next half year. The Chairman went on to refer to the extension of the Company's area sanctioned by their Act of last session, and stated that the Directors had purchased 900 tons of pipes and placed them in nine miles of hard, hilly road, 2 ft. 6 in. in depth, employing 60 men for four months; and during the work there had not been a single accident to life or limb, nor a single complaint from anyone whose district was gone through. The Directors had many meetings and many interviews with their Consulting Engineer (Mr. H. E. Jones), for they were determined to bring to a successful issue what they had set their hands to. They were ably assisted by the Secretary (Mr. J. S. Garrard) and his efficient staff, who worked willingly and heartily, and by the Manager (Mr. John Hammond) and his men at the works, who did their share. All, in fact, assisted to bring the past eventful half year to a successful conclusion, and the Directors offered them their best thanks. The report was adopted and the dividends were declared. A vote of thanks having been accorded to the Directors, officers, and workmen for the care with which they had conducted the business of the Company, as shown in the accounts and by the growth and progress made, the Chairman was thanked for his attention to the business of the day; and he briefly acknowledged the compliment. Mr. Garrard returned thanks on behalf of the officials, and made a few explanatory remarks in regard to the new issue of capital by the Company, as announced elsewhere in the "JOURNAL."

### Profit Sharing and Increased Rental at Enfield.

At the half-yearly meeting of the Enfield Gas Company on the 24th ult., the accounts presented showed that the revenue in the six months ended Dec. 31 was £24,406, compared with £24,154 in the latter half of 1908. The expenditure was £18,931, against £17,491; and the balance carried to the profit and loss account £5475, against £6663. The profit for the half year, after providing for net interest charges, amounted to £4898; and the Directors recommended a dividend at the rate of 5 per cent. per annum on the consolidated preference stock and of  $5\frac{1}{2}$  per cent. per annum on the consolidated ordinary stock, both less income-tax. The sale of gas in the half year amounted to 106,232,500 cubic feet; being 99,168,100 cubic feet for private purposes and 7,064,400 cubic feet for public lighting. The Chairman (Sir Alfred Somerset, K.C.B.), in moving the adoption of the report, said the bonus scheme, formulated in the June half year to give the employees of the Company a direct interest in its affairs, had been vitalized during the period under review; and he was now able to announce that every officer and workman in the regular employ of the Company had signed the service agreement which gave the title to participate in its benefits. He felt very hopeful from the attitude of the employees at the meeting at which the scheme was explained to them, and subsequently, that the



latent mutual advantages to the proprietors, the employees, and the consumers of gas would be manifested. The new gasholder [described in the "JOURNAL" for Nov. 16 last] had been formally brought into use in the period covered by the report. By it the storage capacity of the Company had been increased from 700,000 to 1,700,000 cubic feet. The Engineers (Messrs. W. A. Valon and Son) had pronounced it to be a satisfactory piece of construction; and from the cost point of view, the Company had every reason to be satisfied also. The accounts presented for the shareholders' acceptance exhibited the very gratifying feature of an increased rental from the sale of gas, though the price per 1000 cubic feet had been reduced over the whole of the six months by 2d. from the rate current in the corresponding part of the previous year. Mr. Alfred Ford, in seconding the motion, dealt with the matters of principal interest in the accounts. Comparing these with the figures for the December half year of 1908, he pointed out that the gas sold had increased by 5½ per cent., representing 5,767,700 cubic feet; bringing up the total sold to 106,232,000 cubic feet. The reduction in the price of gas referred to by the Chairman had benefited the consumers by upwards of £800 in the half year. Rentals of meters, stoves, and fittings totalled an extra £182. The makes of gas and coke for sale per ton of coal used had kept up to the high standard reached in 1908. The motion was carried, and the dividend recommended declared. The meeting terminated with resolutions expressing the thanks of the proprietors to the Directors and staff, which were acknowledged by Dr. Collyer and Mr. C. W. Offord, the General Manager.

#### Satisfactory Increase at Exeter.

At the annual meeting of the Exeter Gas Company on Monday last week, the Directors reported an increase of 17½ million cubic feet in the sale of gas in the twelve months ended Dec. 31, a portion of it being due to the cold weather prevailing in the spring and autumn. They expressed their pleasure in announcing a reduction of 2d. (from 2s. 9d. to 2s. 7d.) per 1000 cubic feet in the price of gas used for general purposes, and of 1d. from the prices now being paid for gas consumed for the production of motive power. The accounts accompanying the report showed a balance of £20,079 available for distribution; and the Directors recommended dividends of 10 and 7 per cent. per annum on the original stock and the new ordinary shares, together with an additional dividend to reimburse the shareholders for the deductions for income-tax. The Chairman (Mr. G. Hardy Harris), in moving the adoption of the report, remarked that, in spite of competition, the Company had had a good year; the sale of gas having considerably increased. Several improvements were made in the manufacturing plant—one of the alterations being the introduction of special apparatus to deal with the inconvenience caused to consumers through their services becoming blocked; and he was glad to be able to announce that since it had started the number of complaints up to Christmas last had been reduced 50 per cent., while for the month of January the reduction was 75 per cent. This result would, he felt sure, be received with considerable satisfaction by the consumers. As announced in the report, the Directors had been able to reduce the price of gas by 2d. per 1000 cubic feet from Christmas last. The policy of supplying gas as cheaply as possible to the public was one which the Board had adopted for many years, and one which greatly contributed to the stability of the Company. The motion was seconded by Mr. J. Langdon Thomas, and carried unanimously. The dividends having been declared, and the retiring Directors and Auditor unanimously re-elected, a vote of thanks was accorded to the Chairman. A special meeting was then held to consider the Gas Companies (Standard Burner) Bill. The Chairman remarked that from the report of the discussion at the recent meeting of the City Council it would appear that some people were of opinion that the Gas Company wished to evade their responsibilities. This was not so. The proposed alteration of the test-burner was only a matter of justice to the Company, as they were working under old and obsolete regulations from which many other undertakings having modern Acts of Parliament had been relieved. They simply wished that there should be one standard burner throughout the country for all gas undertakings, and that this burner should be the best possible one with which to burn the gas. It must be emphatically stated that the movement commenced by the Associated Gas Companies, numbering 47 in all, was one that was going to benefit the consumer. The effect of the adoption of the modern test-burner would be to prevent waste and reduce the cost of production; and the public would thus ultimately be the gainers. Mr. W. R. Moore seconded the motion; and it was carried unanimously.

#### Reduced Price and Increased Consumption at Harrogate.

There was a large attendance at the annual meeting of the Harrogate Gas Company on Monday last week, when the accounts presented showed that the profit for the past year was £13,111; the revenue having been £48,869 and the expenditure £35,758. The net revenue was £22,383, out of which the Directors proposed to pay dividends at the same rate as before, which would absorb £10,085 (less the interim dividend), place £1022 to the reserve fund, and carry forward the balance of £16,320. They reported that the reduced price of gas of 2½ per 1000 cubic feet had slightly affected the revenue from the sale of gas; but there had nevertheless been an increased consumption to the extent of 3,667,300 cubic feet. According to a statement by the Secretary and General Manager (Mr. Harry Wilkinson), the quantity of gas made last year was 297,126,500 cubic feet, of which 276,495,300 cubic feet were sold, and 28,140,700 cubic feet accounted for. The Chairman (Mr. F. Barber), in moving the adoption of the report and accounts, referred to the brighter outlook in the coal trade, and at some length to the action of the Harrogate Corporation in connection with electric lighting. [This matter is referred to elsewhere to-day.] Having regard to the improved working results and the economies effected by the management, he said he had never entertained brighter hopes for the future success of the undertaking than he did now. Though the total figures on both sides of the revenue account were only normal, there were underlying factors in the items that made them up which opened out much promise for the future. The reduction of 2d. per 1000 cubic feet which had operated during the whole of the past twelve months was accountable for a reduction of £2273 in the receipts; but

this had been more than met by the increased yield of coke and other residuals from 669 tons of coal carbonized less than in the preceding year, the reduced cost of coal, and great economies in management. The report was adopted. The retiring Directors and Auditors having been re-elected, an extraordinary meeting was held, at which it was resolved to empower the Directors, in addition to the stock authorized to be raised by the resolution passed April 8, 1907, of which £15,000 remains unissued, to issue £30,000 further stock of the class which shall be determined by them. A vote of thanks to the Chairman, Directors, officials, and staff brought the business to a close.

#### Record Half Year at Hastings.

As the half-yearly meeting of the Hastings and St. Leonards Gas Company last Thursday, the Directors reported that the sales of gas in the six months ended Dec. 31 exceeded those of the corresponding period of 1908 by 5 per cent. The total quantity sold, as shown by the accounts, was 234,712,600 cubic feet, out of a make of 247,970,000 cubic feet, of which 77,477,000 cubic feet were oil gas. The accounts also showed that the revenue for the half year was £44,967, and the expenditure £30,396; leaving a balance of £14,571 to go to the profit and loss account. A sum of £2000 was written off the old works and plant, and £200 for loss in connection with public lamps discontinued. The balance of net profit was £57,818; and the Directors recommended the payment of dividends for the half year at the statutory rates per cent. per annum of £6 10s., £5, and £6 1s. on the 5 and 3½ per cent. converted stocks and the 5 per cent. additional stock, all less income-tax. The Chairman (Dr. G. G. Gray, J.P.), in moving the adoption of the report and accounts, characterized the latter as exceptionally satisfactory, showing as they did that during the past half year there had been an increase of 5 per cent. in the quantity of gas sold, which was equivalent to something over an increase of 11½ million cubic feet. They had made the largest profit balance that his memory went back to—a balance sufficient to pay all their outgoings, provide their full statutory dividends, write off a substantial amount, and leave something to be carried forward. The past half year would be difficult to beat. Comparing it with the corresponding period of the preceding year, the increase from the sale of gas, including meters and stoves, amounted to £252, notwithstanding the reduction in the price of gas. In residuals there was a net decrease amounting to £1034. On the expenditure side there was a saving of £3140, including a net decrease on coal, under repairs, and rates, taxes, and insurance. They had not been let off with less rates than other ratepayers; but the corresponding half year had shown an increase owing to the manner in which rates had been collected. They had an increased profit balance of £2404 for the half year. Mr. A. W. Oke seconded the motion; and it was carried. A vote of thanks having been accorded to the Chairman, Directors, officers, and staff, the Chairman and the Engineer and General Manager (Mr. Charles E. Botley) responded; the latter referring to the interest taken in their work by all the men. A special meeting was then held to sanction the association of the Company with other gas companies in the promotion of the Standard Burner Bill. The Chairman (who is a member of the Corporation), explained the effect of the adoption of the new burner, and said it would be to the advantage of consumers even more than stockholders. The Corporation had decided to oppose the Bill. Not one of the opposing local authorities did so on the merits of the proposal, but on a sort of roving or fishing expedition, to try to get something out of the gas companies, who had wisely decided to stand or fall together. No explanation of the Bill had been given to the Town Council; and probably not one member of the Corporation who was not connected with the Gas Company had ever seen the burner, or knew the difference between it and the one now used for testing gas. He doubted whether any member knew what was in the petition which had been ordered to be sealed. Such action brought the Town Council into disrepute. He moved a resolution approving the Bill. Mr. Botley, in supporting it, said the standard of illuminating power of the gas would not be lowered by the adoption of the new burner. The motion was carried unanimously. The Chairman added that he had explained the Bill because he did not want the shareholders to be like their friends on the Town Council—opposing what they knew nothing about.

#### Record Year at Ilfracombe.

The Ilfracombe Gas Company have every reason for congratulation on the results of their last year's working. As the Chairman (Mr. W. C. Rafarel) remarked at the annual meeting last Wednesday, the financial position is highly satisfactory; while the sale of gas reached the highest figure recorded in the history of the Company. A sum of £3021 which had been lent from the reserve fund to the capital account has been replaced in the reserve fund; and there has been transferred from this fund to the capital account the sum of £4618. The effect of this is to leave a balance in hand on capital account of £2093, which may be regarded as working capital. With reference to the revenue account, Mr. Rafarel stated that the cost of coal showed a reduction of £100, though the quantity used was 200 tons more. Other items of expenditure were about the same as in the previous year. The income from private lighting increased by £138, despite a reduction in the price during the year. The experience of an increase in consumption following a reduction in price would encourage the Directors to make a further concession at the earliest possible moment. The sale of gas exceeded by 1,717,700 cubic feet any previous sale. The revenue from residuals had increased by £121. The balance-sheet showed a balance to the profit and loss account of £3277, which was £300 more than the previous year. The report and balance-sheet were adopted; and dividends were declared of 5 per cent. on the preference stock and 5 per cent. on the ordinary consolidated stock. The staff and workmen were thanked; special reference being made to the work of Mr. J. Armstrong, the Manager, and Mr. A. Norman, the Secretary.

#### Lower Price and Increased Profit at Leighton Buzzard.

The report submitted at the recent meeting of the Leighton Buzzard Gas Company stated that the revenue account for the year ending Dec. 31 showed a profit of £2083. This amount, with the sum brought forward, made a balance of £2773 standing to the credit of the profit and loss account. Out of this, the Directors recommended the pay-



ment of dividends at the rate of 10 per cent. per annum on the original stock, and 7 per cent. per annum on the new ordinary stock, less income-tax, together amounting to £1717, and that £300 be carried to the reserve fund. The Chairman (Mr. R. Richmond) remarked that the report was a very satisfactory one. They had made a reduction of 3d. per 1000 cubic feet in the price of gas during the year; but their net profit showed an increase of £130. Whether they would be able to reduce the price of gas still further next year, depended entirely upon the cost of coal. If the price of coal remained at the same figure as last year, he believed they would be able to take a little more off—possibly 1d.; but he was afraid, on viewing the state of the coal market, that they would have to pay a little more for coal. The Company's works were in good condition; and they had a splendid report from their Manager (Mr. C. F. Ruggles). The number of consumers compared favourably with similar towns. Recently they looked into the matter; and they found that, for towns of their size, they stood second in the number of slot meters installed. The town acknowledged to be first was High Wycombe; but in dealing with that town, they were considering an exceptional case. At High Wycombe, there were a great number of small workers; and a lot of work was done at home. It was also interesting to know that at High Wycombe the charges for gas were 9d. higher. The report was adopted, and the Directors' fees were raised. In proposing a vote of thanks to the staff, the Chairman said he was pleased to see Mr. Ruggles on the way back to perfect health; and he trusted that for many years to come he would attend the meeting looking as well as he did on that occasion.

#### Satisfactory Year and a Jubilee at Redhill.

At the recent fiftieth annual meeting of the Redhill Gas Company, the Directors reported that the business of the Company had made satisfactory progress during the year ended Dec. 31. The total number of consumers was 4360; and the number of cooking and heating stoves on hire had increased to 2702. The lower price of coal which obtained during the year had appreciably relieved the cost of manufacture. The Directors regretted to note, however, that the result of the Coal Mines (Eight Hours) Act held out little prospect of such favourable prices being maintained. The accounts accompanying the report showed a balance of £8691 available for distribution; and the Directors recommended dividends of 10 per cent. on the share capital, and 5 per cent. on the "B" stock, both less income-tax, leaving a balance of £1003 to be carried forward; interim dividends of  $\frac{1}{2}$  and  $\frac{2}{3}$  per cent. respectively having been paid on the 1st of September. They also recommended that the remuneration of the Secretary (Mr. H. Long) be increased £50 per annum. The Chairman (Mr. G. R. Hunt), in moving the adoption of the report, said he thought the shareholders could feel satisfied with the result of the past year's working. A fair increase in the revenue from the sale of gas was shown; but this improvement had been offset by a smaller revenue from residuals, principally due to the lower price of coke. Having dealt with various matters connected with the working of the Company in the period covered by the report, the Chairman remarked that it was the last annual report of half-a-century's working. The Company was formed early in the year 1860, with a capital of £3000. It was interesting to note that the revenue of the Company at the end of each succeeding ten years up to the present time reached the following figures: In 1869, it was £3580; in 1879, £8840; in 1889,

£12,214; in 1899, £20,464; and in 1909, £29,156. The Company's returns had thus shown steady progress, in spite of the depression in trade of recent years, and in the face of the competition brought about by the Corporation nearly nine years ago. The district, especially in the outlying parishes, was still growing in favour as a residential centre; and the Directors had every reason to hope that the Company's business would maintain the satisfactory rate of progress hitherto shown. Their Manager (Mr. James Paterson, M.A.) reported that the works and plant were in a thoroughly efficient state, and, in consequence of the many improvements in the new retort-house, an appreciable reduction in the cost of manufacture had been brought about. The manufacturing plant was not only capable of producing all the gas at present required, but was so designed that it would be sufficient to meet a far greater demand as the development of the district continued. Mr. A. W. Oke seconded the motion; and it was carried. The increase in the Secretary's salary having been unanimously agreed to, a vote of thanks was accorded to the officers, which was acknowledged by Mr. Long and Mr. Paterson. A similar compliment was paid to the Chairman and Directors.

#### Continued Prosperity at Richmond.

At the recent half-yearly meeting of the Richmond (Surrey) Gas Company, the Directors, in their report, congratulated the shareholders on the satisfactory results shown by the statement of accounts, and recommended the declaration of a dividend for the six months ended Dec. 31 at the rate of  $5\frac{1}{2}$  per cent. per annum. Mr. A. Chancellor, who presided, in the absence, through illness, of Mr. T. J. Carless, the Chairman, in moving the adoption of the report, said there had been an increase in the consumption of gas. Coals had cost more than £1000 less than during the corresponding half of 1908; about £700 of this sum being due to more favourable markets, and the balance being the result of a larger quantity of gas being produced per ton of coal used. They had taken the precaution of laying in large stocks, and had got through the period of the largest production with sufficient coal left to cover fully two months' requirements. While there had been increases in the receipts from the sale of gas and the rental of meters and stoves, coke showed a falling off of upwards of £500. The profit and loss account showed the Company to be in a satisfactory position. Mr. Pulman seconded the motion, which was carried, together with the recommendation as to the dividend. The retiring Directors having been re-elected, the Chairman moved a vote of thanks to Mr. T. May (the Engineer and Secretary) and the staff for their valuable services; and it was carried. Mr. May briefly returned thanks. A similar vote was passed to the Directors. A special meeting was then held, at which a resolution was duly passed approving of the Gas Companies' (Standard Burner) Bill.

#### Reduction in Price at Southend.

The half-yearly report of the Directors of the Southend Gas Company stated that there had been an increase in the quantity of gas sold of 7.03 per cent. as compared with the corresponding six months of the previous year. The number of consumers had increased by 787; there being on Dec. 31 13,185, of whom 9005 had automatic meters. It was with deep regret that they reported the death of Sir W. Lloyd Wise, who was elected to the Board over seven years ago. The profit

### GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 642.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	86-88	..	£ s. d.	£	Stk.	Nov. 11	p.c.	Imperial Continental	175-177	..	£ s. d.
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	5 13 8	4,940,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	92-94	..	4 10 5
310,000	Stk.	Oct. 28	6 1/2	Bombay, Ltd.	6-6 1/2	..	5 4 0	1,235,000	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
200,000	Stk.	Feb. 25	15	Do. New, £4 paid.	4 1/2-4 3/4	..	5 6 8	195,242	Stk.	Feb. 25	10	Liverpool United A.	222-224	..	4 9 3
40,000	Stk.	Aug. 12	5	Bourne- ) 10 p.c. .	29-30	..	5 0 0	561,000	Stk.	Dec. 29	7	Do. B.	163 1/2-165 1/2	..	4 4 7
50,000	Stk.	Dec. 29	7	mouth Gas ) 7 p.c. .	16 1/2-16 3/4	..	4 3 7	718,100	Stk.	Oct. 1	5	Do. B. Stk.	103-105	..	3 16 2
311,310	Stk.	Aug. 12	5	and Water ) Pref. 6 p.c.	15-15 1/2	..	3 17 5	75,000	Stk.	Nov. 26	6	Malta & Mediterranean.	41-5	..	6 0 0
75,000	Stk.	Dec. 29	12 1/2	Brentford Consolidated	250-253 1/2	..	4 18 10	560,000	Stk.	Oct. 1	5	Met. of 1/2 p.c. Deb.	59-102	..	4 18 0
380,000	Stk.	Aug. 12	5	Do. New	187-189	..	5 0 6	250,000	Stk.	Nov. 11	3 1/2	Melbourne J 4 1/2 p.c. Deb.	100-102	..	4 8 3
300,000	Stk.	Dec. 29	4	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	Stk.	Feb. 25	4 1/2	Monte Video, Ltd.	121-123	..	5 5 8
50,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	1,775,892	Stk.	Dec. 29	3 1/2	Newcastle & Gt. Tesh'd Con	104-105	..	4 3 4
206,250	Stk.	Dec. 29	11	Brighton & Hove Orig.	218-221	..	4 19 7	529,435	Stk.	Feb. 25	7	Do. 3 1/2 p.c. Deb.	91-93	..	3 15 3
220,000	Stk.	Oct. 14	10 1/2	Do. A Ord. Stk.	154-157	..	5 1 1	55,940	Stk.	Nov. 26	8	North Middlesex 7 p.c.	121-123	..	5 5 8
246,320	Stk.	Feb. 25	6	British	44 1/2-45 1/2	+2	4 13 6	300,000	Stk.	Oct. 1	5	Oriental, Ltd.	138-140	..	5 14 4
460,000	Stk.	Dec. 29	4 1/2	Bromley, A 5 p.c.	116-118	..	5 1 8	60,000	Stk.	Feb. 25	13	Ottoman, Ltd.	68-68 1/2	..	6 5 6
109,000	Stk.	Dec. 29	3 1/2	Do. B 3 1/2 p.c.	87-89	..	5 1 2	31,800	Stk.	Dec. 29	12	Portsea Island A.	134-136	..	5 1 1
165,790	Stk.	Dec. 29	3 1/2	Do. C 5 p.c.	103-105	..	5 4 9	60,000	Stk.	Dec. 29	12	Do. B.	126-128	..	5 1 7
82,278	Stk.	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	Stk.	Dec. 29	12	Do. C.	119-121	..	4 19 2
503,000	Stk.	Dec. 29	7	Buenos Ayres (New) Ltd.	14 1/2-15 1/2	..	4 11 10	114,800	Stk.	Dec. 29	10	Do. D and E.	100-102	..	4 18 0
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	Stk.	Oct. 28	7	Primitiva Ord.	78-78 1/2	..	4 8 11
109,000	Stk.	Dec. 29	4	Cape Town & Dis., Ltd.	4-5	+1	—	796,980	Stk.	Jan. 27	5	Do. 5 p.c. Pref.	58-58 1/2	..	4 8 11
50,000	Stk.	Dec. 29	6	Do. 4 1/2 p.c. Pref.	5 1/2-5 3/4	+1 1/2	—	488,900	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	+1	3 19 3
100,000	Stk.	Dec. 29	4 1/2	Do. 6 p.c. 1st Mort.	48 1/2-49 1/2	+1 1/2	6 1 3	1,000,000	Stk.	Oct. 14	8	River Plate Ord.	174-181	..	4 7 8
157,152	Stk.	Feb. 25	5 1/2	Do. 4 1/2 p.c. Deb. Stk.	83-85	+3	5 5 11	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
1,511,280	Stk.	Feb. 25	5 1/2	Chester 5 p.c. Ord.	105-108	..	4 12 7	250,000	Stk.	Dec. 29	9 1/2	San Paulo, Ltd.	16-16 1/2	+1 1/2	5 9 1
560,000	Stk.	Dec. 29	3	Commercial 4 p.c. Stk.	105-108	..	4 16 4	62,500	Stk.	Jan. 3	5	Do. 6 p.c. Pref.	113-122	..	4 18 0
400,000	Stk.	Dec. 29	3	Do. 3 1/2 p.c. do.	103-105	..	4 15 3	125,000	Stk.	Jan. 3	5	Do. 5 p.c. Deb.	53-51	..	4 18 0
870,000	Stk.	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Jan. 3	5	Sheffield A.	233-235	..	4 5 1
200,000	Stk.	Dec. 29	3	Continental Union, Ltd.	96-98	+1	5 2 0	209,984	Stk.	Jan. 3	5	Do. B.	233-235	..	4 5 1
492,270	Stk.	Dec. 29	3	Do. 7 p.c. Pref.	137-139	..	5 0 9	523,500	Stk.	Jan. 3	5	Do. C.	233-235	..	4 5 1
55,000	Stk.	Dec. 29	3	Derby Con. Stk.	121-123	..	4 1 4	70,000	Stk.	Oct. 14	10	South African.	125-127	..	7 16 11
148,095	Stk.	Dec. 29	3	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5 1/2	South Met., 4 p.c. Ord.	120-122	..	4 9 7
486,090	Stk.	Dec. 29	3	East Hull 5 p.c. Ord.	98-100	..	5 0 0	1,895,445	Stk.	Jan. 13	3	Do. 3 p.c. Deb.	82-84	..	3 14 6
351,060	Stk.	Dec. 29	3	European, Ltd.	214-214 1/2	..	4 17 0	209,821	Stk.	Aug. 26	8	South Shields Con. Stk.	161-162	..	4 18 9
15,144,545	Stk.	Dec. 29	3	Do. £7 10s. paid.	18 1/2-19	+1 1/2	4 14 9	605,000	Stk.	Feb. 25	5 1/2	Sth Suburb'n Ord. 5 p.c.	120-122	..	4 12 9
2,600,000	Stk.	Dec. 29	3	Gas 4 p.c. Ord.	104-105	..	4 8 10	60,000	Stk.	Dec. 29	5	Do. 5 p.c. Pref.	119-121	..	4 2 0
3,799,735	Stk.	Dec. 29	3	light 3 1/2 p.c. max.	88-90	+1	3 17 9	117,058	Stk.	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,198,975	Stk.	Dec. 29	3	Do. 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
253,740	Stk.	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
82,500	Stk.	Dec. 29	3	Hastings & St. L. 3 1/2 p.c.	95-97	..	5 3 1	453,940	Stk.	Dec. 29	5 1/2	and B 3 1/2 p.c.	112-114	+1	4 14 4
119,000	Stk.	Dec. 29	3	Do. do. 5 p.c.	119-121	..	5 7 5	149,470	Stk.	Dec. 29	4	Edmonton J 4 p.c. Deb.	98-90	..	4 0 0
70,000	Stk.	Dec. 29	3	Hongkong & China, Ltd.	17 1/2-18	..	6 2 3	182,380	Stk.	Dec. 29	8	Tuscan, Ltd.	93-70	..	8 4 2
134,000	Stk.	Dec. 29	3	Ilford A and C	145-147	..	4 15 3	149,900	Stk.	Dec. 29	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,782	Stk.	Dec. 29	3	Do. B	109-111	+1	4 19 1	236,476	Stk.	Dec. 29	5	Tynemouth, 5 p.c. max.	112-114	+1 1/2	4 7 9
65,500	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	Dec. 29	6 1/2	Wands J B 3 1/2 p.c.	139-141	..	4 14 0
								79,416	Stk.	Dec. 29	3	worth J 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



and loss account showed a net amount available for dividend of £10,351; and it was recommended that payment of dividends be sanctioned at the rate of  $5\frac{1}{2}$  per cent. per annum on the original consolidated and new ordinary stock, and  $5\frac{3}{4}$  per cent. per annum on the new ordinary "B" stock (all less income-tax), which would amount to £6849, leaving £3502 to be carried to the next account. The Directors had given notice that, from the reading of meters for the Lady Day quarter, the price of gas would be reduced 2d. per 1000 cubic feet. An equivalent reduction would be made to consumers by automatic meters. The Chairman (Mr. C. F. Woosnam) said the reduction in the price of gas would cost the Company over £3000; but they had been able to make a good contract for coals, and with the new stoking machinery they hoped to save a fair share of the extra cost. In fixing the price of gas, they ought first of all to consider the people who were going to buy it. They had therefore thought of their customers and not of themselves. The report was adopted; and the payment of dividends authorized as set forth in the report. The meeting concluded with a vote of thanks to the Chairman, who, in reply, referred to the efficient services rendered to the Company by the Engineer and Manager (Mr. F. Clark), the Secretary (Mr. J. T. Randall), and the staff.

#### Dessau Vertical Retorts Satisfactory at Sunderland.

The specially interesting feature of the proceedings at the annual meeting of the Sunderland Gas Company last Wednesday was the statement by the Chairman (Alderman S. Richardson), when moving the adoption of the report, that the Dessau system of vertical retorts which had been adopted at the Ayres Quay works—the first installation of these retorts in England—described in the "JOURNAL" for the 6th of July last (p. 25), had yielded results which indicated that the expectations in regard to them would be realized. The Chairman referred with regret to the death of the Secretary and Manager (Mr. J. H. Cox), and to the appointment of his son (Mr. Norman S. Cox) as Secretary and Mr. C. Dru Drury as Engineer. In regard to the working of the Company, the make and sale of gas still reflected the depression in trade, though the revenue from this source was slightly more than for 1908. The explanation was that the reduction was due mostly to a lessened consumption of gas for power purposes; while for lighting and heating, more gas had been consumed. He attributed the ability of the Company to continue to pay the maximum dividend to favourable contracts for coal and a rather improved yield per ton carbonized, satisfactory prices for coke, and other residuals, and careful management. While there had been a decrease in revenue, there had been a still larger one in expenditure. As to the coals—a matter of chief concern—they had stored at both works as much as they could, and they were in a safe position for any shortage in the near future. Colonel T. W. Stuart, in seconding the motion, said a considerable saving in labour was being effected by the vertical retorts, and the yield of gas would, the Directors believed, be very considerably increased. They also expected a larger yield of sulphate of ammonia. The production of naphthalene was almost entirely done away with, and the trouble

caused by it was thus removed. There was also an improvement in the quality of the coke. The report and accounts were adopted; and the dividend was declared as recommended—viz., 5 per cent. on the original stock, and  $4\frac{1}{2}$  per cent. on the additional stock. It was decided to increase the remuneration of the nine Directors from £750 to £1000 a year.

#### Mechanical Stoking to be Adopted at Sutton.

In the report for the six months ended Dec. 31 last which the Directors of the Sutton (Surrey) Gas Company presented at the recent half-yearly meeting, they stated that the sales of gas had increased 10,629,200 feet over the same period of 1908, or 11·1 per cent.; and the revenue advanced by £1659. The balance available for distribution amounted to £12,979, from which the Directors recommended payment, under the sliding-scale, of a dividend at the rate of  $5\frac{3}{4}$  per cent. per annum (less income-tax) for the half year. The Chairman (Mr. F. Budgen, J.P.), in moving the adoption of the report, said it showed that the undertaking was growing. There were 52 miles of mains which required keeping in order. This was at present rather more trying than in years past, owing to the heavy traffic upon the roads, and especially the motor vehicles; but he did not think they had much cause for complaint, which was proof that their mains were very well laid and the work had been well looked after and supervised by their staff. The gas consumed was 105,554,800 cubic feet, or about 11·1 per cent. more than in the half year ended Dec. 31, 1908; while the number of consumers was 5745, or 278 more. The ordinary consumers were 2900; and the slot-meter consumers practically an equal number—2845. There were 1325 gas-cookers and 536 fires on hire. Owing to the rapid growth of the business, the Board were considering the advisability of introducing mechanical stoking and coal and coke handling plant. They had visited places where such machinery was in operation, and were satisfied that it would result in a great saving; and contracts had been accepted for the completion of the large retort-house, to make it possible for the system to be introduced. The report was adopted and the dividend recommended declared; and the proceedings closed with an expression of thanks to the Directors and staff for their services.

#### Smaller Price and Bigger Revenue at Tonbridge.

The Directors of the Tonbridge Gas Company, in their report adopted at the annual meeting some days ago, stated that the result of the past year's working had been highly satisfactory; for, notwithstanding the reduction of 2d. per 1000 cubic feet in the price of gas, the revenue account showed an increase. The consumers had appreciated the concession made, and had responded by extending the use of gas for lighting, heating, and cooking. The reduction in the price to 2s. 6d. per 1000 cubic feet entitled the shareholders to an increase of  $\frac{1}{2}$  per cent. in their dividend on the "A," "B," "D," and "E" stocks. The revenue account showed a profit of £4227. After allowing for payment of interest on debenture stock, and the interim dividend, the profit and

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loss account exhibited a balance of £6700, from which the Directors recommended the declaration of dividends for the half year to Dec. 31 at the following rates: 13 per cent. per annum on the "A" stock; 10 per cent. per annum on the "B," "D," and "E" stocks; and 5 per cent. per annum on the "C" stock. This would absorb £1887, leaving a balance of £4813 to be carried to the next account. The increase in the consumption was  $4\frac{1}{2}$  million cubic feet; the total output having now reached 107 millions. The Chairman (Mr. W. Judd) said that, at the new figure, Tonbridge supplied gas cheaper than any other town of similar size in the South of England. The preparation and disposal of tar had become a very important part of the Company's business; and practically the whole of the year's production had been purchased by the Kent County Council for use during the coming season. Mr. C. F. Catt, in returning thanks for his re-election as Auditor, remarked that he had been connected with the Company for eighteen years; and it was a great pleasure to him to be associated with such an enterprising Board of Directors, and such an able Secretary and Engineer as Mr. James Donaldson. He thought it would be of interest if he gave a few figures showing the growth of the Company, and the saving which had been effected since Mr. Donaldson came to Tonbridge in 1895. The capital in 1895 was £32,300; in 1909, it was £60,300. The capital per million in 1895 was £952; in 1909, £600. Dividends were then 10, 7, and 5 per cent.; they were now 13, 10, and 5 per cent. The receipts were £7520; they were now £18,697. The number of consumers in 1895 was 700; in 1909, 3210. The gas sold in 1895 was 34 millions; in 1909, over 100 millions. The price of gas in 1895 was 3s. 6d. per 1000 cubic feet; it was now 2s. 6d. He thought that few companies in the district could boast of having made such rapid progress. Under the sliding-scale clauses, from 70 to 80 per cent. of the benefit of any reduction went to the consumers; and the Company, by their practical and economical working, were saving the consumers of Tonbridge some £5000 per annum.

#### Extended Area and Reduced Price at Tunbridge Wells.

The Directors of the Tunbridge Wells Gas Company reported, at the forty-sixth annual meeting, held a few days ago, that the accounts for the year ended the 31st of December showed a profit, including the amount brought forward, of £20,828, out of which they recommended the declaration of dividends for the past six months at the rates of  $12\frac{1}{2}$ , 10, and  $9\frac{1}{2}$  per cent. per annum on the several stocks of the Company. The payment of these would absorb £5765, after deduction of income-tax, and leave £15,063 to be carried forward. In response to a request for a supply of gas, the mains were being extended from Langton to Speldhurst. The Directors added that they had entered into a contract with Messrs. S. Cutler and Sons for reconstructing and adding two lifts to a single-lift gasholder, in order to convert it into a telescopic holder on the spiral-guided system. This will increase the storage capacity by 500,000 cubic feet. In moving the adoption of the report and accounts, the Chairman (Mr. W. H. Delves) said he thought the shareholders would agree with him that

both were very satisfactory. The number of new consumers was just under 200 for the year. This was less than in the preceding twelve months; but the district was now pretty well covered. The Board, however, looked upon the new one to which they were going as promising an extension of business. The output of stoves in the year had been good; the number hired or sold amounting to 400. Referring to the increase in the storage, the Chairman explained that the proposed alteration of the existing gasholder was a very cheap method of obtaining it. He said it was 21 years since the last holder was erected, and with the tank it cost about £14,000. It held 680,000 cubic feet of gas. Now they would get an addition of 500,000 cubic feet for about £3100, which worked out at about £6 per 1000 cubic feet; and it was remarkably cheap. Having dealt with the various items of manufacture, the Chairman said that, after looking at the matter all round, the Directors had much pleasure in announcing a reduction of 1d. per 1000 cubic feet in the price of gas. This meant that the consumers would pay £1250 less for their gas, the employees would get £108 more for their bonus, and the shareholders would have just about £300. Thus 75 per cent. of the advantage went to the consumers, and the other 25 per cent. was divided between the employees and the shareholders. He thought this fully proved the assertion he had often made, that the shareholders, employees, and consumers were all partners in the same undertaking. The cheaper they could sell gas, the better it was for all concerned. The motion was carried without discussion. The four retiring Directors having been re-elected, the thanks of the proprietors were accorded to the Directors for the care and attention they had bestowed on the business of the Company during the year. The Chairman then submitted a vote of thanks to Messrs. Stone, Simpson, and Mason, the Solicitors to the Company, to Mr. A. Dougall, the Engineer and General Manager, to Mr. C. F. Catt, the Secretary, and other members of the staff, for their devotion to the interests of the Company. He mentioned that this year there was an increased bonus of 1 per cent. to the workmen, which was equal to three weeks' wages. Mr. Simpson made a brief response; and he was followed by Mr. Dougall and Mr. Catt, who replied on behalf of the engineering and office staffs. A vote of thanks to the Chairman concluded the business of the ordinary meeting. Subsequently a special meeting was held, at which the Gas Companies Standard Burner Bill received the approval of the shareholders.

#### Steady Growth of Business at Weymouth.

The accounts for the six months ending the 31st of December, which were presented at the half-yearly meeting of the Weymouth Gas Company, bore witness to the continued steady growth of the Company's business. The quantity of gas sold during the period named was 65,748,600 cubic feet, which was an increase of 2,166,800 cubic feet—3¼ per cent.—upon the output for the corresponding half of 1908. During the past year, the sale was 122,676,300 cubic feet; this being 5,876,000 cubic feet—5.03 per cent.—in excess of the previous year. All items of receipts showed an increase, except that of coke. The



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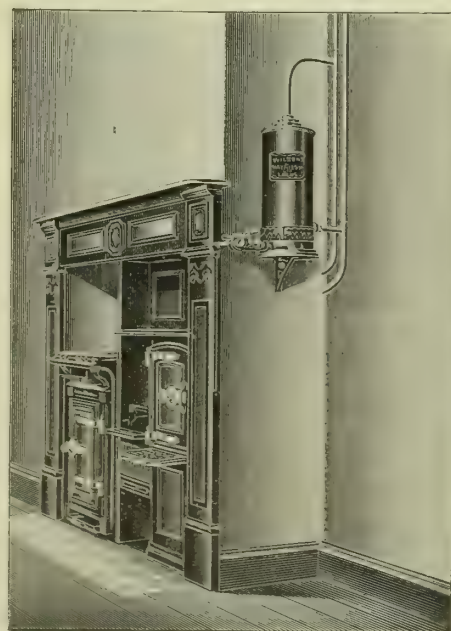
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decreased yield of this residual neutralized the whole of the increases; so that the total receipts were practically the same as in the second half of the year 1908. The profit made warranted the Directors, after paying the interest on the debenture stock, in recommending the declaration of a dividend for the half year on the ordinary stock at the maximum rate of 5 per cent. per annum, less income-tax. The Chairman of the Company (Mr. J. E. Robens) was unable, through ill-health, to be present; but he sent some remarks on the half-year's working of the Company, which were read by Mr. J. G. Rowe, the Vice-Chairman, who presided. After reviewing the position, Mr. Robens concluded as follows: "The entire income for the half year from all sources has been £13,308, and the expenditure, £11,048, which leaves a balance of £2260—sufficient to pay the 5 per cent. dividend we propose to declare. We have now finished the tenth year of the present century. During this period we have added 75 per cent. to our output, which is still continuing to advance, and our capital expenditure has been only 10 per cent. increased. The present year shows how steadily we are progressing, which must be a matter of congratulation to all connected with the Company, especially as during the time before mentioned we have reduced the price of gas from 3s. 8d. to 3s. per 1000 cubic feet." The report was adopted, and the dividend recommended declared. Thanks having been accorded to the Chairman and Directors, a similar compliment was paid to the Engineer and Manager (Mr. D. F. Colson), the Secretary and Accountant (Mr. E. Y. Wood), and the officials. The two gentlemen named were highly complimented on their work; and both expressed their appreciation of the remarks made in regard to them.

**Incandescent Lighting at Brighouse.**—Moving the adoption of the minutes of the Highways Committee at the monthly meeting of the Brighouse Town Council, Mr. Brown said the annual report from the Surveyor had been received as to the cost of street illumination for the last twelve months. At the end of the year 1905, the cost was £2953. Each year since the cost had been less; and last year the total cost of street lighting was £1557. This reduction in price was the result of using incandescent burners. The total cost of upkeep, maintenance, &c., in 1905 was £3490; whereas last year it was £2234—a saving of £1256.

**Newport's Unsatisfactory Electric Undertaking.**—The Newport (Mon.) electricity undertaking has, says a local paper, "given the Corporation some uneasiness." Over £9000 has, since its inauguration, been paid out of the rates to assist it; and the Committee therefore decided to call in an expert to advise them. Mr. C. P. Sparks was selected; and he has now presented his report, in which he recommends an all-round increase in the scale of charges. He points out that no reserve fund has been provided to meet replacements of plant which "may or has become obsolete before the expiration of the loan periods." Further, he cannot indicate any economies in the use of existing equipment.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

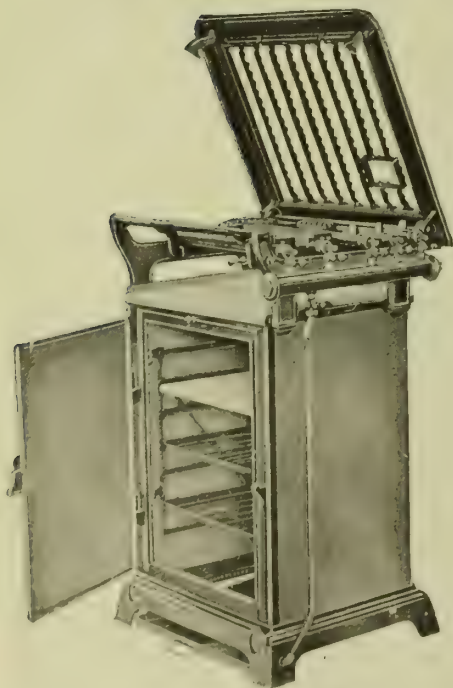
The Western District of the Scottish Junior Gas Association were favoured to-night with a paper by Mr. J. M. Smith, Joint Manager of the Dumfries Corporation Gas-Works, in which he gave a description of the construction and working of a sulphate plant which was erected in the works at Dumfries several years ago, when the late Mr. G. Malam was Engineer and Manager. The plant is a Wilton patent, with variations introduced at Mr. Malam's suggestion. It has all along worked most satisfactorily, and has been a source of great profit to the Corporation. Mr. Smith's paper was an excellent one. Notably he confined his remarks to the matter before the meeting, thereby narrowing the field of vision, and, as a consequence, the subject was discussed probably more sensibly than it would have been had the speakers had more ground to range over.

The shareholders of the Cupar Gas Company, Limited, at an extraordinary meeting the other day, unanimously resolved that the capital of the Company be augmented by the issue of 250 5 per cent. preference shares of £10 each, these shares to be offered to ordinary shareholders in proportion to their holdings, at a premium of 10s. per share; that the reserve fund be capitalized; and that the existing ordinary shares of the Company be augmented to £30 fully paid. The increase of capital is necessary on account of the Directors having resolved to put down sulphate plant.

At the monthly meeting last Monday of the Edinburgh and Leith Gas Commissioners, the report of the Engineer stated that in January there was an increased output of gas, over the preceding January, of 10½ million cubic feet; and that since May 15 the increase had been 99,631,000 cubic feet, equal to 6.49 per cent. The Commissioners suspended their Standing Orders and agreed to a motion by Mr. J. Lyon that in the appointment of a Treasurer no age limit be fixed. This will necessitate the post being re-advertised. In the previous advertisement, it was required that applicants be not over 45 years of age. I understand that, under this provision, the list of applicants is not to the mind of some of the Commissioners—the post, at not less than £500 a year, not having been eagerly sought after.

The Chairmen of the two Houses of Parliament have advised the Secretary for Scotland, under section 2 of the Private Legislation Procedure (Scotland) Act, that the provisions of the Glasgow Gas Acts Consolidation Order are of such a character that they ought to be dealt with by way of Private Bill. As a result of this decision, the inquiry will take place at Westminster. The Corporation promoted the Order with a view to obtaining the repeal of the old Gas Acts, of which there are about twenty, and consolidating them into one measure. Mr. A. W. Myles, the Town Clerk, Mr. D. Stenhouse, the Deputy Town Clerk, and Mr. A. Wilson, the Gas Engineer, were in London on Wednesday adjusting proposed amendments to the Bill.

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The lectures on air purification which were promoted by the Glasgow Corporation Gas Committee were concluded this week; the last two having been given—by Mr. Alex. Wilson on Tuesday evening, and by Mr. W. M. Mason on Wednesday evening. Both lectures were largely re-deliveries of former ones.

It was reported to the Corporation of Glasgow this week that a Sub-Committee of the Gas Committee had attended a meeting in Edinburgh of the representatives of the municipalities appointed to watch over the interests of the Scottish gas undertakings in connection with the charges by the railway companies for demurrage and siding rents, when it was resolved that no application be made at this stage to the Board of Trade for the appointment of an arbiter in reference to these charges. The Chairman also reported that this resolution had been forwarded to the Board of Trade and to the railway companies interested, with an intimation that the municipalities reserved all their rights to apply at a later stage for the appointment of an arbiter, and that they were not to be prejudiced in any way by adopting the foregoing course, or by any decision which might be pronounced in the arbitrations now pending before the Railway and Canal Commissioners with reference to the charges. This course was approved. The hearing before the Railway and Canal Commissioners of the traders' and coalowners' cases is to take place in Edinburgh at the beginning of May, and is likely to be of a protracted nature.

The engineer in charge of the extensions to the Kirkcudbright Corporation Gas-Works—Mr W. B. M'Lusk—has reported the completion of the work. The estimate was £1605; the cost has been £1593.

The fourteenth annual meeting of the Larkhall Gas Company, Limited, was held at the end of last week—Mr. A. Hamilton, the Chairman of the Company, presiding. The net available balance for appropriation was reported to amount to £1486. Out of this, the Directors recommended that £893 be set apart for payment of a dividend of 10 per cent., that £100 be placed to the reserve fund, and that the balance of £493 be carried forward. This was agreed to.

The works of the Aberlady Gas Company, which are managed by Mr. H. Rutherford, have been almost entirely renewed, under the direction of, and to plans prepared by, Mr. H. O'Connor, F.R.S.E., of Edinburgh. The new works consisted of the erection of a retort-house, containing two arches, designed for three retorts each, but at present only one arch with two retorts and one arch with one retort are to be utilized, the firing to be on the regenerative principle (introduced for the first time), the old retort-house converted into a coal-store, air condensers, a Young scrubber, two purifiers with rubber joints, governor, lime-shed, meter-house with station meter of 4000 cubic feet per hour capacity, underground tar-tank with pump, and a gasholder of 25 feet diameter, with steel tank. The only part of the old works which has been retained is a gasholder of 20 feet diameter. The cost of the work has been about £1100, to provide which the capital of the Company has been increased. The gasholder was provided by Messrs. Henry Balfour and Co., Limited, of Leven; and the purifiers, meter, and governor by Messrs. Jas. Milne and Son, Limited, of Edinburgh.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, March 5.

### Sulphate of Ammonia.

Further direct orders for shipment this month having come into the market, and dealers having evidently decided not to delay any longer the covering of their March requirements, there has been resumed activity the last few days, and higher prices have been paid. At the close, the tone is very firm, and the values are £12 to £12 1s. 3d. per ton f.o.b. Hull, £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith. There is rather more demand for home consumption, but it is still on a comparatively small scale. In the former position, further transactions are reported at £11 15s. per ton f.o.b. Leith for delivery over the second half of this year. Makers have now advanced their quotation for this period to £11 17s. 6d. per ton, but no business has transpired at the latter figure.

### Nitrate of Soda.

This continues without change, and spot quotations are maintained at 9s. 3d. per cwt. for ordinary, and 9s. 6d. for refined quality.

### Tar Products.

LONDON, March 7.

The markets for tar products have been firm during the past week. Pitch has been steady, with a tendency to improve. Creosote maintains its position; and makers are hopeful that there will be an improvement in price after the heavy make of tar has been disposed of. Benzol is very firm indeed, especially for delivery to the end of June. Fifty-ninety per cent. is scarce, and is fetching good prices. Toluol is also in good demand; while for solvent naphtha the market is still showing signs of improvement. Carbolic acid is steady, but crystals are still neglected. Liquid carbolic is firm. Anthracene is unchanged; and tar is fetching good prices.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. *ex* works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. to 31s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7½d.; North, 7½d.; 50-90 per cent., casks included, London and North, 8d. to 8½d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 2½d. to 1s. 3½d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., east and west coasts, 1s. 0½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

### Sulphate of Ammonia.

The market is still very firm, though buying has not been quite so brisk. To-day actual Beckton are asking £12 5s.; and outside makes upon Beckton terms are £12. In Hull, the price is £12; in Liverpool, £12 to £12 1s. 3d.; in Leith, £12 5s.; and in Middlesbrough, £12.



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## COAL TRADE REPORTS.

## Northern Coal Trade.

There is a steady demand for coal in the North, and the output is still kept a little below the normal by the idleness of a few collieries. In steam coals, the inquiry is fuller, and the prices are a little higher than a week ago. Best Northumbrian steams are from 11s. 3d. to 11s. 4½d. per ton f.o.b.; second-class steams are about 10s. 3d.; and steam smalls are 5s. 9d. to 6s. 9d., according to quality. Work at the collieries is fair, but there is still some uncertainty as to future working. In gas coals, the output is maintained, and prices are generally firm. The usual kinds of Durham gas coals are from 10s. 4d. to 11s. per ton f.o.b., according to class, and "Wear" specials are from 11s. 6d. to 11s. 9d. As to contracts, there are one or two small ones concluded at something like the prices that are current, and some larger ones are expected to be soon put on the market. As there is a tendency of stiffness in the prices, and one or two collieries are idle, these more distant contracts are still in doubt, and collieries do not readily take up fresh sales unless at relatively good prices. Coke is firm, with gas coke from 14s. to 14s. 3d. per ton f.o.b.

## Scotch Coal Trade.

Trade was better last week, the demand for all classes of coal having improved. Shipping trade was brisk, with better prospects than for some time. The prices quoted are: Ell, 9s. 9d. to 10s. 6d. per ton, f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 289,285 tons—an increase of 14,542 tons upon the preceding week, and of 24,936 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,196,108 tons—an increase of 375,607 tons upon the corresponding period.

In the report to be presented by the Directors of the Richmond Gas Stove and Meter Company, Limited, at the nineteenth ordinary general meeting on Thursday, they state that the balance standing to the credit of the profit and loss account for the past year (after deducting debenture interest, but including the amount brought forward) is £24,767, which it is recommended should be appropriated as follows: Depreciation in buildings, plant, &c., £5776; dividend on preference capital at the rate of 6 per cent. per annum, £5893; dividend at the rate of 10 per cent. per annum (free of income-tax), £8068—leaving, in round numbers, £5030 to be carried forward, subject to the Directors' remuneration. The Directors announce that, owing to the increase in the business, new fitting-shops are being erected at their works at Grapenhall. Further extensions are also being made to the Company's laboratories, which, they say, will make them one of the most up-to-date in the country. They also mention the acquisition of the Clark's Syphon Stove Company—a business which has been established upwards of twenty years.

## An Unsuccessful Compensation Claim.

Last Thursday, at Crewe, Judge Brown, K.C., had before him an application by the widow of a London and North-Western Railway gas-fitter for £217 compensation for the loss of her husband, Samuel Dean, who, it was alleged, died from gassing while following his employment. He was fitting a gas-meter; and in testing it a slight explosion occurred, due, according to the applicant, to a defective gas-pipe supplied by his employers. He died a week later. On behalf of Mrs. Dean, two doctors attributed death to cerebral hemorrhage caused by carbon monoxide poisoning; but the Railway Company's surgeon, who was present at the postmortem, attributed death to natural causes. It was also contended by the respondents that if the deceased was gassed it was not an injury by accident, inasmuch as gasmen must necessarily inhale gas. It was an incident of their employment. The Judge agreed that the deceased in a sense was gassed; but if death was the result of that, he would have expected hemorrhage immediately, whereas it did not occur until three days afterwards. Gassing undoubtedly might cause congestion of the brain, and congestion might cause the arteries to give way; but, in his opinion, all appearances in the case were equally consistent with the deceased having died from natural causes. He refused the application.

**Sales of Stocks and Shares.**—There was a large gathering of investors at the Mart, Tokenhouse Yard, E.C., on the occasion of the sale by Messrs. A. & W. Richards of a new issue of stock of the South Essex Water Company. The Directors offered £5000 of 5 per cent. ordinary (1901) stock, £10,000 of 5 per cent. preference stock, and £5000 of 4 per cent. perpetual debenture stock. The ordinary stock, on which £4 17s. 6d. per cent. is being paid, all sold at £115 10s. to £116 10s., the 5 per cent. preference stock at £125 to £126 10s., and some of the debenture stock at £109 per £100. The sale of the Hornsey gas stock, which was to have taken place on the same day, is postponed till the 22nd inst. At a recent sale by auction, ordinary £10 shares in the Gosport Gas Company fetched from £12 5s. to £12 10s. each.

**Quality of Eastbourne Gas.**—The Lighting Committee of the Eastbourne Corporation have received a letter from the Secretary of the Gas Company (Mr. J. S. Garrard) stating that his Directors are no less anxious than the Committee that the heating quality of the Company's gas should be maintained, and that they will spare no expense or trouble to maintain at the highest practicable level the quality of gas for all purposes. With reference to the results of the calorific tests made during the month of December last, the Directors cannot recognize such tests as proving conclusively that since the passing of the Company's new Act there has been a lowering of the standard. They are advised that the test should cover a long period; and, in fact, that no definite comparison of one year as against another can possibly be made until the tests for the year following the passing of the Act have been recorded.

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### A Serious Charge Dismissed.

At the Marylebone Police Court, last Saturday, the investigation was concluded by Mr. Plowden of charges brought by the Gaslight and Coke Company against Arthur Percival Jemmett, for ten years a clerk at their branch office at Kilburn, of stealing two postal orders for £1 3s. 8d., and obtaining this amount by forging and uttering them. The previous proceedings were noticed a fortnight ago (p. 515). Mr. Humphreys, solicitor, prosecuted. Mr. H. H. Curtis Bennett, who defended, said the prisoner denied absolutely that he had anything whatever to do with any one of the postal orders, and he was in a position to prove that it was utterly impossible for him to have cashed the two orders as alleged by the postal clerk. Evidence was then given that the orders did not reach the Company's office until about two o'clock, the time before which they were said to have been cashed by Jemmett at a post office a third of a mile away. The accused also denied the charges on oath, and said he did not even know of the existence of the post office until after these proceedings had been taken. The Magistrate remarked that it was eminently a case that called for inquiry, for naturally some suspicion attached to the prisoner; but in view of the evidence, and the very high character the accused bore, he could not conceive that any jury would convict. He therefore took upon himself the responsibility of discharging the prisoner.

**Shanklin Water Supply.**—The Local Government Board have approved of the plans submitted to them by the Shanklin Urban District Council for the Chillerton water scheme, by which a much more liberal supply of water will be provided for the town than that which is now available.

**Prepayment Installations at Hereford.**—One of the items in the Gas Committee's report submitted at the last monthly meeting of the Hereford Town Council had reference to the supply of gas-pendants to slot-meter consumers. It was as follows: "In consequence of the gas-pendant now in use being unsuitable for incandescent burners and mantles, the Committee have decided, on the recommendation of the Gas Manager (Mr. W. W. Townsend), to fix free of cost an improved type of pendant with incandescent burner and mantle in the houses of slot-meter consumers who use over £2 worth of gas per annum—such houses being, in the opinion of the Manager, otherwise suitable. The cost of each pendant, including burner and fixing, is 6s. The Committee fully expect that this additional concession to consumers will be much appreciated, and result in additional revenue." In answer to a question, the Chairman of the Committee said about half the number of consumers used £2 worth of gas a year. The proposal represented a considerable concession to the poorest consumers. One of the town councillors remarked that he thought the Committee deserved the congratulations of the Council upon the enterprising way in which they were meeting the small consumers and benefiting them. The report was adopted.

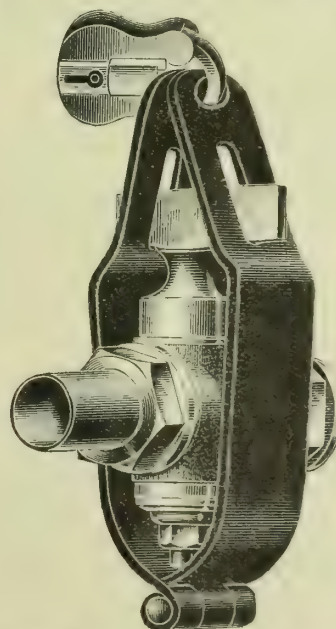
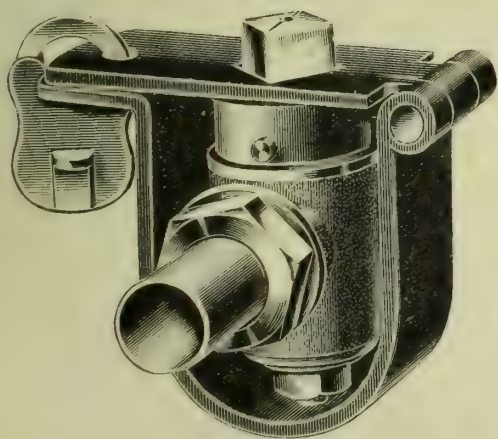
**Proposed Extension of the Devonport Gas-Works.**—It was decided by the Devonport Corporation Gas Committee last week to apply to the Local Government Board for a loan of £6000 for extensions at the gas-works, to increase the output of gas. The decision will require the confirmation of the Town Council; and the matter will come before that body this week.

**Reductions in Price.**—The Exeter Gas Company have reduced the price of gas 2d. per 1000 cubic feet for general purposes, and have taken 1d. per 1000 cubic feet off the prices now charged for gas used for motive power. The Directors of the Tunbridge Wells Gas Company have reduced the price of gas 1d. per 1000 cubic feet; making it 2s. 7d. within the borough.

**Colliery Workings under Audenshaw Reservoirs.**—At the meeting of the Manchester City Council last Wednesday, the Water Committee reported, with reference to the colliery workings beneath and adjacent to the Audenshaw reservoirs, that they had conferred with the representatives of the New Moss Colliery, Limited, and had come to an arrangement by which the Corporation purchase from the Company and Lord Stamford the coal for the sum of £35,000. This includes all mines and minerals under the reservoirs not already vested in the Corporation, and also those under Lord Stamford's land surrounding the reservoirs which have to be left as support to the reservoirs and adjoining lands of the Corporation. The Colliery Company agree to pay to the Corporation £6000 in lieu of taxed costs. This, together with £11,667 unpaid balance of damages, will be deducted from the £35,000, and leave £17,333 to be paid to the Colliery Company—thus putting an end to prolonged litigation.

**Penistone Gas Purchase Question.**—A large meeting of ratepayers assembled at Penistone last Saturday week to further consider the question of the proposed purchase of the undertaking of the Penistone, Thurlstone, and Oxspring Gas Company, for the sum of £19,800. A good deal of opposition to the proposal was manifested; and ultimately a resolution was passed that in the opinion of the meeting the Council should suspend all action in reference to the purchase of the gas undertaking until the possibility of the Yorkshire Electric Power Company supplying electricity to Penistone had been fairly investigated. Mr. W. Newbigging, of Manchester, who had been called in to advise the Council, attended the meeting and gave his reasons for recommending the purchase. He said that when he examined the balance-sheet of the Gas Company, it occurred to him that it was a pity the Council had not moved in the matter a few years ago. The Company had considerably developed; and their profits had increased enormously—jumping up from £932 in 1907 to £1049 in 1909. The payment of the purchase price of £19,800 was to extend over a period of forty years; and he was confident that at the end of this period they would have the undertaking free from debt, unless they had to make extensions because of increased demand. He was satisfied that there would be no call upon the rates. The maintainable profits of the undertaking were more than sufficient to meet interest and sinking fund, and would leave a small balance of profit.

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**Gale's Harvest of Broken Incandescent Mantles.**—From a report presented to the Rochdale Corporation Gas Committee last Wednesday, the gale which swept over the district on Feb. 17 and succeeding days played sad havoc with the incandescent mantles in the street-lamps. On Feb. 17, over 800 mantles were wrecked; and the high wind prevailing on succeeding days accounted for 400 more. It was stated that the cost of the new mantles would be over £13.

**Concession to Chard Gas Consumers.**—At the meeting of the Chard Town Council last week, the Gas Committee reported their ability to allow a further discount of 2½ per cent. to consumers of gas through ordinary meters, and a rebate of 1d. per 1000 cubic feet to users of prepayment meters consuming 10,000 cubic feet and upwards per annum. This concession, it was stated by Mr. A. E. Townsend, the Chairman of the Committee, was made possible by the surplus on the running of the undertaking last year. He looked forward to a further surplus at the end of next year, which would enable them to reduce the price again. It was explained that the average consumption in prepayment meters was 12,000 cubic feet.

The Hemsworth, Grimethorpe, and District Gas Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, for a new steel coal-store, complete with coal elevator and conveyor.

The "Iron and Coal Trades Review" states that the Gas Coal Collieries, Limited, of Cardiff, who, a few months ago, took over Messrs. Robert Davies and Co.'s colliery, near Llanharan, are now working the colliery.

The friends of Mr. George Hands will, with us, be pleased to learn that, after a very serious illness of four months' duration, he has so far recovered as to be able to attend at his business premises in Farringdon Road for a few hours daily.

The first batch of letters of allotment and regret in respect of the Trinidad Oilfields, Limited, which was advertised in the "JOURNAL" last week, has been posted. The "Financial News" states that the issue was many times over-subscribed.

The contract for the whole of the cooking apparatus of the new General Post Office—King Edward's Building, London—has been placed by His Majesty's Office of Works with Messrs. R. & A. Main, Limited, of Falkirk, Glasgow, and London.

A verdict of "Suicide during temporary insanity" was returned by a Coroner's Jury at Kingston-on-Thames who inquired into the death of Danewood Fiveash, an insurance agent. Deceased was found dead at his residence with his head in a gas-oven. He had been bound over to give evidence against a man at the Surrey Assizes.

It may be remembered that the Tottenham and Edmonton Gas Company recently advertised in our columns a sale of £30,000 of "B" stock to be issued at a minimum price of £111. We learn that tenders were received for £90,595, at prices ranging from the minimum to £116. The average price obtained for the stock was £112 9s. 1d.

The Directors of Stewarts and Lloyds, Limited, have decided to pay dividends of 10 per cent. per annum on the preferred ordinary shares and of 1s. per share on the deferred shares for the half year ended Dec. 31 last, after setting aside £70,000 for depreciation, and placing £30,000 to the reserve fund; leaving a balance of £81,000 to be carried forward.

The Manchester City Council, at last Wednesday's meeting, appointed a Special Committee to consider the applications for advances of salary presented by the Gas, Water, and other Committees on behalf of officials engaged in the different departments. The Committee have to present a report on the subject within three months. It is understood that the members of the Special Committee, who held a meeting last Friday, favour a scheme framed on the lines of Civil Service methods.

A serious fire broke out early last Thursday morning at the Birmingham Gas Lamp and Fitting Company's works in Dudley Road, Birmingham. The damage, which will run into a considerable sum, was chiefly occasioned by the destruction of gas and lamp fittings and a quantity of machinery. Last Tuesday, the extensive premises of Messrs. Johnson and Phillips, Limited, electrical engineers, in the Victoria Road, Charlton, were the scene of an alarming conflagration, which it is estimated will result in a very heavy loss.

At a meeting of the Tredegar Urban District Council, a deputation was received representing the licensed victuallers of the town, who asked for an abatement in their gas bills owing to a failure of the supply. It was pointed out that if the licensed victuallers pressed their claims, all other consumers would have to be similarly treated, and this would entail a very heavy drain on the finances of the Council. The deputation hinted that, unless their application for abatement was conceded, they would have to consider the question of providing their own light.

At the meeting of John Wright and Eagle Range, Limited, next Thursday, the Directors will report that the balance on the revenue account for the year ended Dec. 31, after augmenting the contingent reserve and charging Directors' fees, Managing-Directors' remuneration, and depreciation on the buildings and plant, amounts to £55,052. After adding the balance (£8785) brought forward, and deducting the interim dividends (£17,936) paid in August last, there remains for disposal the sum of £45,900, which the Directors recommend should be appropriated as follows: Payment of a dividend at the rate of 6 per cent. per annum for the half year on the preference shares, less income-tax, £2401; dividend of 2s. 6d. per share on the ordinary shares, free of income-tax, £25,875; to the reserve fund, £8000; to be carried forward, £9624. The Directors report with much regret that Mr. J. F. Wright, finding it necessary to limit his business engagements, has resigned his position as a Director, and does not offer himself for re-election. The shareholders will be invited to vote a sum of £250 to Mr. Wright, in acknowledgment of his long and valuable connection with the Company.

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At the next meeting of the British Gaslight Company, the Directors will recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share (both free of income-tax), for the half year ended Dec. 31 last.

In a report on the work of the Middlesex County Council, during the past three years, the Chairman says the gas-meter testing-station at Edmonton, which was opened in July, 1900, continues in a satisfactory condition. The number of meters tested in 1908-9, was 82,558; and the fees earned amounted to £2497. The net profit derived by the Council from the station during the last three years amounts to about £2849. The total number of meters tested since the station has been in existence is 679,051; and fees amounting to £20,563 were received. The net profit to the Council during this time has been £8659.

Alluding to the question of filling up the vacant secretaryship of the Birmingham Corporation Gas Department, a local paper says: "There are plenty of good business men to be found, but unfortunately they cannot claim any practical knowledge of the making and distribution of gas; while, on the other hand, there are gas engineers of repute who might be induced to come to Birmingham, but they are without the commercial acquaintance which is an essential quality of the secretaryship. It is realized that Mr. Hampton Barber united these merits in such a successful degree that he is a difficult man to follow. The work of the department is proceeding very satisfactorily under existing arrangements; and this knowledge relieves the Sub-Committee of undue haste in finding a man whose appointment they can recommend. They will therefore proceed prudently and cautiously, in the hope of ultimately selecting the most capable man available."

The employees of the Grimsby Gas Company have lately formed a social and recreation club; and the Directors have assisted the movement by placing at their disposal a large room, formerly used as a showroom, for the meetings, and providing the furniture for it. The President is Mr. John Terrace, the Manager of the Company, and his Assistant (Mr. J. Sayner) is Vice-President; Messrs. J. Kennington and A. Whitworth being the Secretary and the Treasurer. The room was opened for the first time on the 25th ult. with a tea and smoking concert. Mr. Terrace presided, and gave a brief address during an interval in the programme. He asked for the personal interest of each employee in the work of the Company, and urged them all to do their best to make the club a success. These remarks were emphasized by Mr. Sayner in proposing a vote of thanks to the Board for the support they had given to the club; and the vote was heartily accorded.

## APPLICATIONS FOR LETTERS PATENT.

- 4293.—ANDERSON, D., and WORSFOLD, J., "Supply of combustible in gas-lamps." Feb. 21.  
 4327.—DOBSON, E., "Gas-pressure regulators." Feb. 21.  
 4363.—BONE, W. A., WILSON, J. W., and M'COURT, C. D., "Transferring heat from gases to liquids or gases." Feb. 22.  
 4364.—BONE, W. A., WILSON, J. W., and M'COURT, C. D., "Burner for welding." Feb. 22.  
 4372.—DUFF, A. B., and GAS POWER AND BYE-PRODUCTS COMPANY, LIMITED, "Recovery of ammonia from producer gas." Feb. 22.  
 4407.—HANWELL, H. W., "Gas-fittings." Feb. 22.  
 4438.—JACKSON, T., "Gas-lighted flash-signs." Feb. 22.  
 4439.—BROWN, T. W., and TILLEY, F. C., "Gas-lamps." Feb. 22.  
 4450.—WILLIAMSON, H., "Incandescent lighting." Feb. 22.  
 4468.—PRANGNELL, N. W., "Street-lamps." Feb. 23.  
 4473.—FABRY, R., "Recovering ammonium sulphate direct from coke-oven or retort gas." Feb. 23.  
 4482.—LEACH, S. H., LANG, A. M'A., and FAWCETT, PRESTON, AND CO., LIMITED, "Manufacture of heating gas." Feb. 23.  
 4490.—FLETCHER, RUSSELL, AND CO., LIMITED, and FLETCHER, T. W., "Blast-tube burners." Feb. 23.  
 4543.—DAVIS, G. K., "Gas-washers." Feb. 23.  
 4612.—O'NEILL, W. P., "Petrol air-gas lighting." Feb. 24.  
 4613.—SADLER, H. S., and ASHMORE, BENSON, PEASE, AND CO., LIMITED, "Purification of gas." Feb. 24.  
 4621.—BURSTALL, F. W., "Extracting tar and other impurities from gases." Feb. 24.  
 4627.—GAS-LATERNEN-FERNZÜNDUNG, SYSTEM ROSTIN, G. M. B. H., "Gas-lighting apparatus." Feb. 24.  
 4723.—O'CALLAGHAN, P. B., "Protecting and conserving mantles, and increasing the illuminating power of gas." Feb. 25.  
 4792.—HAM, F. G. S., "Union ferrule for insertion into mains under pressure." Feb. 25.  
 4889.—ST. JOHN, L. M., "Gas-saver." Feb. 26.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations, &c., Vacant.

TRAVELLERS (COAL). No. 5200.  
 REPRESENTATIVE (CHANDELIERS). No. 5201.  
 WORKING TINSHOP FOREMAN. No. 5202.

### Situations Wanted.

ASSISTANT-MANAGER OR HEAD FOREMAN. (COKE OVENS). No. 5187.  
 ENGINEER'S ASSISTANT. No. 5203.  
 MANAGER, SUPERINTENDENT, &c. No. 5204.  
 SATURATOR MAKER AND REPAIRER. Leadburner, 117, Gallaway Road, Shepherd's Bush.

### Capital Wanted by Syndicate. No. 5196.

### Plant, &c. (Second Hand), for Sale.

SATURATOR. No. 5194.  
 WASHER FOR AMMONIA RECOVERY, &c. Powell  
 Duffryn Steam Coal Company, Aberaman.

### Business for Disposal.

ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY.

### Meeting.

BRITISH GASLIGHT COMPANY. London Offices, March 23, Twelve o'clock.

### Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. March 17.  
 EASTBOURNE GAS COMPANY. March 12.  
 GASLIGHT AND COKE COMPANY. March 15.  
 HORNSEY GAS COMPANY. March 22.  
 MITCHAM AND WIMLETON GAS COMPANY. March 15.  
 ROMFORD GAS AND COKE COMPANY. March 15.  
 SEVENOAKS WATER COMPANY. March 15.  
 SOUTH AFRICAN LIGHTING ASSOCIATION. No. 5199.  
 WANDSWORTH AND PUTNEY GAS COMPANY. March 15.

### TENDERS FOR

#### Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 18.

### Fire-Clay Goods, &c.

AUDLEY URBAN DISTRICT COUNCIL. Tenders by March 15.  
 STOCKPORT GAS DEPARTMENT. Tenders by March 15.

### General Stores—

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 STOCKPORT GAS DEPARTMENT. Tenders by March 15.

### Meters.

LEEDS GAS DEPARTMENT. Tenders by March 19.  
 STOCKPORT GAS DEPARTMENT. Tenders by March 15.

### Pipes, &c.

LEEDS GAS DEPARTMENT. Tenders by March 19.  
 STOCKPORT GAS DEPARTMENT. Tenders by March 15.

### Retort-Benches.

AUDLEY URBAN DISTRICT COUNCIL. Tenders by March 15.

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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.  
WORKS, HANDSWORTH, BIRMINGHAM.

**"GAZINE" (Registered in England and Abroad).** A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas. Manufactured and supplied by O. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, P. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "Domio," Newcastle-on-Tyne. National Telephone No. 2497.

## HIGH PRESSURE PLANT COMPLETE.

**JAMES MILNE AND SON, LIMITED,**  
will have pleasure in submitting Prices and Specifications for large or small Schemes.  
MILTON HOUSE WORKS, EDINBURGH.  
MIDLAND METER WORKS, LEEDS.  
111, St. Vincent Street, GLASGOW,  
59, FARRINGTON ROAD, LONDON.

## BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.

## AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

**J. E. C. LORD, Ship Canal Tar Works,**  
Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

## LUX'S GAS PURIFYING MASS.

See Advertisement on p. 690.  
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

## KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.  
39, VICTORIA STREET, S.W.

## TAR WANTED.

Telephone: Central Manchester, 7002.  
Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD, MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

## SPENCER'S PATENT HURDLE GRIDS.

**THE very best Patent Grids for Holding**  
Oxide Lightly.

See Illustrated Advertisement, Feb. 1, p. 277.

## OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the  
**NEW WESTBURY IRON COMPANY, LTD.**  
WESTBURY, WILTS.

## HYDRATED OXIDE OF IRON.

## PREPARED from Pure Iron.

Twice as Rich as Bog Ore.  
Gives no back Pressure.  
The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

## GEO. NEWTON, Limited,

Wires: "AUTOMATIC, MANCHESTER."  
40 YEARS' REPUTATION.

WET, DRY, ORDINARY and PREPAYMENT,  
STATION METERS, &c.

Late of Oldham—Note new Address:—

39, RIVER STREET, HULME, MANCHESTER.

**GAS PLANT for Sale—We can always** offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhaustors, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

## R. &amp; G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS,  
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,  
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

## GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers,  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.

## SATURATORS made or Repaired.

Reasonable Terms (workmanship guaranteed) by a 30 Years' Saturator Maker (Labour and Plant only), at per Hour and Rail. Saturators improved, Saving 10 to 20 per Cent of Ammonia. Perfect Mixing and Noiseless. Late of Beckton.

LEADBURNER, 117, Gallaway Road, SHEPHERD'S BUSH, W.

## PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRIOR, Chartered Patent Agents, 70 & 72, Chancery Lane, LONDON, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

## AMMONIA Waste Liquor Disposal.

Purification Plant.  
Results Guaranteed. No Working Costs.  
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

## LITTLE'S PATENT INVERTED GAS-BURNER.

**THERMOSTATIC** regulation of Air and Gas prevents Flashbacks and Carbonization, and insures highest Candle-Power efficiency.

THOMAS J. LITTLE, Junr., Inventor, Bush Lane House, Cannon Street, LONDON.

## APPLICATIONS FOR APPOINTMENTS.

**Do** you appreciate how much success depends on well-considered and lucid presentation of your qualifications? I make a Specialty of the Preparation of Applications, and am continually receiving complimentary letters from clients. Write now for Particulars.

HERBERT GREATORREX, HACKNEY, MATLOCK.

## GAS-WORKS requiring Extensions

should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Specialty of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

## ECONOMY and Efficiency can be obtained by installing one of

MILNE'S PRESSURE REDUCING GOVERNORS in your Hilly Districts. No Trouble. No Consumers' Complaints. Pressure Automatically Controlled.

JAMES MILNE AND SON, LIMITED,  
EDINBURGH, LEEDS, LONDON, GLASGOW.

## GAS Engineer's Assistant seeks

vacancy. Works or General. Excellent qualifications and Experience in Works, District, and Office. Chemist and Draughtsman.  
Address No. 5203, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

## BYE PRODUCT COKE OVENS.

## WORKING Manager is desirous of a

SITUATION. Would accept place as ASSISTANT-MANAGER or HEAD FOREMAN. Good References.

Address No. 5187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

## WANTED by Advertiser (Age 26)—of

good inventive ability, who has had Six Years Experience in a large London Gas Company; also good Commercial Training—position as MANAGER, SUPERINTENDENT, or any POSITION of RESPONSIBILITY. Good Prospects more important than Commencing Salary. Excellent References (London preferred).

Address No. 5204, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.



**WANTED, Two or Three Good Men to**  
call upon Gas Companies FOR SALE OF COAL  
and CANNEL for Factors. Must have had Experience  
as Salesmen to Gas Companies. State Locality best  
known.  
Apply, by letter only, to No. 5200, care of Mr. King,  
11, Bolt Court, FLEET STREET, E.C.

**CHANDELIER TRADE—Repre-**  
sentative wanted, with First-Class Gas Company  
Connection, London and South Coast, by an Old  
Established Birmingham Firm manufacturing Fancy  
and Slot Gas Fittings.  
Apply, by letter only, to No. 5201, care of Mr. King,  
11, Bolt Court, FLEET STREET, E.C.

**GAS ENGINEERS.**  
**WANTED, several Gentlemen having**  
Influence in the Gas Industry to JOIN SYNDI-  
CATE being promoted for Further Developing Valuable  
Patents which are already on the Market and paying  
Excellent Profits. Minimum Qualification, £500.  
Apply, by letter, to No. 5196, care of Mr. King, 11,  
Bolt Court, FLEET STREET, E.C.

**WANTED by a large Municipal Gas**  
Undertaking, a thoroughly Competent and  
Practical Working TINSHOP FOREMAN. None but  
those who have had considerable Practical and Up-to-  
Date Experience in the Manufacture, Repair, and  
Testing of Wet and Dry Meters will be entertained.  
Applications (which will be treated as strictly con-  
fidential) stating Age, Experience, and Wages required,  
to be accompanied by copies only of Testimonials, to be  
addressed to No. 5202, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C., not later than March, 19, 1910.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete to  
Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can  
be seen temporarily erected. Re-erected Cheap for  
immediate Sale.  
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

**FOR SALE—One Three-Ton Lead**  
SATURATOR, including all Pipe Connections,  
open Type. Suitable either for Hand Fishing or for  
Wilton's Ejector. Strongly built and in good Condition.  
Has been only little used. Can be inspected.  
Address No. 5194, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**FOR SALE—One "Wilton's" Patent**  
Washer, for Ammonia Recovery, in Six Sections,  
each Section Complete, with Four Bubbling Trays and  
Hoods, Inlet and Outlet Valves, and with 20-inch Con-  
nections. Also the necessary Seal-pots and Liquor  
Connections.  
For further Particulars, Apply to the POWELL DUFFRYN  
STEAM COAL COMPANY, LIMITED, Stores Department,  
Aberaman, near ABERDARE.

**THE ANTI-VIBRATION INCANDESCENT**  
**LIGHTING COMPANY, LIMITED.**

**IN VOLUNTARY LIQUIDATION.**  
**THIS well-known and Established**  
business of Gas Lighting Engineers and Makers  
of Greenall's Positive Measurement Meter, as at  
present carried on at the Albion Works, Otley, is now  
OFFERED AS A GOING CONCERN, with all Plant  
and Machinery, Patterns, Patents and Goodwill.  
The Works were re-arranged Five Years ago, by the  
Company, and are admirably adapted for their purposes,  
consisting of a large, very well-lighted shed, with ex-  
tensive Offices, Storeroom, and Lavatories, with small  
Iron and Brass Foundries attached, the whole covering  
an area of 3000 sq. yards, and can be obtained at a  
moderate rental.  
Apply to the LIQUIDATOR, Albion Works, OTLEY.

**AUDLEY URBAN DISTRICT COUNCIL.**

**GAS-WORKS.**  
**THE above Council invite Tenders for**  
the RE-CONSTRUCTION OF TWO BENCHES  
OF RETORTS.  
Further Particulars and Specifications, &c., can be  
obtained on Application to the Gas Manager, Gas-  
Works, Audley.  
Tenders, endorsed "Retorts," to be sent to the  
undersigned not later than the 15th inst.  
JOHN J. NELSON,  
Clerk to the Council.  
Kingsgrove, Staffs,  
March 4, 1910.

**LEEDS CORPORATION GAS-WORKS.**  
**THE Gas Committee of the Leeds Cor-**  
poration are prepared to receive TENDERS for the  
Supply of WROUGHT-IRON TUBES and FITTINGS.  
Forms of Tender may be obtained on Application to  
the undersigned.  
Sealed Tenders to be delivered not later than Satur-  
day the 19th inst., addressed to the Town Clerk, Town  
Hall, Leeds, and endorsed "Tender for Wrought-Iron  
Tubes."  
The Committee do not bind themselves to accept the  
lowest or any Tender.  
R. H. TOWNSELEY,  
General Manager.  
Gas Offices, East Parade,  
Leeds, March 5, 1910.

**LEEDS CORPORATION GAS-WORKS.**  
**TENDERS FOR DRY GAS-METERS.**  
**THE Gas Committee of the Leeds Cor-**  
poration are prepared to receive TENDERS for the  
Supply of DRY GAS-METERS, Ordinary and Pre-  
payment, to be delivered at their Meter Stores during a  
period of Twelve Months from receipt of Order.  
Each Party Tendering is required to send on or be-  
fore Saturday, the 12th inst., Two Sample Five-Light  
Ordinary Meters, and Two Sample Three-Light Pre-  
payment Meters (one in each case to be left open for  
Examination), addressed to the Gas-Meter Department,  
Meadow Lane, Leeds.  
Form of Tender may be obtained an Application to  
the undersigned.  
Sealed Tenders to be delivered not later than Satur-  
day, the 19th inst., addressed to the Town Clerk, Town  
Hall, Leeds, and endorsed "Tender for Gas-Meters."  
The Committee do not bind themselves to accept the  
lowest or any Tender.  
R. H. TOWNSELEY,  
General Manager.  
Gas Offices, East Parade,  
Leeds, March 5, 1910.

**COKE.**  
**THE Directors of the Wandsworth and**  
Putney Gaslight and Coke Company invite  
TENDERS for the Removal of about 8000 Tons of  
Guaranteed "Wandsworth" COKE from their Works  
at Wandsworth, between April 1 and Sept. 30 next.  
The Coke to be removed by Van or by Barge (free  
waterway on River Thames). "Tender for Coke," to be  
delivered not later than March 18.  
The Directors reserve to themselves the right to  
accept any Tender in part or in whole, and do not bind  
themselves to accept the highest or any Tender.  
Any further Information may be obtained from the  
Engineer, Mr. H. O. Carr.  
CHAS. W. BRAINE,  
Secretary.  
Wandsworth and Putney Gaslight and  
Coke Company, Fairfield Street,  
Wandsworth, S.W., March 5, 1910.

**COUNTY BOROUGH OF STOCKPORT.**  
(GAS DEPARTMENT.)  
**TENDERS FOR STORES.**  
**THE Gas Committee are prepared to re-**  
ceive TENDERS for the Supply of GENERAL  
STORES for One Year from April 1, 1910, to March 31,  
1911.  
1—Bolts and Nuts. 11—Mill Furnishing.  
2—Brushes. 12—Oils and Grease.  
3—Brass and Meter 13—Tarred and Spun  
Fittings. Yarn.  
4—Cartage. 14—Shovels, Pick Heads,  
5—Iron Castings. &c.  
6—Drysaltery. 15—Timber, English and  
7—Retorts and Fire Foreign.  
Goods. 16—Tubing.  
8—Glass and Putty. 17—Wet and Dry Ordinary  
9—Iron and Steel. Meters.  
10—Ironmongery. 18—Lime.  
Forms of Tender and all further Information may be  
obtained on Application to the Engineer, Gas-Works,  
Portwood.  
No Form of Tender other than that issued by the  
Committee will be accepted.  
Sealed Tenders, endorsed "1," "2," "3," &c., as the  
case may be, must be addressed to the Chairman of  
the Gas Committee, and delivered at the Town Clerk's  
Office not later than Tuesday, March 15.  
No Tender will be accepted without satisfactory proof  
that the Firm tendering pays the Trade Union Rate of  
Wages and observes the Trade Union number of hours  
usually paid and observed in the district where the  
Goods are made or produced.  
The Committee do not bind themselves to accept the  
lowest or any Tender.  
By order,  
ROBERT HYDE,  
Town Clerk.  
Stockport, Feb. 25, 1910.

**EASTBOURNE GAS COMPANY.**  
**SALE by Tender of £10,000 "B" Stock**  
to rank equal with the existing "B" Stock for a  
Standard Dividend of 3½ per Cent.—subject to the  
Sliding-Scale, by the Action of which the Dividend in  
this Class of Stock is  
6½ PER CENT. PER ANNUM.  
Minimum Price, £125 per £100 of Stock.  
This additional Capital is required to meet the Natural  
Growth of the Undertaking in Eastbourne and District  
and for the Cost of the Extension of Mains to Polegate  
Junction and the Market Town of Hailsham. The  
unchecked growth of the Company's Business is  
indicated below:—

Year.	Number of Gas Consumers.	Gas Sold. Cubic Feet.	Price of Gas
1893	2,900	198,495,000	3s. 2d.
1898	4,250	241,654,000	2s. 10d.
1903	7,005	336,568,000	2s. 10d.
1904	7,945	352,951,000	2s. 8d.
1905	7,750	367,128,000	2s. 8d.
1906	8,182	393,060,000	2s. 8d.
1907	8,564	413,730,000	2s. 8d.
1908	8,854	429,528,000	2s. 8d.
1909	9,423	448,770,000	2s. 6d.

The full Statutory Dividends have been paid for the  
past 40 years.  
Tenders will be received for any amount of Stock  
being not less than £5 or multiples thereof.  
This is a unique opportunity for small investors as  
well as those with larger means.  
Tenders and Particulars of the SECRETARY at EAST-  
BOURNE, or at any of the Branches of the Company's  
Bankers—BARCLAY AND CO., LIMITED.  
Last Day, Saturday, March 12, 1910.  
By order of the Directors,  
JAMES S. GARRARD,  
Secretary.  
March 1, 1910.

**BOURNEMOUTH GAS AND WATER COMPANY.**  
ISSUE OF £10 SEVEN PER CENT. "B" SHARES.  
MINIMUM PRICE OF ISSUE, £15 PER SHARE.  
SALE BY TENDER OF 2019 £10, 7 PER CENT.  
"B" SHARES, in pursuance of the provisions of  
the Bournemouth Gas and Water Act, 1896.

**NOTICE is Hereby Given, that it is the**  
intention of the Directors of this Company to  
SELL BY TENDER 2019 "B" SHARES of £10 each,  
(the Dividend of which is limited to £7 per cent.) to be  
paid up in full on or before the 31st of May, 1910.  
The Capital now offered is required by reason of the  
Purchase of Freehold Properties at Alderney and  
Longham, and for the Extension of the Company's  
existing Works and Plant to meet the increased demand  
for Gas and Water by reason of the continuous develop-  
ment of the District supplied by the Company.  
The Dividend on the Original Shares for the Half-  
Year ending the 31st of December, 1909, was at the rate  
of 10 per Cent. per annum, with an addition at the rate  
of 5 per Cent. per Annum under the Sliding-Scale, and  
on the "B" Shares at the rate of 7 per Cent. per Annum.  
Since the 30th of June, 1904, the Dividend on the  
Original Shares has been at the rate of 14 per Cent. per  
Annum, and, for the past Year, at the rate of 15 per  
Cent. The Net Profit earned in the Year ended the  
31st of December, 1909, after deducting all charges,  
including Debenture and other Interest, amounted to  
£45,322 1s. 4d., exclusive of Interest on Reserve In-  
vestments, amounting to a further £701 8s. 2d., and  
after payment of Dividends to the 31st of December,  
1909, the sum of £27,830 5s. 6d. remained to be carried  
forward to the current half-year.  
Particulars and Conditions of Tender may be obtained  
at the Company's Offices, Bournemouth and Poole, or  
of the Secretary as under.  
Sealed Tenders must be sent to the Secretary not  
later than Eleven o'clock on Thursday morning, the  
17th of March, 1910.  
By order, H. A. PLUMB, Secretary.  
London: 90, Cannon Street, E.C.,  
Feb. 18, 1910.

**SALES BY AUCTION OF GAS AND WATER**  
**STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS beg to**  
notify that their SALES BY AUCTION OF NEW  
CAPITAL ISSUED UNDER PARLIAMENTARY  
POWERS, and of STOCKS and SHARES belonging to  
EXECUTORS and other PRIVATE OWNERS in LON-  
DON, SUBURBAN, and PROVINCIAL GAS and  
WATER COMPANIES, take place PERIODICALLY  
at the Mart, TOKENHOUSE YARD, E.C.  
Terms for Issuing New Capital, and also for including  
other Gas and Water Stocks and Shares in these Periodi-  
cal Sales, will be forwarded on Application to MESSRS.  
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**WANDSWORTH AND PUTNEY GASLIGHT**  
**AND COKE COMPANY.**

NEW ISSUE OF £12,500 THREE PER CENT.  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, March 15, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

By order of the Directors of the  
**ROMFORD GAS AND COKE COMPANY,**  
**LIMITED.**

NEW ISSUE OF 600 £5 "B" SHARES AND £2000  
FOUR PER CENT. DEBENTURE BONDS.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, March 15, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

By order of the Executors of A. G. Tilley, Esq., decd.,  
and other Owners.

**THE GASLIGHT AND COKE COMPANY,**  
£1000 CONSOLIDATED ORDINARY STOCK.  
**SEVENOAKS WATER-WORKS COMPANY,**  
£270 CONSOLIDATED STOCK.

**MITCHAM AND WIMBLEDON DISTRICT**  
**GASLIGHT COMPANY,**  
£900 CONSOLIDATED ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, March 15, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

By order of the Directors of the  
**HORNSEY GAS COMPANY.**

NEW ISSUE OF £5000 CONSOLIDATED STOCK,  
£6500 FIVE PER CENT. PREFERENCE STOCK,  
AND  
£3000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, March 22, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.



**FOR SALE**—50 Ordinary Shares in the SOUTH AFRICAN LIGHTING ASSOCIATION, Particulars on Application. Will accept £12 10s. each. Address No. 5199, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**BRITISH GASLIGHT COMPANY, LIMITED.**  
**NOTICE** is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 23rd inst., at Twelve o'clock precisely, to transact the usual Business; and to declare a Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 12th inst. and RE-OPENED on the 24th inst.

By order of the Court of Directors,  
A. W. BROOKES,  
Secretary.

Chief Office: No. 11, George Yard,  
Lombard Street, London, E.C.  
March 4, 1910.

Price 5s. 6d. Post Free.

## REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1909.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

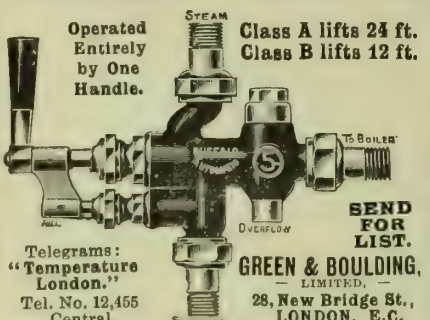
*Testing Instruments*

ALEXANDER WRIGHT & CO., LD.  
WESTMINSTER.

**JOHN COATES & CO., LTD.,**  
Gas and Water Works Engineers,  
Inspectors, and Merchant Shippers,  
5, Laurence Pountney Hill, LONDON, E.C.

NOTE. Much expense and trouble is often saved by Colonial and Foreign Gas and Water Companies, and City Corporations, by having their requirements from Great Britain bought or properly inspected by practical men. We have a staff of experts for Buying, Shipping, and Inspection, of Gas Plant and Machinery of every description, Cast Iron Pipes, &c., and may add that our Engineering Branch is under the direction of Mr. John Coates, M.Inst.C.E., and Shipping Branch under Mr. Alfred J. Kingdon, both with over 20 years' experience.  
J. C. & Co.

**'BUFFALO' INJECTOR**



Operated Entirely by One Handle.

Class A lifts 24 ft.  
Class B lifts 12 ft.

TELEGRAMS: "Temperature London."  
Tel. No. 12,455 Central.

GREEN & BOULDING, LIMITED,  
28, New Bridge St., LONDON, E.C.

**MIDLAND ENAMELLING CO.,**

Manufacturers of

**DIALS** (Enamelled)

For Gas, Water, Electric, &c., Meters.

**DIALS**

For Pressure Scales in One Length up to 4 feet.

**DIALS**

For Clocks, Barometers, Thermometer Indicators, and for every purpose.

140, Finch Rd., Handsworth, Birmingham.

**THOMAS DUXBURY & CO.,**  
16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1806.

**JOHN HALL & CO. OF STOURBRIDGE,**

LIMITED,

**STOURBRIDGE,**

Manufacturers of

**FIRE-BRICKS, LUMPS, TILES,**

**GAS RETORTS,**

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED  
FOR SHIPMENT.

**MIRFIELD GAS COAL.**

UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

**MIRFIELD COLLIERY COMPANY,**

**RAYENSTHORPE, NEAR DEWSBURY**

LONDON: 16, Park Village East, N.W.

**JAMES OAKES & CO.,**

**ALFRETON IRON-WORKS, DERBYSHIRE,**

AND

**Wenlock Iron Wharf, 21 & 22, Wharf Road,  
CITY ROAD, LONDON, N.**

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS,  $1\frac{1}{2}$  to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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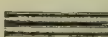
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**GRASSMOOR COLLIERIES,**  
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Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality  
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Maintains a High Standard in Residuals.

**LUX'S**  
**Gas Purifying Material**

is now used in many Gas-  
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Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.

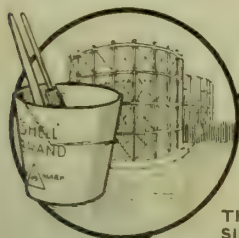


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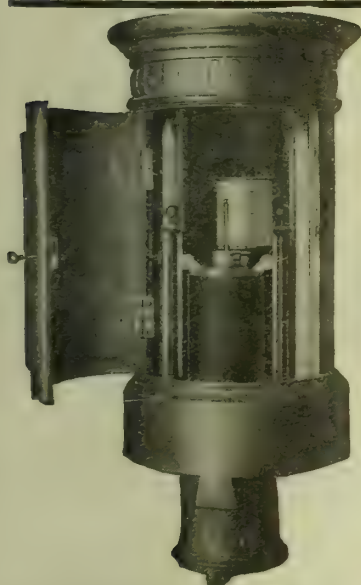
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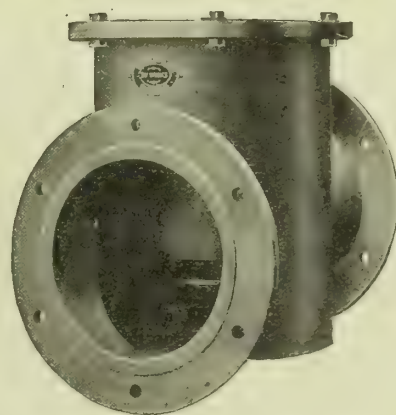
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From a Photo. of 24 in. Size.

May be Loaded by Weights or Air Pressure from a Distance.

The Outcome of a Practical Gas Engineer's Life Experience.

# THE CENTENARY PETROL GAS TURBINE GENERATOR.

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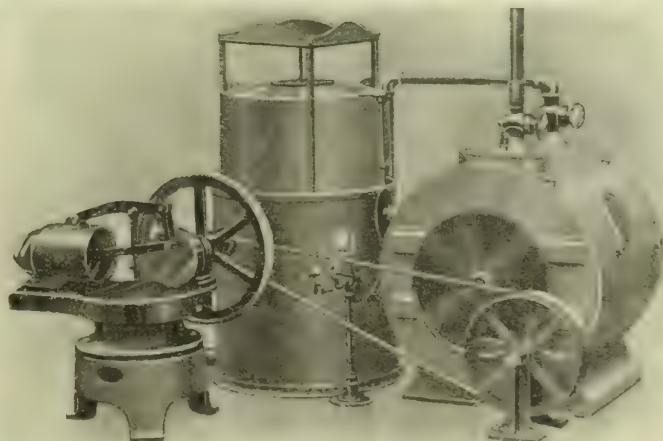
Plants from 100 cub. ft. per hour up to  
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NON-EXPLOSIVE and ECONOMICAL.



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**VOL. CVIII.**

OF THE

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ROTARY  
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## Important Improvements.



### BURNERS.

- 1. 20=Candle Power more light without increase in the consumption of gas.
- 2. Patent Gas Adjuster; cannot get out of order.
- 3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
- 4. Accurate Regulation of the Air Supply.
- 5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
- 6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

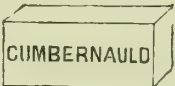
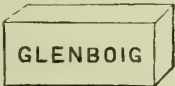
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

# THE GLENBOIG UNION FIRE-CLAY CO., LTD.

## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices. The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,  
BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



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Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.  
THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

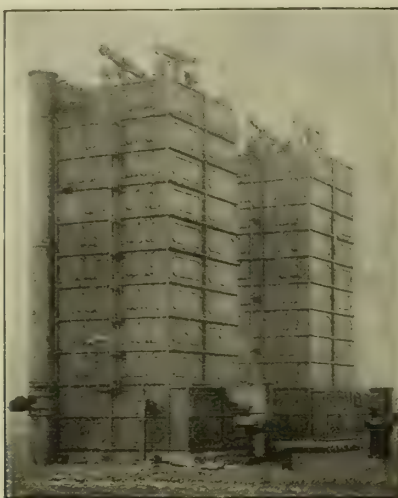
CHEMICAL ANALYSIS.				PHYSICAL RESULTS.			
	Raw.	Fired.		Density ..	..	..	2.65
Silica, free ..	3.03	3.49		Volume weight ..	..	..	1.90
Silica, combined ..	43.20	49.77		Porosity ..	..	..	15.4 %
Alumina ..	36.55	42.10		Linear shrinkage at 100° C. ..	..	..	3.70%
Ferric oxide ..	1.80	2.08		" " " 1050° C. ..	..	..	4.76%
Titanic oxide ..	1.30	1.50		" " " Total ..	..	..	8.46%
Lime ..	trace	trace		Volume shrinkage at 100° C. ..	..	..	10.7 %
Magnesia ..	trace	trace		" " " 1050° C. ..	..	..	12.6 %
Alkaline oxides ..	trace	trace		" " " Total ..	..	..	23.3 %
Sulphates as trioxides ..	0.92	1.06		Plasticity ..	..	..	20.0 %
Loss on Ignition ..	13.20	..		Fire Stability ..	..	..	1850 C. equiv. to 3362° F.
	100.00	100.00					

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. -I am, yours faithfully,

(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

JOHN T. NORMAN.





**GASHOLDERS.  
STRUCTURAL IRON AND STEEL WORK.  
SCRUBBING AND PURIFYING  
MACHINES.**

**GAS PLANT OF EVERY DESCRIPTION  
DESIGNED AND ERECTED.**

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**Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.**

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With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

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**Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbohc Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia up to 20.75 per cent. Nitrogen.**

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**RADIATE MORE HEAT**

BY USING

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**SILCO BRICKS** prevent all settling of setting.

**SILICA BRICKS** for Combustion Chambers, any shape.



# Welsbach

## LIGHT

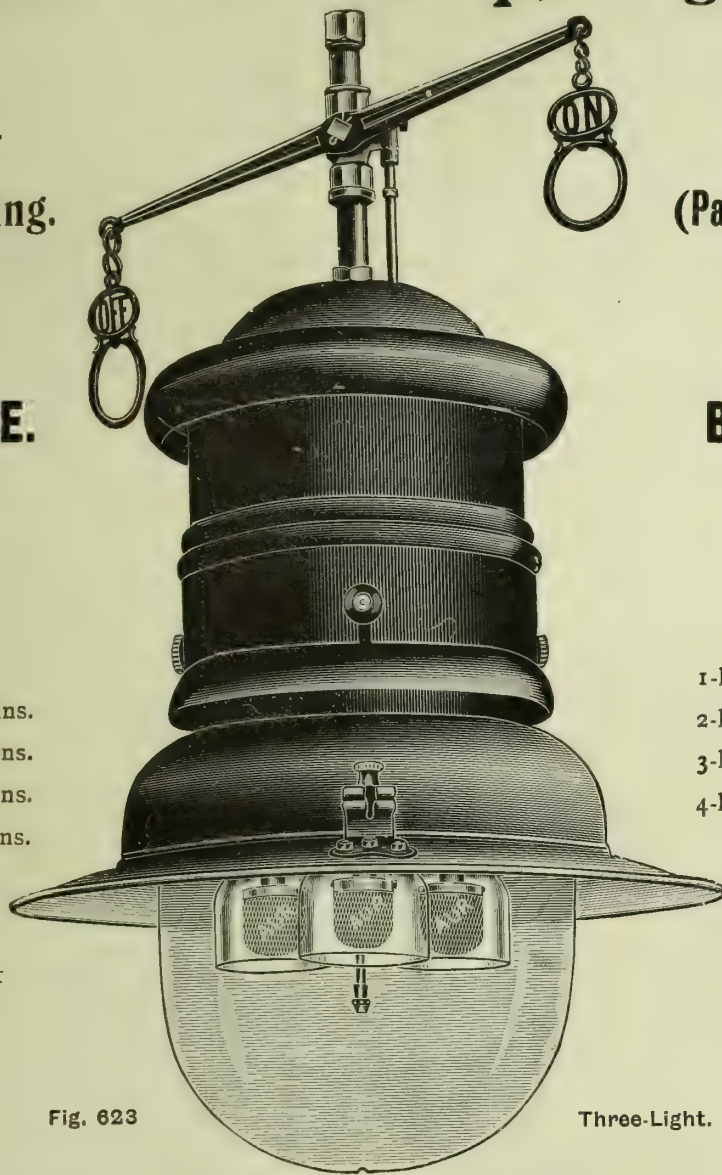
### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

#### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

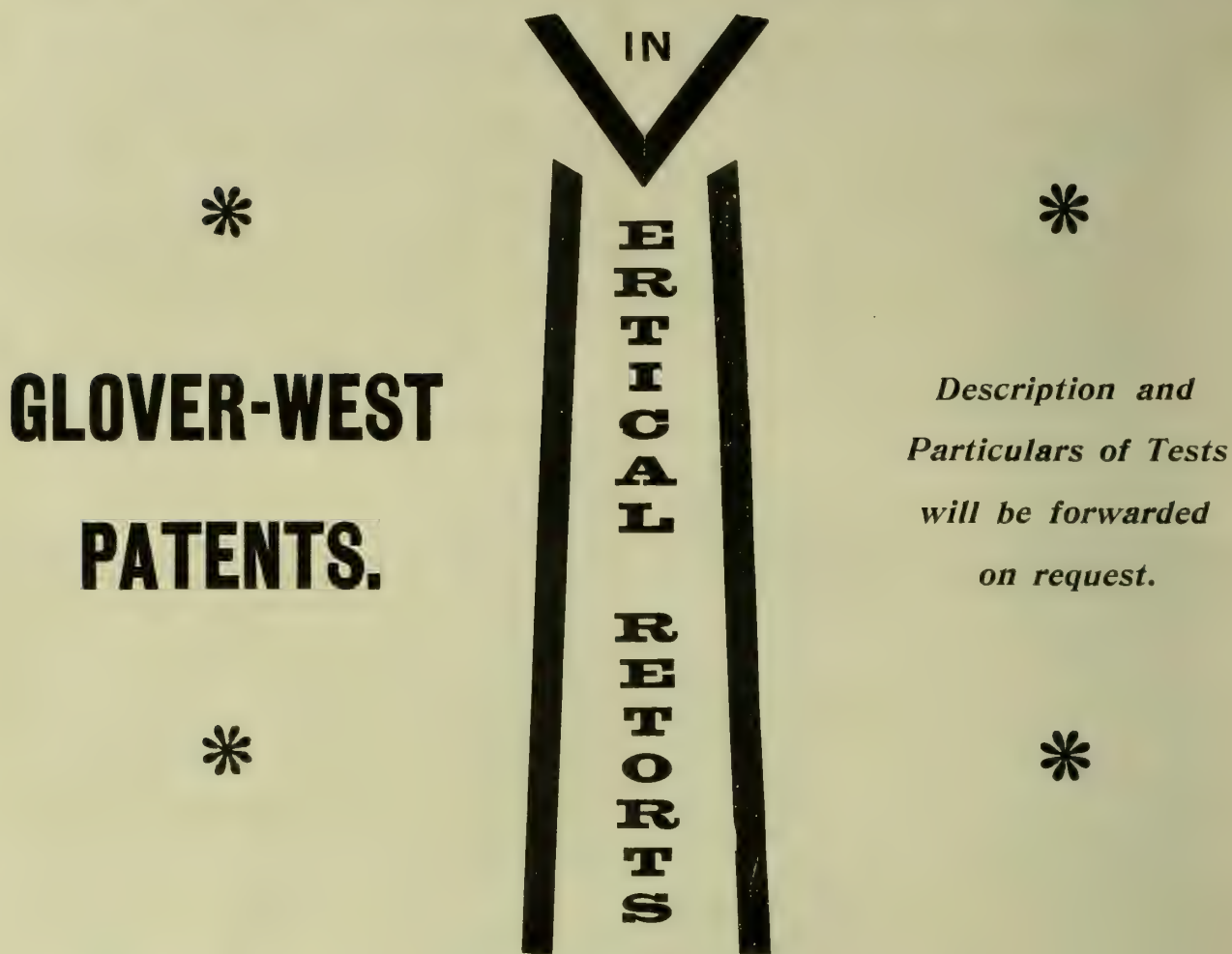
**THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,**  
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

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## COST OF LABOUR

REDUCED TO

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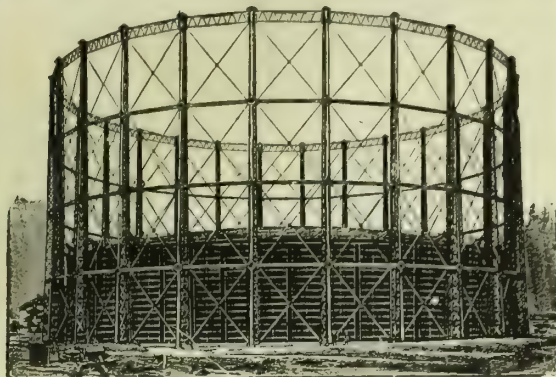
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Aggregate capacity of Plant supplied  
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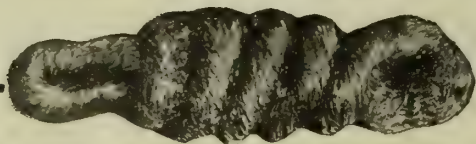
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YIELD OF GAS  
and  
REDUCTION  
OF FUEL  
CONSUMPTION.**

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Lead Wool requires no melting and can be used in water without risk.

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THE STRONGEST AND  
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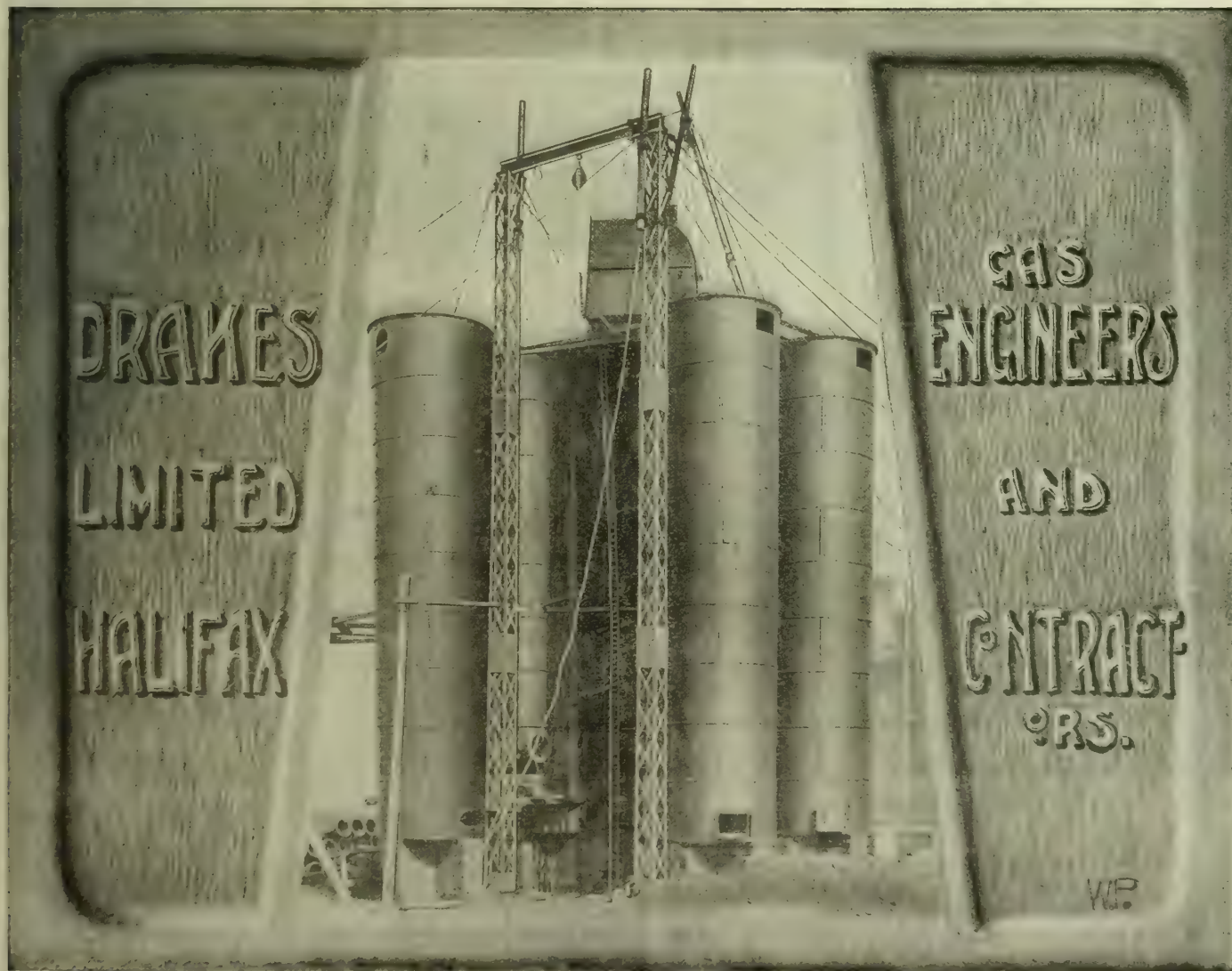
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— 2000 Workmen. —  
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FURNACES.**  
In point of efficiency, cost of  
production and results:  
**BEST FURNACES in the WORLD!**



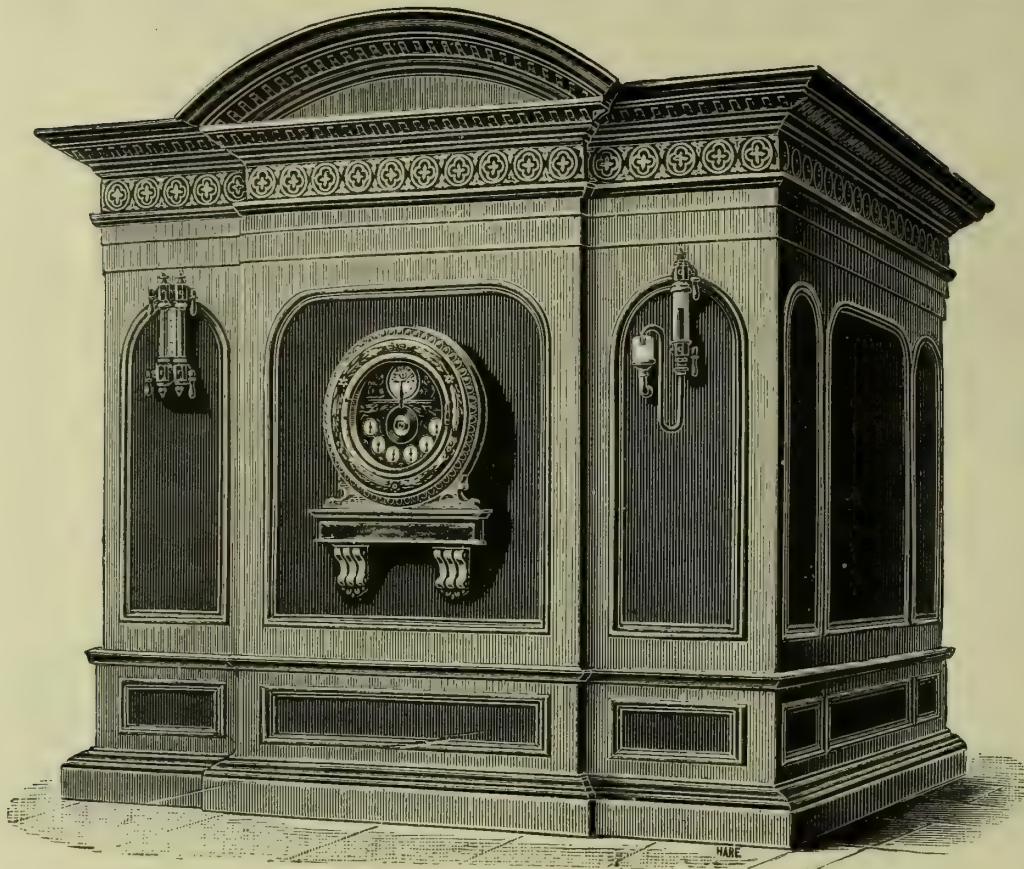
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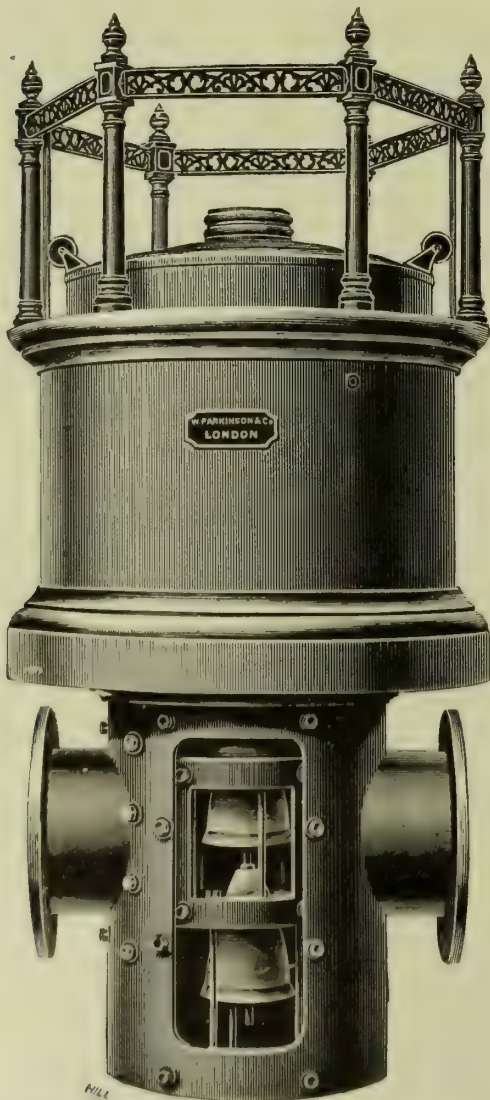
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ELEGANT  
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# THE JOURNAL OF GAS LIGHTING

## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2444.]

LONDON, MARCH 15, 1910.

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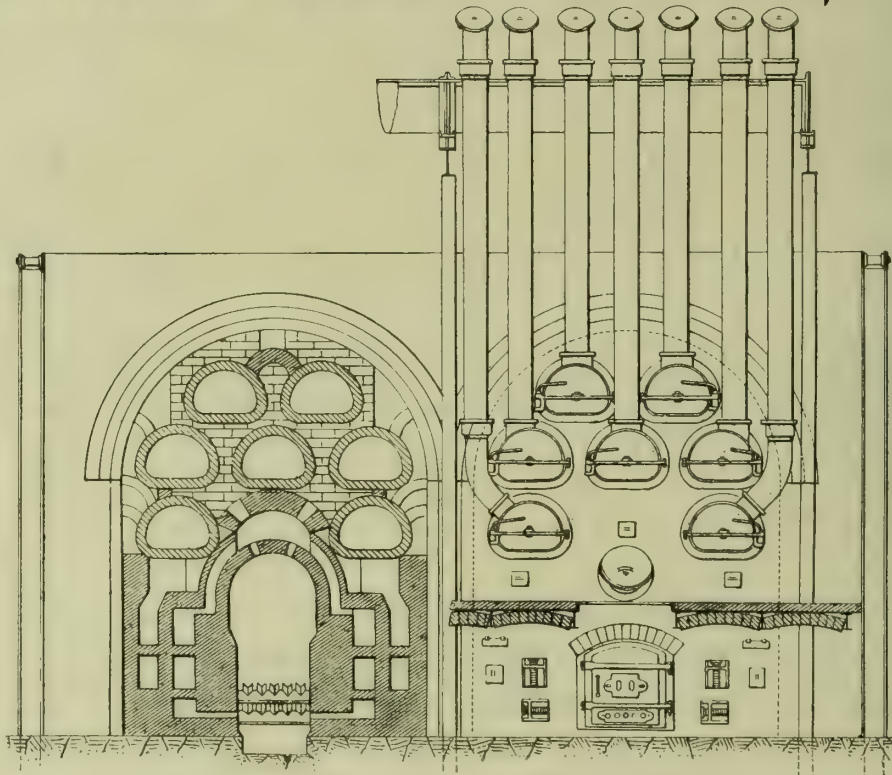
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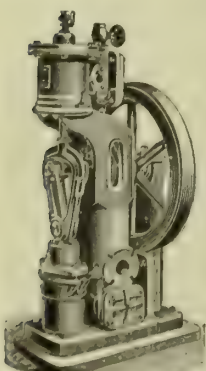


Fig. 706. "SINGLE RAM"  
 STEAM-PUMP.

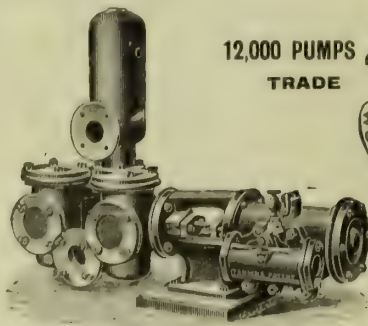


Fig. 598. "CORNISH" STEAM-PUMP FOR  
 BOILER FEEDING, &c.

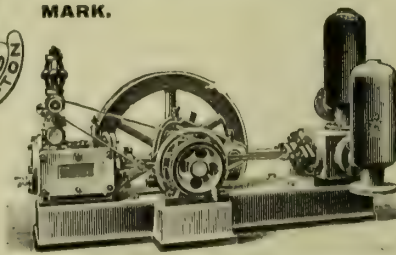


Fig. 685. "RELIABLE" STEAM PUMP FOR  
 TAR AND THICK FLUIDS.

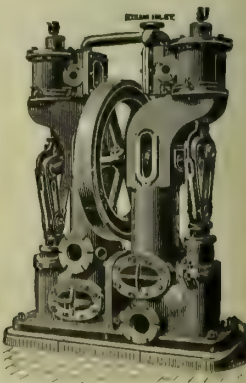


Fig. 712. "DOUBLE-RAM"  
 STEAM-PUMP.



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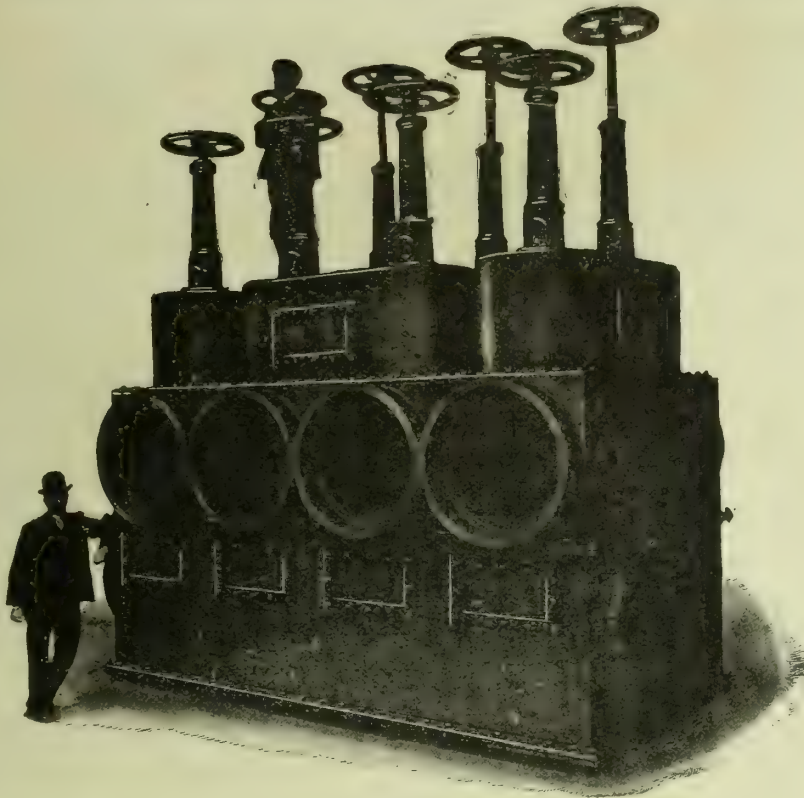
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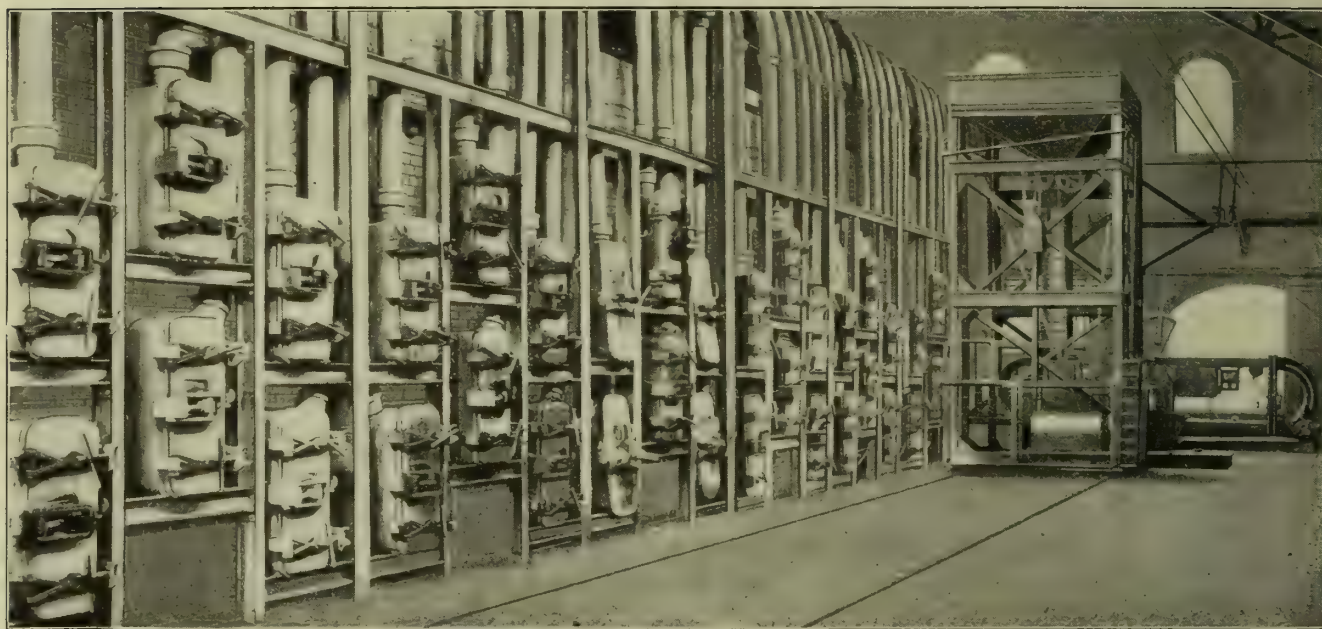
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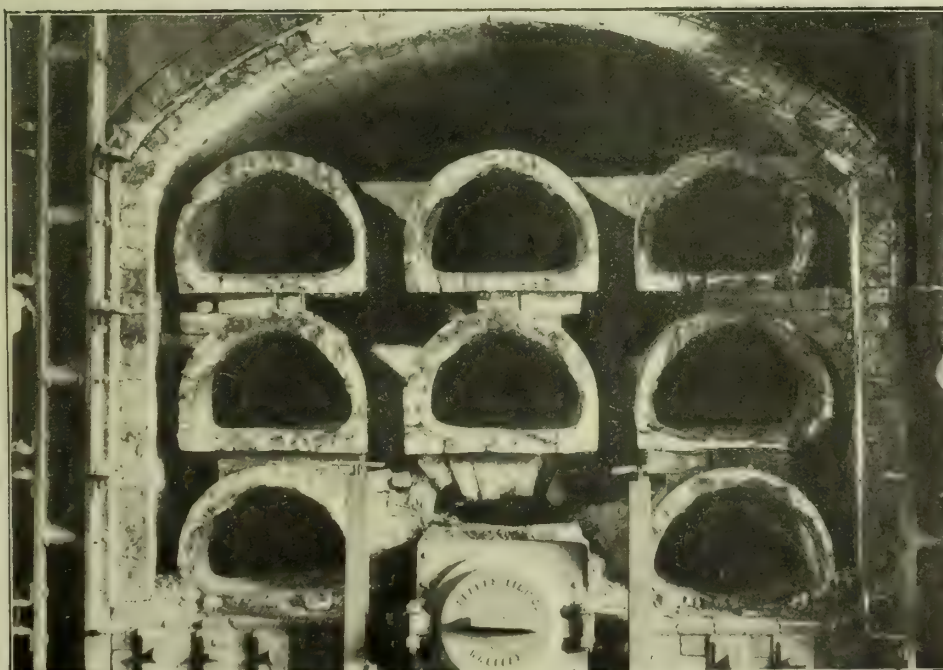
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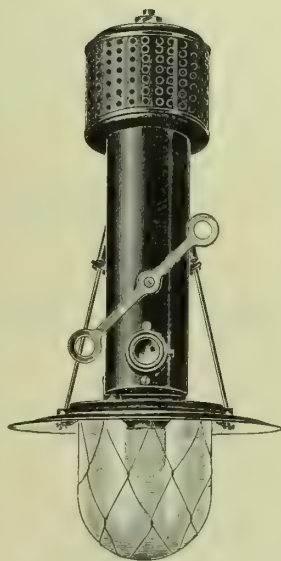
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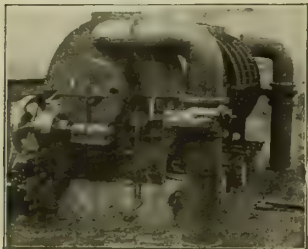
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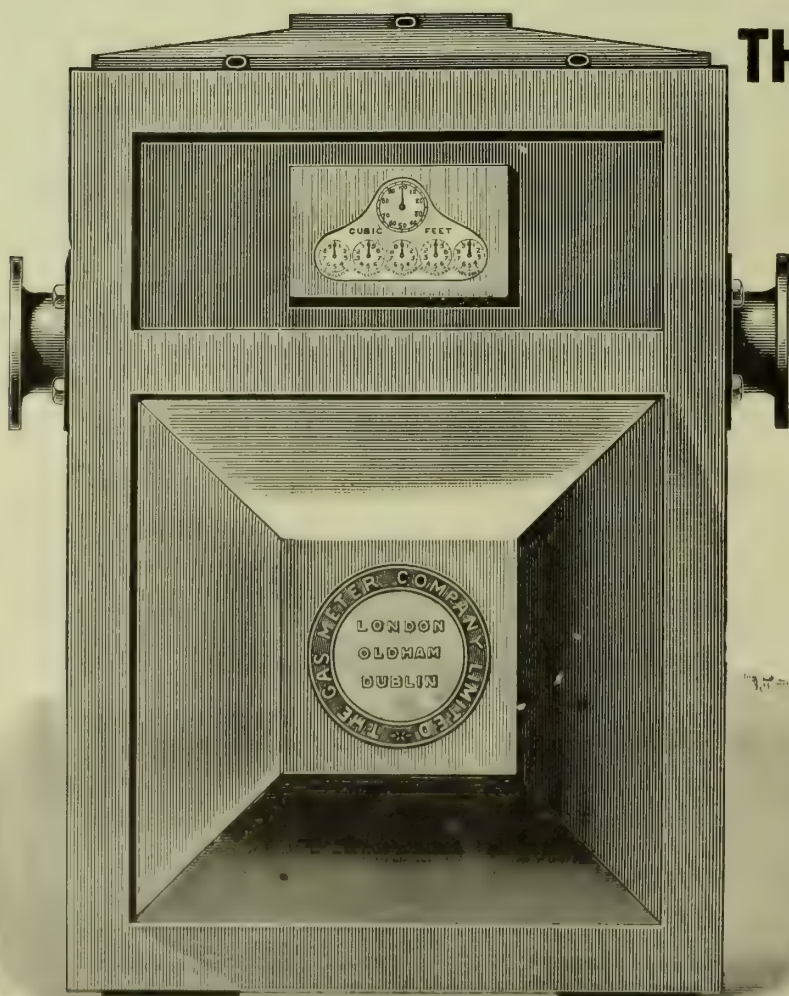
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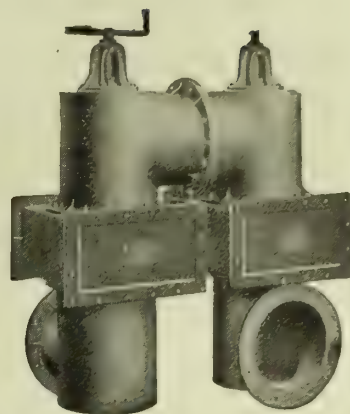
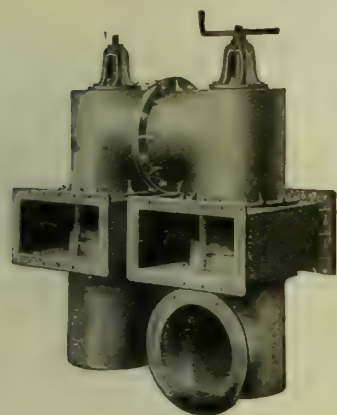
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Brussels-Ville (3rd) . . .	1,500,000	Liège, Belgium . . .	1,000,000	Swansea (3rd) . . .	450,000
Brussels-Ville (4th) . . .	350,000	Liège (2nd) . . .	750,000	Swindon . . .	300,000
Bucarest, Roumania . . .	1,100,000	Lincoln . . .	500,000	Sydney-Harbour . . .	500,000
Budapest, Hungary . . .	50,000	Liverpool . . .	3,500,000	Sydney-Harbour (2nd) . . .	500,000
Budapest (2nd) . . .	1,750,000	Liverpool (2nd) . . .	4,500,000	Sydney-Mortlake . . .	500,000
Carlisle . . .	600,000	Liverpool (3rd) . . .	750,000	Sydney-Mortlake (2nd) . . .	500,000
Carlsruhe, Germany . . .	500,000	Longton . . .	600,000	Syracuse, N.Y. . . .	850,000
Chigwell . . .	350,000	Louvain, Belgium . . .	800,000	Taunton . . .	225,000
Chorley . . .	300,000	Lübeck, Germany . . .	400,000	Taunton (2nd) . . .	350,000
Commercial, London . . .	850,000	Maastricht, Holland . . .	200,000	The Hague Holland . . .	1,000,000
Commercial (2nd) . . .	850,000	Magdeburg, Germany . . .	1,400,000	The Hague (2nd) . . .	500,000
Commercial (3rd) . . .	1,250,000	Maidenhead . . .	225,000	Tilburg, Holland . . .	400,000
Commercial (4th) . . .	2,000,000	Maidenhead (2nd) . . .	225,000	Torquay . . .	350,000
Copenhagen . . .	700,000	Maidstone . . .	500,000	Tottenham . . .	750,000
Copenhagen (2nd) . . .	2,500,000	Malines, Belgium . . .	500,000	Tottenham (2nd) . . .	750,000
Courtrai, Belgium . . .	250,000	Malmö, Sweden . . .	350,000	Tottenham (3rd) . . .	350,000
Coventry . . .	600,000	Malta . . .	400,000	Tottenham (4th) . . .	1,000,000
Coventry (2nd) . . .	600,000	Manchester . . .	3,500,000	Tottenham (5th) . . .	1,000,000
Cracow, Galicia . . .	200,000	Manchester (2nd) . . .	3,500,000	Tottenham (6th) . . .	1,250,000
Cracow (2nd) . . .	200,000	Marlborough . . .	100,000	Tunbridge Wells . . .	1,000,000
Crefeld, Germany . . .	500,000	Mayence, Germany . . .	700,000	Utrecht, Holland . . .	1,000,000
Croydon . . .	1,250,000	McKeesport, Pa. . . .	500,000	Utrecht (2nd) . . .	1,000,000
Croydon (2nd) . . .	625,000	Merthyr Tydfil . . .	300,000	Verviers, Belgium . . .	1,000,000
Croydon (3rd) . . .	625,000	Middlesbrough . . .	1,250,000	Vienna . . .	3,500,000
Croydon (4th) . . .	550,000	Namur, Belgium . . .	175,000	Vienna (2nd) . . .	2,500,000
Debreczin, Hungary . . .	100,000	Nelson . . .	400,000	Waltham . . .	400,000
Deventer, Holland . . .	150,000	Newburgh, N.Y. . . .	600,000	Wandsworth & Putney . . .	1,800,000
Deventer (2nd) . . .	200,000	New York . . .	5,200,000	Watford . . .	300,000
Dorking . . .	150,000	Nitheroy, Brazil . . .	250,000	Watford (2nd) . . .	350,000
Dublin . . .	2,000,000	North Middlesex . . .	150,000	Wellington, N.Z. . . .	350,000
Dublin (2nd) . . .	2,000,000	North Middlesex (2nd) . . .	200,000	West Bromwich . . .	550,000
Dublin (3rd) . . .	650,000	North Middlesex (3rd) . . .	75,000	West Ham . . .	1,500,000
Dundee . . .	1,500,000	Norwich . . .	1,000,000	West Ham (2nd) . . .	800,000
Dunedin, N.Z. . . .	150,000	Norwich (2nd) . . .	300,000	Weston-super-Mare . . .	350,000
Dunedin, N.Z. (2nd) . . .	275,000	Norwich (3rd) . . .	500,000	Weston (2nd) . . .	350,000
Durham . . .	200,000	Nottingham . . .	1,000,000	Wexford, Ireland . . .	100,000
Düsseldorf, Germany . . .	1,000,000	Nottingham (2nd) . . .	1,000,000	Wiesbaden, Germany . . .	850,000
Eastbourne . . .	1,250,000	Nuneaton . . .	125,000	Winchester . . .	225,000
Edinburgh . . .	2,000,000	Oberhausen, Germany . . .	175,000	Winchester (2nd) . . .	125,000
Epsom . . .	225,000	Oldenburg, Germany . . .	200,000	Wolverhampton . . .	1,500,000
Epsom (2nd) . . .	300,000	Ostend, Belgium . . .	100,000	Zwolle, Holland . . .	200,000
Falmouth . . .	150,000	Ostend (2nd) . . .	200,000	Zwolle (2nd) . . .	200,000

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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2444.—TUESDAY, MARCH 15, 1910.

## EDITORIAL NOTES—GAS, &c.

### Independent Thoughts and Practices.

AN independent and a searcher after truth are the impressions that one has received after listening to the Presidential Address that Mr. C. Stafford Ellery, of Bath, delivered to the Southern Association of Gas Engineers and Managers last Thursday. Both qualities are good in any man, and both are interlinked. The independent can only be so by being inquisitorial on his own account, and finding a backing for the attitude he takes. The searcher after truth is only so because, in the first place, he is unwilling to give credence to all he reads and hears without personal examination. The qualities disclose the active mind; and the active mind gives us the fruit of original thought and work. But however independent and active in mind a man may be, he cannot afford to sequester himself from his fellow men with similar pursuits. The fields of thought, of work, of application, are all broadened by intercommunication. The President, independent though he be, knows this well. Therefore in the forefront of his deliverance, he sets forth the value to individuals of organization and association. The need for association in the gas industry does not, with advancing time, dwindle in importance. It expands. New ground is being constantly opened up; practices are altering; conditions are mutable. Under such circumstances, it is good and necessary to take counsel together. It aids the engineer in reaping from collective experiences. The rapid march of invention and discovery the President finds almost bewildering; and this rapid march increases the difficulties of the individual engineer. It cannot be expected that one engineer can ever put upon trial all that comes before him. He has to proceed about this part of his work largely in the spirit of an eclectic, and choose from the aggregate of experience that which he himself shall put to the test. But though difficulties accrue with greater rapidity and more poignancy than before through developing advances, there are the advantages. There are not only the working economies, but, if productivity is increased by new invention, there is a reduction of capital charges. So that though the difficulties of professional position increase, there are valuable compensations. In this connection, Mr. Ellery emphasized the importance—an importance that is still insufficiently recognized in many undertakings to-day—of regularly writing-down capital and writing off sufficient sums for depreciation, not only in the manufacturing department, but in connection with stoves, meters, and slot installations. Gas administrators who saw the wisdom of capital economy in the time long ago, and who pursued the dictates of wisdom, are in these days of competition blessed by their successors. Those who did not, and were lavish in capital expenditure, have left nothing behind them in this connection for which their memories are to-day cherished. But in this inventive age, the responsibilities of engineers and of gas administrators generally are more momentous than ever; and there must be a care as to the legacy they confer upon those who will hereafter take up their work.

Passing on to refer to some of the technical matters touched upon by the President, he gave the relative costs of dealing with coke by two different forms of conveyor—showing that the costs of one were more per ton by 1·1d. than the other. A cross conveyor accounts for part of this extra cost; and the smaller quantity of coke transported by the more costly one, suggests also that it may have a less amount of work to do in a given time, which again would increase the operating expense. The particulars supplied are insufficient to form the grounds for condemnation of the one form of conveyor. It will also be interesting to learn that the President has run up the full gamut of hydraulic main method. From wet main to anti-dip, from anti-dip to liquor seal, and from liquor seal to tar seal; and in the last-

named antiquated practice—a practice long since generally discarded on account of the robbery by the tar of some of the rich hydrocarbons of the gas—he is for the present reposing. It would be interesting to learn what effect, if any, he finds the reversion has had upon gas yield and quality. It is necessary to steam the tar to keep it liquid; and there can be little question that this steaming has also the effect of liberating some of the lighter oils from the gas, which in turn cannot lessen the necessity for naphthalene treatment, though the President claims some beneficial effect from the tar seal on the naphthalene contents of the gas. In this connection, there is endorsed the efficacy found by other gas engineers of treatment by water-gas tar, in practically eliminating naphthalene from the gas. The President, however, uses in his washer rather a large quantity per million cubic feet; and his excuse for this is that the naphthalene varies “very considerably from time to time, “and shows some unaccountably sudden changes.” This seems to reflect somewhat upon the President’s faith in the tar seal. Then the further precaution is taken of vaporizing into the gas some 10 gallons of benzol per million cubic feet of gas. Immunity from naphthalene troubles at any price is obviously the policy of the President; but when he sets against the cost the freedom he enjoys from stoppages (stoppages representing a not inconsiderable item of expense) and the added illuminating power of the gas, he is well content. Perhaps, however, when mains and services are thoroughly cleared, the cost of this comprehensive treatment for restraining the freakish naphthalene will diminish.

The President subscribes to the value of the high-pressure system of conveying gas; and in this connection he advances the results of a number of tests made some time since to prove the accuracy of the theoretical formulæ—Pole’s and Cox’s—as to the capacity of the new mains and the discharge at varying pressures. The general conclusion derived from the tests is that there are so many conditions peculiar to any particular piece of pipework that the theoretical formulæ and the actual working capacities and discharges have not the relationship that admits of any reliance being placed on the former. Concerning certain of the concluding parts of the address, the gas industry will not regard with any great amount of satisfaction the results of Mr. Ellery’s investigations; but it will undoubtedly have the good effect of directing the attention of other gas engineers and managers to the importance of making tests for themselves of meters, cooking-stoves, and burners, to ascertain precisely those quarters where the greatest accuracy and efficiency are to be obtained. The statements made as to the hourly consumption of certain cooking-stoves reflect lax method and crude design; and the extraordinary consumptions of certain stoves, a want of consideration for the interests of the gas industry. The fact that there are many stoves on the market possessing excellent efficiency is the positive proof that only indifference in production is at the bottom of the grotesque consumption of certain other makes. We have corroborative tests from a totally different quarter. It is to be hoped there are not many stoves of the kind on the market; but such work as Mr. Ellery has done should soon result in the transference of patronage, which is the most salutary method of enforcing necessary care. The same remarks will apply to incandescent gas-burners. Upon his experiences in the testing of meters, the President added his plea for the amendment of the Sales of Gas Act; but, in connection with this matter, the defects in registration found by the tests are shown to be more in favour of the gas consumer than of the gas purveyor.

Other topics that supplied the President with material were municipal trading and the “Metropolitan” No. 2 burner. As to the former, Bath unfortunately is not an isolated illustration of the robbing of ratepayers in the name of municipal trading. The reflections of the President on this subject are stated with a directness that will not make pleasant reading for those who sit in the high places in the present



government of the historical city; and they will find the utmost care has been exercised by the President in stating the facts. While electricity supplying local authorities are doing their best to injure local gas undertakings by their methods of competition and by increasing the burdens of the ratepayers (of which the gas undertaking is frequently the largest), they are hostile to gas undertakings applying to their business the modern gas-testing burner that has both scientific and parliamentary ratification. And the President also finds that there is no burning desire on the part of these same local authorities to obtain greater stringency in the testing of the lighting and heating values of electrical appliances. That is an anomaly to which the local authorities should give full consideration. Every point upon which the President touched in his address would form a text for extended comment; and, with the multiplicity of subjects, practically nothing more than an indication of their character could be attempted here. The verdict of our readers will be that of the members of the Association—that the address is an attractive and useful contribution to the current technical literature of the industry.

### Street-Lamp Tests from Westminster.

WE have no great faith in photometrical tests of street lamps *in situ*; experience having convinced us that many extraneous circumstances creep in to vitiate results and render them uncomparable. Years ago we had to take serious objection to tables of street photometrical tests that had been made by, or under the supervision of, the City Engineer of Westminster (Mr. J. W. Bradley, M.Inst.C.E.). After a long interval, there has been received from him, and we have reproduced in large part, a further tabulated statement of tests of street-lamps (gas and electric), with the comparative costs extending over a period of seven-and-a-half years. It may at once be said that, subject to the qualification in the opening lines of this article, objection cannot be urged against these tests with weight equal to that advanced some few years since. The tests are peculiarly informative. In the first place, it is noticed that the latest type of high-pressure gas-lamp tested is that in Aldwych and Kingsway; so that, in respect of high-pressure gas lighting, the latest achievements are not included in the tests. We are not without hope that the photometrical trials that were being made of the high-pressure inverted lamps in Fleet Street a few nights since were on behalf of Mr. Bradley, and that, both in average candle power and in cost per candle power per annum, they will have given superior results to anything that can be found in the City of Westminster.

The next point to which readers' attention may be specially directed are the two columns in the table referring to nominal candle power and average candle power as measured. It will be noted that a wide gulf exists in most instances between the relative figures under the two headings in the case of the electric arc lamps. A very bad case is the one for which the greatest total amount of money is paid per annum, in which the nominal illuminating power per lamp is 1000 candles, while the average candle power as measured is only 449 candles. There are two instances of arc lamps in which there are moderate excesses of illuminating power as measured over the nominal—the excesses being only 11 and 73 candles. The same wide differences are not found in the case of the high-pressure gas lamps (though not of the most modern type). As a matter of fact, the Parliament Street nominal 900-candle high-pressure gas-lamps are credited with an average actual power of 983 candles; the Aldwych and Kingsway lamps, for which a nominal illuminating power is claimed of 700 candles, are returned as giving an average of 1151 candles; and the Parliament Square high-pressure lamps, of 700 nominal candle power, give an actual illuminating power of 995 candles. The relation between the nominal and actual illuminating power figures should be particularly interesting to our electrical friends; and perhaps a little homily, addressed by our contemporaries to the makers of arc lamps as to their nominal claims, would not be out of place.

The illuminating power as photometrically tested and the refinement as to cost per candle power per annum are not the only matters to be considered; the questions of distribution, reliability, and effect under the worst of our fickle climatic conditions are of no small importance. But we will not ignore the cost per candle power per hour for the last quarter. Looking down that column, it will be remarked that it is only the exceptionally high-power flame

arc lamps that beat the latest of the forms of high-pressure gas-lamps included in the table; and the efficiency of these lamps (by Mr. Bradley's measurements) only ranges from 30 to 38 candles per cubic foot. The Fleet Street inverted lamps are giving from 60 to 70 candles per cubic foot of gas consumed; and gas is being supplied to them at a cheaper rate now than during the period covered by Mr. Bradley's data for Westminster. Under these circumstances, though we do not give much weight to such figures, we are hoping to see that the new high-power inverted gas-lamps in cost per candle power come out level with, if not superior to, the best the flame arcs can show (notwithstanding the low prices at which current is charged up for them), with, in addition, greater reliability and efficiency to their credit during the worst of our atmospheric conditions, when in the City of Westminster "flares" have been occasionally requisitioned to assist the electric lamps.

Mr. Bradley makes some observations relative to the condition of mantles causing a considerable variation in illuminating power, particularly where there is a cluster of mantles in one lantern. In reference to the high-pressure lighting, he seems to have devoted considerable attention to the Aldwych and Kingsway lighting; having made of these lamps the highest number of photometrical tests of any class (525 tests). Seeing that the average from actual measurement is 1151 candles, while the nominal power is only 700 candles, there does not appear to be much to complain about there in regard to the mantles. In the newer form of high-pressure inverted lamps, the mantles are single, and are suspended from a ring; and though we think that Mr. Bradley has made overmuch of the point in connection with upright mantles, he will find with experience of inverted gas-lamps that it will be necessary to considerably modify his statements. But as against these comments on mantles, reference letter "d" in the table informs us that many of the electric arc lamps referred to were of very poor candle power during the quarter; and the double 32-candle power electric lamps against which the letter "e" is placed, have the comment passed upon them that the "lamps were too poor to read for testing purposes. Globes to lanterns very dirty." The difference between nominal and actual candle powers of the arc lamps is also a point of which sight will not be lost.

We remember that Mr. Bradley at one time was a strong advocate of high-power sources on high columns for street illumination. We are not without hope, in view of this last report, and the fact that it does not refer to the latest systems of gas lighting, that Mr. Bradley will yet be convinced that for all-round efficiency what he requires can best be realized by inverted incandescent gas-lamps. The Berlin City Fathers have come to that conclusion, after a fierce battle between the rivals; and there is no reason why a similar result should not obtain in Westminster.

### High-Pressure Gas for Industrial Operations.

OCCUPYING a unique position as the Engineer in charge of the Woolwich Arsenal Gas-Works, there is no one perhaps who has more favourable opportunities for the study of the application of gas for furnace heating, and for purposes large and small, than Mr. A. W. Onslow. The application of gas for heating in industrial work is an important one in these times; and gas undertakings in large industrial centres—such as the Sheffield Gas Company and the Birmingham Corporation Gas Department—are doing much in various ways to cultivate new business in this direction. But Mr. Onslow thinks the gas industry has been negligent in this matter. He administers his castigation with right good will. There has been too much that is haphazard and crude about methods and practices in industrial furnace heating by gas; and haphazard and crude methods and practices are uneconomical and inefficient. We have all this in the paper that Mr. Onslow read (as well as in the asides of the author) the other day before the Society of Chemical Industry; and it cannot be gainsaid that in the results he obtains from practices developed from his own researches, Mr. Onslow makes his point. He deserves to be thanked no less for his plain-spoken criticisms, and his encouragement to better service in the industrial heating field, than for the notable achievements in efficiency and economy that have issued from his work. If industrial heating is worth having by the gas industry, it is worth carrying out in a scientific manner; and in Mr. Onslow's paper we have the science of the matter put clearly and tersely. The secret of the



heating of industrial furnaces is constancy of pressures, and constancy of pressures means constancy of temperatures. The pressures, too, must be high, and regulated to the particular purpose to which the temperature has to be applied. Under these circumstances, furnace temperatures will (with properly designed apparatus) be constant, will be equal throughout a furnace, and will be reproducible; and the results will be definite. In other words, by these means certainty displaces uncertainty, and a precise efficiency, something that is problematical—no matter whether one or more furnaces is or are used, and no matter whether a number are being employed simultaneously at different temperatures. Mr. Onslow tells us how it is done; and his paper is packed with practical wrinkles and guidance to the making of a successful business of industrial heating, by working under known conditions, by economizing gas and time, and by realizing efficiency.

The gas industry, in his judgment, is not doing enough in this matter. It is trying to meet modern requirements by old principles and customs. These have to be overthrown; and the new ones that he advocates as the outcome of personal extensive work, must be set up. He looks for the time when isolated compressing plants will not be needed for industrial work; when high-pressure gas will be supplied to factories as an advance necessary and compatible with modern conditions and ideas. Under the circumstances of urban development, factories cannot be brought to the gas-works; but high-pressure gas can be conveyed to the factories. The Gaslight and Coke Company have been carrying gas at high pressures to the printing-works in the neighbourhood of Fleet Street for melting the metal for stereo and other work. The Birmingham Corporation Gas Department are laying a 4-inch high-pressure main, for conveying gas to the jewellers' quarter in the city for heating purposes. With reference to this latter development, when further advanced, we hope Dr. W. B. Davidson, the Chief Chemist to the department (who, with Mr. S. R. Barrett, the Distributing Superintendent, has taken an active interest in the matter), will give the gas industry the benefit of experiences. But the supply of high-pressure gas is not enough; the provision of proper furnaces and appliances for the work to be accomplished is required. "Much harm has been done," avers Mr. Onslow, "through useless methods of furnace heating that seems almost incomprehensible." Makers of such furnaces and appliances will not be disposed to sit quietly under the scathing dismissal and denunciation of their work in this respect, and will naturally point to the increasing demands for their goods in this line as rebutting evidence. Their defence may be safely left to themselves. In the design of furnaces and their arrangements, a feature to be kept in view is to render them as independent of the man as possible, and to make them perfectly controllable. That is a lesson the gas industry has learnt in other directions; but in this particular one of the industrial use of gas for trade heating, the industry has regarded their duty ended in the giving of a constant supply of gaseous fuel, and leaving the design of the appliances for its use to those intimate with the necessities. Putting a plain meaning on Mr. Onslow's assertions, the latter have not been very successful in their designs; and if the gas industry is to make a flourishing business in industrial heating, it follows that its technical chiefs will have to step over the borders of their profession, and make acquaintance with the technicalities within the bounds of the heating requirements of the manufacturers in their areas. There is no insuperable difficulty about this; but Mr. Onslow must not forget he practically lives in Woolwich Arsenal, and his opportunities are great for acquiring special knowledge of industrial heating necessities outside his own particular province as a gas engineer.

The use of high-pressure gas for lighting was not of the subject-matter of the paper; but it was introduced. When it is remembered that their remarks apply to Woolwich Arsenal, with its spacious shops and heavy work, the testimony of Colonel Bagnold and Colonel Sir H. Barlow as to the superiority of high-pressure gas lighting over electric lighting is valuable. If the former is the means of lighting *par excellence* for the shops of the Arsenal, then it must be the superior system of lighting for all other large factories and shops where high-power sources of illumination are required. The positiveness with which the two gallant officers delivered themselves on this point leaves no opening for doubting the sincerity of their tribute. Said Colonel Bagnold: "For factory and workshop lighting, his friend Colonel Barlow would agree with him that electric light

"was 'not in it' with high-pressure gas lighting." And Colonel Sir H. Barlow not only agreed, but was even more emphatic than his friend. He remarked that "he would never dream of putting in electric light now for factory illumination. With high-pressure gas-burners for lighting workshops, there was absolutely no comparison. He would no more think now of putting in arc lighting than think of flying. High-pressure gas gave a beautiful and steady light." Declarations of this kind are helpful in carrying home to other manufacturers the fact that there is something to be said for high-pressure gas lighting that should be favoured with consideration when the agents of electricity suppliers are hovering around endeavouring to book fresh patronage.

In another part of the paper, the question of the use of high-pressure gas for warming large halls and rooms was treated upon, in relation to a project of Colonel Bagnold, whereby a combination system of steam and gas heating is arranged. Through the injector action of high-pressure burners, the heat generated in a combustion chamber and the hot products of combustion (after some part of the heat has been absorbed in heating water in a boiler for the hot-water circulating system) are made to travel at a high velocity through a long length of metallic tubing running through a room; and the products issue at the other end of the piping almost denuded of thermal value. It is found to be an economical system of heating. But what effect has it upon the humidity of the atmosphere?

### Port of London Dues and Coal Supply.

THE schedule of port rates framed by the Port of London Authority is now under inquiry, on behalf of the Board of Trade, by Lord St. Aldwyn; and the formidable task his Lordship has before him is seen by the fact that no less than 223 objections have been lodged by representatives of public and commercial interests all over the country. The amount of opposition that the provisional schedule has engendered must not be taken to indicate altogether any deep-seated seriousness with which the proposals are generally regarded, but rather that every branch of trade and commerce is fighting for the most moderate terms that can be obtained. The Port Authority must carry on the work with which it has been entrusted by Parliament, and to do so there is no question that there must be an increase of revenue. But if we take coal alone, the Port Authority in putting forward its suggested maximum charge, has not, it is evident, sufficiently taken into account the gravity of laying too heavy a rate upon coal brought into London coastwise. A heavy rate on coal must, in some degree, be detrimental to the trade of London (which is just one of those conditions that it is not to the interest of the Port Authority to influence); and it must also bear hardly on the myriads of poor householders, who already feel keenly enough the burden of their fuel bill, and are oppressed by the sensitiveness of the coal market to all inflictions, positive or anticipated. The extent, too, to which the burdens of industry affect the price of gas has its ultimate effect upon the pockets of the consumers. The three London Gas Companies, the Brentford, and others, have been before Lord St. Aldwyn, to plead for some remission of the maximum rate on coal. Counsel, on their behalf, argued much to the point; and Mr. Charles Carpenter (the only witness called by the Counsel for the Gas Companies) made a most effective statement and claim on behalf of both the consumers and the Companies. The latter had a case quite distinct from the ordinary coal dealers and retailers, seeing that their public service is for London and the suburbs alone, with earnings in the way of dividend limited by the efficiency of their service, and the opportunities offered by their respective allocated districts. The Companies do not claim to be altogether exempt from some contribution to the expenditure of the Port Authority; but they do say that it should have some relation to the benefits that the work of the authority may confer upon them. As a matter of fact, there is little concrete advantage to be derived by them from this work. The case presented by the Companies is reported at length elsewhere; and there is no question that it assisted Lord St. Aldwyn to the conclusion that the proposal of the Port Authority in regard to coal is too high, and that it would be his duty to recommend to the Board of Trade a considerable reduction. The principle he has laid down, that there should not be a large margin in the case of coal between the maximum



rate and the rate actually charged, is a good one; and it will eliminate almost completely the uncertainty that would result from the reverse order of things. So far the Companies, in regard to the maximum rate, have therefore been partially successful; but interest will have to be suspended to see the actual outcome of the decision. Exemptions claimed in respect of the Lea, Medway, and Swale were not favourably entertained.

### Popular Lectures and Illumination Costs.

In popular lectures, such as those Professor Silvanus P. Thompson has been delivering at the Royal Institution, one does not look for much that is technically new, and in the final lecture (as reported last week) there was a great deal that has been previously published in the learned lecturer's presidential address to the Illuminating Engineering Society, and in the reports of the "Glare" discussion that took place at recent meetings of the same organization. These things are excusable, and are expected. But we do submit that, in disseminating at such popular lectures relative figures as to costs for gas and electric lighting, recognition should be made of the more modern advances of gas lighting; and we protest now (as we similarly did at the time Mr. Leon Gaster delivered his London Institution lecture) against the figures that Professor Thompson presented for gas lighting in his final lecture at the Royal Institution. He gave the cost of high-pressure gas lighting per 1000 candle-hours at 1½d., with gas at 2s. 6d. per 1000 cubic feet, as compared with 1d. for electric flame arcs, with electricity at 4d. per unit. This 1½d. for high-pressure gas is worse than the 25,494 candle-hours for 2s. given for the "Millennium" light by Professor Thompson in his British Association lecture in 1906. So that gas has, according to his figures, receded in efficiency. But the fact is that the lecturer has not taken note of the efficiency of modern high-pressure inverted lamps—60 candles, or rather more, per cubic foot of London gas. Some actual figures from an installation at West Ham, published by Mr. H. N. Clark, in his Southern Association paper in November last (see "JOURNAL" for Nov. 9, p. 396), showed that, with gas at 2s. 8d. per 1000 cubic feet, 45,000 candle-hours was obtained with an expenditure for gas of 2s., while the motive power cost only 0·76d., with an average use of twelve mantles per burner. Then in these Royal Institution figures, we have low-pressure incandescent gas lighting quoted at 3d. per 1000 candle-hours, which again shows that no account has been taken of the inverted incandescent burner. Of gas at 2s. 6d. per 1000 feet, 3d. will purchase 100 cubic feet; and taking an efficiency of only 20 candles per foot, the 100 cubic feet would represent 2000 candle-hours. So that if a fair reduction of this last-named figure is made for maintenance, the 3d. is altogether too excessive for 1000 candle-hours. Professor Silvanus Thompson has modified his figures considerably for electric lighting since 1906. In that year he credited electric flame arcs with 47,169 candle-hours for 2s.; now he quotes 1d. for 1000 candle-hours. This represents 24,000 candle-hours for 2s., which is vastly inferior to the West Ham figures already cited for high-pressure inverted gas-lights. Take the "Osmium" lamps, 6d. per 1000 candle-hours is now put forward, which is equal to 4000 candle-hours for 2s. In the 1906 lecture, 7143 candle-hours for 2s. was the figure named. It is pretty clear that the figures for electric lighting have been revised by Professor Thompson; but those for gas lighting require further revision by taking into account modern developments of inverted gas-lamps. We make this protest, and point to the need for revision of the gas figures, with all respect, as notwithstanding Professor Thompson's close identity with the electrical industry, we have always associated with him, his writings, and his public utterances a marked spirit of independence.

### Annual Meeting of the Gas Institution.

We are reminded by the receipt, just before going to press, of a copy of a circular-letter from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn), that three months from to-day, Tuesday, June 14, the opening sitting of the annual meeting will be held, under the presidency of Mr. James W. Helps, M.Inst.C.E., of Croydon, in the hall of the Institution of Mechanical Engineers. Distinct from the technical and other interest associated with the proceedings, there will be a particular

desire on the part of the members to do honour by their presence to a President who has laboured so sedulously—with much personal sacrifice, but animated solely by delight in the work—over a long course of years for the cause of technical organization in the industry. Support we are sure will be also extended to him in preparing, with the Council, the technical programme for the meeting. Members will observe in this preliminary circular that those who have communications to offer for reading and discussion are asked to send in the particulars not later than April 9 for placing before the Council. Apart from general knowledge of the fact, recent presidential addresses before District Associations show that there is no lack of material in connection with current technical and commercial movements and problems in the gas industry upon which discussable papers can be founded. On the Tuesday evening there will be a reception by the President and Mrs. Helps; and arrangements are being made for the customary excursion on Friday. One other matter remarked upon in the circular will, we hope, incite fresh interest in the Benevolent Fund. It is not at all pleasant to read such words as these in connection with a flourishing industry: "Unfortunately, the [Benevolent Fund] Committee, owing to insufficient subscriptions and donations, have been unable to deal with all the applications for assistance received during last year; the expenditure exceeding the income by £19 8s. 1d." The words above should be sufficiently stimulating to produce what is required.

### Visit of the German Association.

Almost strangers at one time, there has been of recent years much interchange of courtesy and intercommunication in respect of common interests between the members of the gas professions of this and neighbouring Continental countries. We are glad to see from the circular referred to in the preceding paragraph that arrangements are being made to continue these desirable conditions during the summer of this year, by a visit to London of the members of the German Association of Gas and Water Engineers. The action of the Council in issuing this invitation will be unanimously endorsed by the members of the Institution generally, and most heartily by those eighty or so members who had the good fortune to visit Berlin in 1908. To speak of the attention and generous hospitality of our German friends on that occasion inadequately expresses the abounding warm-heartedness and good-fellowship that were met with on all sides. The invitation has been cordially accepted by our German colleagues; and the members of the Association have been circularized to ascertain how many will be able to join in the excursion. The only point for regret is that it is impossible for them to be with us in June at the time of the Institution meeting, owing to their own annual meeting having been arranged to be held at Königsberg the same month. But the next best thing is that they will be in this country towards the end of May; and their reception will be marked with no less sincerity in May than it would have been in June. The only difference will be that there will not be in London in May such a large number of gas engineers representative of the gas industry all over the British Isles as there will be in June.

### The Close of a Coal Strike.

The welcome news reached here yesterday that the coal strike in Australia had terminated, and that work will be resumed this week. Thus ends another chapter in industrial warfare, which should stand forth for all time as a shining example of how not to do things. We say the chapter is "ended;" but this is, of course, only partially correct, as masters and men must for some time yet continue to feel the effects of so disastrous a struggle. One authority estimates the loss of wages entailed at over a million pounds, of which the miners will have to bear three-quarters; but it is not possible to say what the loss to trade generally is in cases of disturbances of this character. Among others, the gas companies have naturally suffered severely. As reported last week, the Chairman of the Australian Gaslight Company stated that, if the Company had doubled their charge for gas, it would not have recouped them for the enormous additional outlay incurred; and now we see from the report of the meeting of the Metropolitan of Melbourne Gas Company that in the past half-year's accounts £9500 has been set aside to partly meet the extra expenditure on coal during the strike. What this disastrous affair would ultimately cost them, the Chairman



added, it was impossible at that time to say. Apart from the effect of this unhappy labour dispute, the position disclosed by the Chairman of the Melbourne Company is gratifying in every respect. Rapid progress is being made, which, he says, is largely owing to the keen manner in which the staff devote their energies to the work of the undertaking. The record for the last three years is certainly one justifying pride on the part of all concerned—24,246 additional meters having been installed, which represents an increase of about 35 per cent. The total quantity of gas sold in 1909 was 1694 million cubic feet, as against 1563 millions in 1908, or an increase of about  $8\frac{1}{2}$  per cent. Upon the success with which work has been carried on during the coal strike, the Directors and officials will be congratulated, as well as upon the excellent results just referred to. The half year must have been an anxious one for all connected with the undertaking.

#### Midland Junior Gas Association.

The business of the fifth session of the Midland Junior Gas Association was brought to a close with last Saturday's meeting, though there are still two visits to be paid before the programme is finally completed. While looking forward, as the members are doing, to these future outings, it is meanwhile possible for them to look back and take stock of the past six months' work; and such a review of the session cannot fail to give them satisfaction. The papers read have not been over-numerous; but they have certainly been of excellent quality, and on subjects of the greatest possible interest to the members. The construction of a retort-house, calorimetry, and competition and the development of gas sales, are all subjects which are uppermost in the minds of those connected with the gas industry. Thus it is not surprising that the discussions have all been long, when one calls to mind the number of good debaters that are included in the membership of the Association. The paper last Saturday, which dealt with "Competition and the Development of Gas Sales," led, perhaps, to the longest discussion of all, and many interesting points were brought out. In speaking thus of the papers, mention must not be omitted of the first-class Inaugural Address which was delivered by the President (Mr. A. O. Jones, of West Bromwich), which formed the subject of an editorial notice in our columns at the time. The visits so far undertaken have, too, been of a most instructive character; and there is no reason to anticipate that the remaining fixtures will prove less valuable. At Coventry, the members have seen a new splendidly arranged gas-works; while at Messrs. Hardman's tar distillery much useful information was gleaned with reference to the working-up of products. The annual report of the Council showed that there are at the present time 133 ordinary members. This is seven less than the preceding year, which, however, constituted a record. A new rule has now been adopted which will extend the scope of the Association by relaxing the qualifications for membership so as to include a much wider range of gas-works employees. Inasmuch as the Junior Associations' chief claim is that they are educative, it seems a move in the right direction to welcome all those engaged in gas manufacture, &c., who are sufficiently keen about their work to desire to get on. The standard maintained by the Midland Juniors is a high one; and many who have hitherto been obliged to remain outside, will no doubt be glad of the opportunity of joining in the benefits to be derived from membership.

#### Unprofitable Electricity Supply at Newport (Mon.).

In the last number of the "JOURNAL," brief reference was made to a report by Mr. C. P. Sparks on the position of the electricity undertaking of the Newport (Mon.) Corporation. The fuller notice of the report, the proceedings of the Town Council thereon, and the remarks of the Secretary of the Ratepayers' Association which appear elsewhere to-day, throw additional light on the working of the Corporation Electricity Committee. Mr. Sparks reports that, in order to meet the existing deficiency and provide for reserves, the revenue this time last year should have been increased by £4189; but, to minimize the risk of losing business, he recommends that the charges should be raised so as to produce increased revenue at the rate of £2905 per annum. The Corporation have followed the advice of their expert to the extent of advancing their charges about 12 per cent.—that is to say, they have not gone much more than half

way towards placing their electricity undertaking on a right financial basis. It would seem almost as though they were afraid to go farther lest the ground should be taken up by the Gas Company. And it must be confessed that we should regard such a result as not altogether unmerited, for the Company have had a hard fight during the past five years against a Corporation Department who were selling their commodity below cost price, and who grabbed all the big central consumption owing to their system of making good deficiencies out of the rates and putting forward great promises of future reductions. That the Company not only maintained its prosperity during this period, but actually went ahead, is evidence of the soundness of the concern, the capacity of its conductors, and the utility and popularity of its commodity. We do not for a moment question the business ability of the members of the Electricity Committee. But, in view of the light that has just been thrown upon their doings, we cannot help regarding them as men who, having taken the wrong road, would not retrace their steps until circumstances made a return an absolute necessity.

#### Professor Dixon and the Manchester Junior Association.

At the Victoria University, Manchester, an address was delivered to the members of the Association on Saturday afternoon by Professor Harold B. Dixon, M.A., F.R.S., who took for his subject "Some Theories of Combustion of Gases." Mr. James Taylor (Mossley), President, occupied the chair, and at the conclusion of the lecture—a summary of which will be given in our next issue—expressed the pleasure it had given him to again hear the Professor deal with a matter of such interest to those connected with gas undertakings. Mr. D. V. Hollingworth, F.C.S. (Salford), in moving a vote of thanks to Professor Dixon, expressed regret that more members had not been able to avail themselves of the opportunity of hearing the address that afternoon. They were, he added, greatly indebted to the Professor for having given so freely the results of his labour in the laboratory; and he desired to convey to that gentleman the cordial thanks of the members for the trouble he had taken. For himself, he had been particularly interested in the remarks upon the compression of gases, and also the slides that had been thrown on the screen showing the various explosive waves, &c. Mr. J. Alsop (Stockport), in seconding the motion, referred to the benefits that were to be obtained by the chemist and engineer working together—giving a case in point, illustrative of how such a union of the two professions would have saved considerably in material and in money. The resolution was carried with acclamation. In responding, Professor Dixon agreed with what Mr. Alsop had said, and gave another illustration in support of the contention. He expressed the hope that in the future there would be a closer union between the University and the Gas Associations, feeling sure that the results would be of the greatest assistance to both professions.

The Yorkshire Junior Gas Association will meet at the Leeds Institute next Saturday, when Mr. P. M'Nab will read a paper on the "Sales of Gas Act, 1859," and Mr. R. Halkett one on the "Heating of Water by Means of the Gas Circulator—its Fixing and Working."

Ruegg's "Employers' Liability and Workmen's Compensation."—We have received from Messrs. Butterworth and Co. the eighth edition of the above-named work. It differs from its immediate predecessor, which was published in July, 1906, in this respect—that it contains some important decisions under the Workmen's Compensation Act of that year. The price of the book, which may be noticed more fully in a subsequent issue, is 25s.

"The Electrician" Electrical Trades Directory and Handbook.—We have received from "The Electrician" Printing and Publishing Company, Limited, of Salisbury Court, Fleet Street, E.C., the above-named directory for the present year. It is the 28th edition of what is known throughout the electrical industry as the "Big Blue Book." Included in the contents are notes of the improvements made in arc and metal filament lamps, and a summary of the parliamentary work of the past session so far as it affected electrical affairs. The law of electric lighting, power, traction, &c., is dealt with; and there is a specially prepared digest by Mr. A. C. Curtis-Hayward. Full financial details as to electrical joint-stock enterprise, and information relating to the financial side of every branch of the industry are to be found, including a directory of directors of electrical companies, particulars of the capital authorized and issued, the last dividends paid, the latest Stock Exchange quotations, all the principal officials, &c.; also the principal issues of capital made last year. A graphic survey of the engineering and electrical equipment of all the electricity supply, electric power, and traction undertakings of the kingdom is given in the form of a number of compact tables, one of the largest of which is devoted to Colonial and Foreign undertakings. There are upwards of 2000 pages in the book, the contents of which have undergone thorough revision up to the time of publication. The price of the work is 15s. net, postage extra.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 758.)

THE Stock Markets, both inside the Exchange and outside in the street, have had a very busy week. The public is possessed by a spirit of speculation; and the activity and excitement are at a high pitch. A new boom was started towards the latter part of the week—South Africans *vice* Rubber and Oil resting. But concurrently with, and in spite of, all this, the leading investment markets have not done badly. The opening day was rather quiet, even in the speculative whirlpools; Consols giving way a bit, and Railways closing easier. On Tuesday, the chief markets were still inclined to be dull, and business in them was no better than quiet. Wednesday found all the Home Government issues oppressed by uneasiness in regard to the national financing; but Railways were strong and accomplished some good rises. Speculative quarters were weaker. A very fair improvement in tone and activity was apparent on Thursday. Gilt-edged were strong, and Consols rose. Railways continued cheerful and busy; and the speculative favourites revived. On Friday, the new South African boom was in full action; but the general markets were not neglected. There was steadiness in the gilt-edged division, and some advance in Railways. Saturday was quieter; but the general firmness was unimpaired, and the South African rush was still going strong. In the Money Market, the supply was ample to meet all demands for short loans on easy terms, but rates for discount stiffened steadily, and closed very firm. Business in the Gas Market was a good average bulk on the whole; but the greater part of it was in the leading issue, with a fair backing-up by the Argentine group. Changes in quotation were few, slight, and variable. In Gaslight and Coke issues, the ordinary had a good many transactions every day, and failed to maintain its position entirely. On the opening day, 104½ was marked more than once, and this was the best price of the week; the figures giving way till one special bargain was done at 103½—a fall of ½. In the secured issues, the maximum changed hands at 89 and 89½, the preference at from 103½ to 105, and the debenture at 81½ and 82. South Metropolitan was done several times at from 121 to 122, and once specially at 120½. The debenture realized 82½. One transaction in the debenture at 81½ was all the business in Commercials. Among the Suburban and Provincial group, Alliance and Dublin was marked at 87½, Brentford old at 252, ditto debenture at 101½ and 101¾, British at 45, Portsea "A" at 135, South Suburban at 121½, and Tottenham "B" at 113½. In the Provinces, Chester marked 110, and Liverpool "A" 223. In the Continental companies, Imperial was firmer at from 175½ to 177½—a rise of 1. European part-paid realized 18¾, and Tuscan 9½ and 9¾. Union advanced 1 in both issues. Among the undertakings of the remoter world, Buenos Ayres changed hands at 14¾ and 15, Cape Town at 4½, Primitiva at 7½, ditto preference at from 5¾ to 5½, ditto debenture at 99½, River Plate at from 17¾ to 18, ditto debenture at 99½, San Paulo at 15¾ and 16 (a fall of ¼), and ditto preference at 11½ and 12. Oriental rose 1; and Cape Town debenture, 3.

## ELECTRICITY SUPPLY MEMORANDA.

Interesting Items from the London Companies' Meetings—Inflating Business through the Public Service—A Joint Promotion for Wiring and Fittings—Electrical Interest in the "Metropolitan" No. 2 Burner.

MOST of the London Electricity Supply Companies have now held their half-yearly or yearly meetings; and the almost uniform report at them has been that, financially, they have merely been marking time. The output of units has, generally speaking, increased; but the increase has been in the power units—the lighting units having receded through the supersession of carbon filament by metallic filament lamps. The increased revenue from power, *plus* economies in working (the lower price of coal being one), have kept the final financial position about level with 1908. Some figures given at the Charing Cross (West End and City) Company's meeting, instances how the power supply is preponderating over the lighting supply. In respect of the West-end business last year, of the increased output 50 per cent. was for power and 50 per cent. for lighting; while in respect of the City undertaking, 75 per cent. of the increase was for power, and only 25 per cent. for lighting. And according to the Chairman, the Company have only got about half way through their troubles in relation to the change-over to metallic filament lamps. From some figures compiled by the officials of the South Metropolitan Electric Light and Power Company, it would appear that, of their customers, about 75 per cent. of the shopkeepers and about 60 per cent. of the private house consumers now use metallic filament lamps, more or less. The effect in the case of this Company of the power increase over the lighting, is seen by the fact that the average price per unit received was 2.59d., as compared with 2.88d. for the previous year—a decline of about 10 per cent. This is the Company that has the wonderful "Electra" House in the Bromley Road, to show how the middle-class man's house should be "electrified" in the most extravagant manner, and beyond the ordinary man's means. It is not astonishing to learn that between 3000 and 4000 curious folks have been over the

place, nor is it surprising that as yet very little direct business can be traced to the demonstration. While the Directors of the London Electric Supply Corporation do not undervalue the lighting demand, there is little doubt that they are looking forward to the power business for traction and other purposes being the backbone of their business in future. Last year 46 per cent. of the units sold by the Corporation represented the power business; and the percentage continues to move upwards in a manner showing that the low-priced units will soon be making a bigger demand on the generating plant and cables than the high-priced units, which represent the most lucrative part of the business.

In the Smithfield Markets Supply Company, we see an instance of how hardly an electricity concern is hit by the metallic filament lamp when lighting offers the only scope for business. The Company's profits from the supply of the Central Markets, as shown by the last accounts, only amount to £307; the almost universal adoption of metallic filament lamps having reduced the receipts from the sale of energy by upwards of £4000. The average revenue per lamp fell from 7s. 8d. in 1908 to 5s. 9d. in 1909. These are peculiarly interesting figures in view of the misleading statement that is so freely advertised that the adoption of the metallic filament lamp saves 75 per cent. of current. The first consequence of the loss to the Company is no dividend; the second, that the price of current to metallic filament lamp users is to be raised in order to restore happiness to the shareholders. With this increase, the Directors state that the cost of lighting will still be cheaper than gas. While sympathizing with their parlous position, we will let this piece of mendacity go by without further comment. There are two other small, but very interesting, items. The first is that Harrod's Stores now have private generating plant; and the Kensington and Knightsbridge Company are the losers of the business, which represented to them a quarter of a million units a year. The second item refers to the loss of electricity in transmission. It was mentioned by the Chairman of the Charing Cross Company that, in connection with their West-End undertaking, the loss in transmission last year was 33.1 per cent., compared with 34.1 per cent. in 1908; and in connection with the City undertaking the loss was 28.4 per cent., against 31.8 per cent. in 1908. What an amount of electricity must be lost in London during a year! We wonder if it may be assumed that a part of this finds employment in assisting the leakage of gas from the mains of the gas companies.

The electrical industry is constantly grumbling at the cloudy conditions that appear to have set in with remorseless obstinacy over it. There is one way, however, in which progress is being made by the part of the electricity industry under municipal control, over which progress the gas industry has a right to object, and that lustily. It is the action of the municipal owners of such undertakings in converting street gas-lamps to electricity for no other purpose than to inflate the business of their electricity departments. The cases of Marylebone and Hastings, and the proposals of numerous other places, rise instantly in mind. Hampstead, it is now announced, are converting a further 159 gas-lamps in Cricklewood, Kilburn, and the West-end districts; and each lantern is to be fitted with a pair of 35-watt (say 28-candle power) metallic filament lamps—that is to say, each standard will carry a light of under 60-candle power. This is stated to be the first step towards converting the whole 2237 street lamps in the borough into electric incandescent lamps. We have seen no case put forward to justify this conversion—either in respect of capital and running costs or efficiency. As a matter of fact, there is nothing to be said beyond the trite argument that municipal electricity undertakings belong to the ratepayers (and well some of them know it!). So also does the public lighting service belong to the ratepayers; and in that service they have the right to the best value for the money expended. At Leyton, too, the whole of the public lamps have been converted from gas to electricity. This has been done, out of sums taken from the ratepayers' pockets each half year, solely for the benefit of the electricity undertaking; so that it is said, with some amount of pride, no loan has been required. Of course, if we can filch from someone else the wherewithal to meet current expenses, there is no occasion to work or to borrow; but the mode of paying one's way as practised by Leyton is not a thing to boast about. The ratepayers do not know where their expenditure is going to end on this public lighting. Hastings is a shining example. For several years at this holiday resort, there has been a heavy deficit on the electricity undertaking, with the result that an increase in the price of current has been imperative; and this has put an additional annual charge of £5 per lamp on the many arc lamps in the borough. This means that every arc lamp in the borough is costing the ratepayers £5 extra—and all for the sake of the municipal electricity concern. But reverting to those twin 35-watt metallic filament lamps that are going to be fitted in the Hampstead district. In the Grove, Hammersmith, 400-candle power Osram lamps have been fixed. Reproductions of photographs of the lighting have appeared in the electrical papers. The distance from the tops of the lamp standards to the sky is much greater than from the metallic filament lamps to the surface of the road; but the sky is shown to be much better illuminated than the roadway. If the pictures truly present the condition of the Grove, then on moonless nights it is a place to be avoided. The moral of all this is the pointing of the urgent necessity for taking measures to stop the grabbing by the municipal authorities of the public lighting for the electricity concern without any care as to whether or not the ratepayers and the public service are



benefited thereby. This was a matter referred to in our editorial columns last week.

A joint effort is to be made by the Maidstone and some sixteen or seventeen other local authorities to secure (by means of a Bill) wiring and fittings powers; but much we doubt whether they will get them. It is thought that the powers can be obtained for a maximum individual contribution of £10 10s. towards the expenses. That will be cheap. But of this the promoters may be sure, that there will be severe organized opposition to the measure on the part of the electrical contractors. A similar power was last session knocked out of the measure amending the Electric Supply Acts through the pertinacity of the contractors' opposition, supported by a sympathetic House of Lords. The Canterbury Corporation are one of the authorities participating in the promotion of the Joint Bill. But after the resolution was passed supporting the measure, the consciences of some of the members pricked them, or probably the tongues of some of the local contractors had been assailing their ears; for a proposal was advanced at a subsequent meeting for the rescinding of the resolution to be part promoters. But though there were half-a-dozen members of the Council in favour of retracing steps, the remainder were not. Where the shoe pinches was seen in the remarks of the Deputy-Mayor when he said: "They as an authority were competing, in some sense on behalf of the citizens, with a powerful Company—the Gas and Water Company. In the main street, the Company had a shop showing all the latest appliances to advance their trade." That is what weighed with the majority of the Council in rejecting the rescinding resolution; but the half-a-dozen opponents of the resolution to take part in the Bill need have no fear. A stronger interest than theirs will operate against the measure.

Our electrical friends have learned that a number of Gas Companies have also a joint Bill in Parliament, but in connection with the subject of gas testing. It is interesting to find that the news has penetrated so slowly into electrical knowledge. Having got hold of the intelligence, "Meteor" in the "Electrical Times" recently commented on it, taking, of course, the point of view of the (in large part) electric supply authorities who are opposing the Bill—not so much, we opine, in the interests of the gas consumers, but because anything that tends to the slightest increase of liberty for the gas industry is against the interests of municipal electricity supply. The ignorance of "Meteor" when he writes on gas matters is the most conspicuous feature of what he has to say. It is clear that he knows little or nothing about this testing question; and so he adopts without reserve the opposition misconceptions. He tells his readers that the idea is to substitute the "Metropolitan" No. 2 test-burner for the "test-burner" now in use. Of course, it is not within his ken that there are several test-burners "at present employed," and that one of them—the one last approved by Parliament, the Board of Trade, and the Metropolitan Gas Referees—and applied to all gas undertakings, company and municipal, that have been to Parliament the last four or five years, is the "Metropolitan" No. 2 burner, which is the only recognized burner that does justice to gas of the lower illuminating power standard that Parliament now authorizes. "Meteor" apparently thinks there is some definite association between illuminating power and calorific power, because he says "the effect of this apparently trivial change will be to reduce the illuminating and calorific quality of the gas." It is not to be supposed that he has heard of gas which is only of 10 to 12 candle power that has a thermal value equal to some of our gases of 15 to 16 candle power. He also adopts the complaint of the opposition that, if the test-burner is changed, "much more gas would have to be consumed in cooking-stoves." Again, he is not aware that the hard facts of experience with consumers' accounts are against him where the "Metropolitan" test-burner is already applied. He does not know, too, that in a bunsen burner such perfect combustion cannot be obtained with gas of high illuminating power as with one of somewhat lower power, owing to the difficulty of securing thorough admixture of air with gas richly laden with illuminating hydrocarbons.

On the other hand, "Meteor" states that there is no proposal to reduce the price of gas. He need not worry himself on this score; the sliding-scale of price and dividend keeps the relations of the companies and the consumers on the right lines as to charge. Another interesting statement is that "gas has been steadily getting worse and worse." Curious, is it not, that the gas industry is not in the slightest degree perturbed? But "it has come to this, that people simply cannot use flat-flame burners, even when sick to death of the breakages, and dirt and nuisance of mantles, advertised as unbreakable." That is typical of "Meteor's" exaggeration. But it is singular, again, that the gas industry—being aware that ten times the illuminating power can be obtained from inverted incandescent burners than can be realized from an equal consumption of gas by flat-flames—are particularly anxious to exterminate all the latter burners, and to cause those burners that are supposed to sicken to death to reign supreme. Now "Meteor" do take our advice, and let the gas industry go on peaceably manufacturing a rope long and strong enough to hang itself with. When the end of the gas industry comes, see how much nicer it will be for the electricity industry. There is one point upon which we agree with "Meteor," and that has reference to chairmen of gas companies boasting that people sometimes unconsciously believe the light of the inverted incandescent gas-burner is electric light. This suggests that people think the electric light is the better one, and that the gas industry has

succeeded in getting out a good deceiving imitation. At the origin of the inverted gas-lamp, the intention was not to make one having identity with the electric lamp, but to secure an actual and more useful efficiency from a pendant mantle than from an upright one. The fact that in producing lower units of the inverted form of lamp, there has been a closer approach in appearance to incandescent electric lamps is more accidental than premeditated.

## OBITUARY.

Mr. JAMES BAXTER, who had been Manager of the Forfar Corporation Gas-Works since 1899, died on the 27th ult. He had been in indifferent health for a considerable time. Mr. Baxter went from Armadale to Forfar. Before that he served at Berwick and Innellan.

The death is announced, as having taken place two days after the celebration of his 70th birthday (on the 28th of February), of Herr JAKOB LINDMANN, who had for 35 years been Manager of the gas and water works at Fürth, a town of about 50,000 inhabitants, in Bavaria.

The death occurred in Vienna last Thursday, in his 66th year, of Dr. KARL LUEGER, the Burgomaster. Deceased was one of the most remarkable men in the Austrian capital, as from very humble beginnings, he became, in the language of the writer of his obituary notice in "The Times," the "founder of the Christian Socialist Party, demagogue, political 'boss,' Jew-baiter, and statesman." His name figured rather conspicuously in the "JOURNAL" some thirteen years ago, when he stirred up an agitation against the Imperial Continental Gas Association, which resulted in the establishment of municipal gas-works for Vienna, the funds for which they had some difficulty in raising. An illustrated description of these works appeared in the "JOURNAL" for the first half of 1901.

## PERSONAL.

At their meeting on Thursday last, the Gas Committee of the Stockport Corporation confirmed the appointment of Mr. WALTER STANLEY SOWERBUTTS as Assistant Gas Engineer.

At St. Andrew's Church, Holborn, on the 5th inst., the marriage was solemnized of Mr. ERNEST C. PALMER, second son of Mr. C. I. Palmer, of Ipswich, and CLAUDINE PATTIE, the youngest daughter of Mr. E. D. Sapey, the Manager and Secretary of the Horsham Gas Company.

Mr. D. V. HOLLINGWORTH, F.C.S., has been appointed Chief Chemist to the Salford Gas Committee. He is a member of the Council of the Manchester and District Junior Gas Association, and has been engaged in the Gas Department of the Salford Corporation for about five years.

At the Parish Church, Hampstead, on the 26th ult., the marriage was solemnized of Mr. LAWRIE TREWBY, the Engineer and General Manager of the North Middlesex Gas Company (second son of Mr. G. C. Trewby, M.Inst.C.E., late Chief Engineer of the Gas-light and Coke Company), and EDITH CLAIRE, only daughter of Commander H. C. Wallis, R.N., of Dieppe.

The Corporation of Forfar have appointed Mr. JAMES DICKSON, the Manager of the Keltly Gas Company, as their Gas Manager, in succession to the late Mr. Baxter. Mr. Dickson is a native of Forfar. He served his apprenticeship in the Forfar Gas-Works. Afterwards he held appointments in Broughty Ferry, Burntisland, and Dunfermline, where he was foreman of the works. Three and a half years ago he was appointed Manager of the newly-formed Keltly Gas Company; and he has done excellent pioneer work there. He has been President of the Scottish Junior Gas Association—Eastern District; and for two years has been Hon. Secretary and Treasurer to that body.

A pleasant feature of the final ordinary monthly meeting of the Burslem Town Council, which took place on Monday last week, was the passing of a resolution, on the presentation of the accounts of the Gas Department for the year ended Dec. 31, 1909, expressing the Council's high appreciation of the manner in which the duties of Gas Engineer and Manager had been discharged by Mr. EDWARD JONES, M.Inst.C.E., during the four years he has filled the position. A copy of the resolution, under the seal of the Council, is to be sent to Mr. Jones. During the short discussion on the Committee's minutes, testimony was borne to Mr. Jones's able management.

## German Association of Gas and Water Engineers.

A preliminary announcement is made that the fifty-first annual general meeting of the German Association of Gas and Water Engineers will take place from Monday, June 20, to Friday, June 29, at Königsberg, the capital of East Prussia. The customary reception will be held on the Monday evening; and the following three days will be devoted to the technical proceedings. On the Friday there will be an excursion. The detailed programme will be issued later. The President of the Association is Herr H. Prenger, the Manager of the Gas, Water, and Electricity Works of Cologne.



STREET ILLUMINATION IN WESTMINSTER.

Tests by the City Engineer.

WE have received from the City Engineer of Westminster (Mr. J. W. Bradley, M.Inst.C.E.) the accompanying tabulated statement containing the results of his tests of gas and electric street illumination for the quarter ended Dec. 31 last, together with a

statement of the comparative costs extending over a period of seven years and six months. Appended to the table are the following explanatory remarks: "In order to anticipate any objections which might arise on comparing the figures obtained for the various lamps, I have the following comments to make on the tests. All tests are carried out under precisely similar conditions. The photometer which has been used in making the observations is fitted with two, five, and ten candle standards for testing low

and high power lamps respectively, and will, from its construction, give results in all cases, if anything, slightly higher than the true values by a small amount which is practically constant for all types of lamp tested—thus making the comparison of the various lamps approximately accurate. Further, precautions are duly taken during each test to guard against the effect of extraneous light, reflection from buildings, obstruction by any opaque object, such as glazing bars, and the tests are only carried out on clear

Tests of Street Lamps (Gas and Electric), with Statement of Comparative Costs Extending over a Period of 7 Years and 6 Months.

Description and Position of Lamps.	To Whom Lanterns and Columns Belong.	No. of Lamps in City, of Class Specified.	Nominal Candle Power.	Average Candle Power as Measured.	Cost of Illuminant per Lamp per Annum.		Cost of Lighting and Maintenance per Lamp per Annum.	Total Cost per Lamp per Annum. (3940 Hours.)		Total Cost per Candle Power per Hour.	Total Cost per Annum.		Total Cost per Candle Power including all Tests Made during past Thirty Quarters.	Total No. of Tests up to Date.		
					Current Contracts with the Various Companies.	£ s. d.		£ s. d.	£ s. d.		£ s. d.					
<b>Charing Cross Company.</b>																
Electric arcs, Oliver, open type double carbon (Charing Cross, West-End, and City Electricity Supply Company), opalescent globes	Columns and brackets, City Council	100	1000	593	£28 £27 10s. £27 10s. £28		30 0 0	0	0	00308	d.	3,000 0 0	0	12 14	10 36	192
Do., do., Strand, do.	Do.	21	1000	718			29 10 0	0	0	00250		619 10 0	0	9 86	9 86	6
Do., do., "Oriflamme," Strand, do.	Do.	2	2000	1355			29 10 0	0	0	00132		59 0 0	0	5 22	5 22	2
Do., do., Whitehall, do.	Do.	1	2000	1102			30 0 0	0	0	00165		30 0 0	0	6 53	6 38	37
<b>St. James and Pall Mall Company.</b>																
Electric arcs, "Crompton-Pochin" (St. James and Pall Mall Electric Light Company), opalescent globes. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	City Council	45	900	911	£17 £17 £17 £17		19 5 0	0	0	00128		866 5 0	0 (a)	5 07	4 92	331
Do., do., "Duplex Exello Flame," Regent Street, do. (Minimum candle power under the contract should be 1400 c.p. for each lamp.)	Do.	16	From 3000 to 4000	3575			19 5 0	0	0	00032		308 0 0	0	1 29	1 29	12
Do., do., "Exello" lamps, St. James's Street and St. James's Place, do. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	Do.	4	From 1500 to 2000	1656			19 5 0	0	0	00070		77 0 0	0 (b)	2 78	2 78	4
Do., do., Electric arcs (various)	Do.	6	..	..			..	..	..	..		87 0 0	0 (c)	..	..	..
<b>Westminster Company.</b>																
Electric arcs (Westminster Electric Supply Corporation), opalescent globes Electric (two) 32 c.p. lamps (do.), on refuges, Buckingham Palace Road type Electric flame arcs (do.), Marble Arch. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	Elec. Corp.	957	1000	449	£21 2 5 3 17 7 14 0 0 ..	..	21 2 5	5	7	00286		21,212 12 9	9 (d)	11 29	10 35	190
Do., do., "Exello" lamps, St. James's Street and St. James's Place, do. (Minimum candle power under the contract should be 900 c.p. for each lamp.)	City Council	5	1500	1573			14 0 0	0	0	00054		70 0 0	0	2 13	2 13	5
Do., do., Electric arcs (various)	Columns and brackets, City Council	73	..	..			..	..	..	..		190 8 4	4	..	..	..
<b>Gaslight and Coke Company.</b>																
High-pressure gas-lamps—	Lamps, complete, to City Council	2	300	284	4 5 4 £8 10 9 £15 1 0 £15 1 0 £15 1 0	3 15 0 £4 10 0 1 0 1 0	8 15 4	4	0	00187		17 10 8	8	7 40	7 40	2
Parliament Street refuges, by Parliament Square (10 cubic feet per hour)*	Do.	8	600	473			13 15 9	9	0	00177		110 6 0	0	6 99	8 27	131
Whitehall and Parliament Street (28 c.f.h.)* (Minimum candle power under the contract should be 900 c.p. for each lamp.)	Do.	18	900	985			16 4 0	0	0	00100		391 12 0	0	3 94	4 05	78
Aldwych and Kingsway (30 c.f.h.)* (Minimum candle power under the contract should be 700 c.p. for each lamp.)	Do.	20	700	1151			16 1 0	0	0	00084		321 0 0	0	3 34	4 17	525
Parliament Square (Gas Co.) (30 c.f.h.)* (Minimum candle power under the contract should be 700 c.p. for each lamp.)	Do.	5	700	995	5 6 6 3 11 0 1 7 9 1 15 10	3 6 0 1 18 6 1 7 0 1 7 0	16 1 0	0	00098		80 5 0	0	3 87	4 22	180	
Three "C" incandescent gas-mantles, Victoria Street refuge lamps (11'25 c.f.h.)*	Do.	9	200	130			9 7 6	6	0	00439		84 7 6	6	17 30	15 91	84
Two "C" incandescent gas-mantles, Victoria Street footway (7'5 c.f.h.)*.	Do.	70	130	83			6 0 6	6	0	00442		421 15 0	0	17 42	13 67	144
One "C" incandescent gas-mantle, Carlton House Terrace (3'25 c.f.h.)*.	Do.	216	60	65			3 0 9	9	0	00284		656 2 0	0	11 21	14 27	165
"Kern" single incandescent gas-mantles Tothill Street type (4'2 c.f.h.)*.	Do.	1205	70	53	..	..	3 8 10	10	00394		4,147 4 2	2	15 56	14 52	184	
Low-pressure gas-lamps (various), practically all double mantles plus specials	Do.	1494	{ 600 } { 900 }	..			..	..	..	..		7,588 5 11	11	..	..	..
High-pressure do., do.	Do.	8	..	..			..	..	..	..		128 1 0	0	..	..	..
Two "Osram" M.F. electric lamps, Finchley Road (borough of St. Marylebone)	..	..	150	188	4 9 6	6	..	00142		£41,020 19 9	9	5 71	5 71	14		

\* These statements of gas consumption are made by the Gas Company, and cannot be verified by this Department.

REMARKS.—(a) In September, 1904, the Muranese globes were replaced by opalescent; a better illumination resulting.

(b) These lamps will shortly be altered to the Regent Street type. (c) These lamps are trimmed and maintained under an agreement dated Dec. 3, 1906, the rate being £2 10s. per lamp per annum; and energy for them is supplied under an agreement dated Sept. 23, 1905 (to which the last-mentioned agreement is supplemental), the rate of charge being 2'5d. per unit.

(d) Many of the lamps tested during the quarter were of very poor candle power. (e) Lamps were too poor to read for testing purposes. Globes to lanterns very dirty.



nights. In the case of incandescent mantles, including ordinary and high-pressure lamps, great variations in candle power are found to be due to the condition of the mantles. What appears to the naked eye as only a slight diminution in intensity resulting practically in an enormous loss of candle power. In the case of lanterns with groups of incandescent mantles, it is found that such mantles are difficult to keep in good order; and the effective candle power does not increase in the same ratio as the number of mantles. "It has been repeatedly found that a slight defect in any one of the incandescent mantles in high-pressure lamps causes a great loss of candle power; and this circumstance renders it difficult to form any comparison between tests carried out in a laboratory and those made under actual lighting conditions, as in the cases given above."

## THE "PAX" PATENTS.

### Electrical Ignition—Light in any Position—New Petrol Gas System.

THERE are men of many parts; and Mr. P. Curral Pace appears to be one of them. He is an inventor; and he has been turning his attention to gas-lighting in more than one direction. At the office of the Pax Patents Company, of Durham House, John Street, Adelphi, examples of his ingenuity are to be seen. From our point of view, the most attractive is the "Pax" switch for electrically lighting and extinguishing gas. The system has remarkable adaptability and elasticity. A little pressure that is almost unconsciously given when turning a gas tap at the entrance, or in any other part, of a room simultaneously establishes electrical contact, sets the igniter at work, and opens the gas-way to the burner. It is simplicity itself. The combined switch and tap are situated on the inlet-pipe to the lights in a room. Two discs (through the centre of which runs the gas-tap) form the electric switch. The discs are kept apart by a small spring; but on their inner faces metallic rings are fixed; so that, when pressed together, they make contact, and the electrical circuit is established. Only one wire is carried round a room. A small coil and three batteries will suffice for "hundreds" of lights, and it is understood will last a considerable period, seeing that there is only a small momentary demand on them at any time. The electrical ignition spark (special platinized points are used) is fixed just outside the mantles of the burners; so that it is not subject to the direct influence of the heat of the gas-flame. The invention, tried by a representative of the "JOURNAL," fully answered all the demands made upon it. It can be applied to any number of lights, can be arranged so that any number can be operated at one time, and can be installed so as to be operated from any distance. Means of lighting and extinguishing can be provided at any one or more convenient points on the lighting system of a room, hall, factory, church, or other place. And there can also be application just as easily to gas-fires, cooking-stoves, water-heaters, &c. Street lighting is not beyond its province; and it is suggested that an installation of the system will quickly repay its cost by the economy effected by doing away with the bye-pass and by the saving of mantles, the life of which is not prolonged by the careless use of the lamplighter's torch. The inventor does not propose, though it can be accomplished, to do away with the lamplighter himself. He contemplates fitting the arrangement to street lamps, and to provide a little plug-hole in the lamp standard. The lamplighter will carry a small coil and battery in a satchell; and all he will have to do will be to put in the plug, and the lamp will be lighted. Of course, by the continuous wiring of the lamps, they can be ignited and extinguished from one centre.

A second invention is an angle bracket light with reflector for use with a special inverted gas-burner; one of the features of the latter being the patent locking arrangement for the mantle, which maintains it rigidly fixed to the burner nozzle no matter at what angle the bracket is placed. The convenience of such a bracket is that the full power of the light can be directed at will on to any object in any position, without injury to the mantle. The arrangement should be particularly applicable to shop window lighting, exhibits, and so forth.

Mr. Pace is also proposing by his "Pharoso" system of lighting and heating by petrol gas that every house shall have its own gas manufactory on the small scale; although he recognizes that the main field in which his system must make appeal is among those habitations, factories, mills, and other places that are remote from distributing-mains, carrying a cheap gas supply. The new system differs entirely from the ordinary petrol air-gas ones. There is the petrol container, from which petrol is driven through a fine flexible tube to a small vaporizer situated in any convenient position in the house or other building to be lighted. The vaporizer is a very small thing, and consists of an arched-shaped casing on a stand. Through this (connected up at one end with the petrol supply-pipe) runs the vaporizing-tube, which is about the size of an ordinary lead pencil. The petrol vapour passes through fine perforations in a cap at the other end of the tube, out through an injector, into a  $\frac{3}{8}$ -inch brass tube connected up to the house gas-service. Between the injector and the inlet to the brass tube, there is an air space; and it is here that the petrol vapour sucks in the necessary amount of air. By varying the distance between the injector and the inlet-tube, the quality of the mixture is determined. The vaporizer is started by a small tray of methylated spirit; and is afterwards kept going by bye-passing to the bottom of the vaporizer a small amount of the petrol gas

from the neighbouring service-pipe. The capacity of the vaporizer is varied by adding fresh vaporizing-tubes. The quantity of gas made, if it exceeds requirements, can be diminished by reducing the size of the nipple; and if any surplus gas is made, it can be stored. The gas has also been tried with, it is reported, good results, for cooking and heating. With regard to lighting, any incandescent burner can be employed. Those seen in use were the bijou "Nico" inverted with the primary air-supply reduced very low. The mantles were fully incandescent; and the light was good. The inventor has not yet made any positive tests of consumption or photometrical value; and therefore it must be taken as within the region of conjecture, or rather of computation only, that a light equal to 100-candle power can be procured for ten hours for 1 $\frac{3}{4}$ d., with petrol at 1s. 2d. per gallon. Among other claims are that the gas is non-explosive, and that there is no condensation trouble from it if the mixture is properly adjusted.

## DIRECT SULPHATE OF AMMONIA MANUFACTURE.

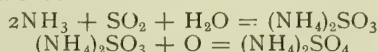
### NOTES OF SOME EXPERIMENTS AND THEORIES.

#### II.

By G. STANLEY COOPER, B.Sc.

IN a previous article on this subject (*ante*, p. 496), the manufacture of sulphate from crude coal gas was considered. In this communication, the manufacture through ammonium sulphite is discussed; and further experimental work on another direct process is also submitted. It has been proposed to manufacture sulphate of ammonia by first obtaining sulphur dioxide, passing this gas into ammonia, and oxidizing the ammonium sulphite so formed to ammonium sulphate. If sulphur dioxide is passed into water, a solution of sulphurous acid is obtained which, on long standing, changes by atmospheric oxidation into sulphuric acid. If a process could be established for bringing about this oxidation cheaply and quickly, it would soon become a general method for the manufacture of sulphuric acid. But unfortunately up to the present no such process has been discovered.

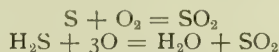
If we substitute ammonia for water in the above, a similar reaction goes on. The ammonia is first converted into ammonium sulphite, and this, by further oxidation, changes to ammonium sulphate. Here, again, the process is a slow one, and the difficulty is the oxidation. The reactions involved are represented by the following equations:—



If insufficient ammonia is present, the acid salt is formed instead of the neutral salt required. Thus—

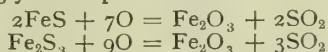


Since sulphur is present in some form or other in all crude coal gas, the production of the sulphur dioxide required is an easy matter. Both free sulphur and sulphuretted hydrogen yield sulphur dioxide on oxidation. Thus—

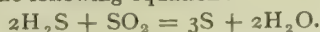


Hence a process might be devised by which the sulphuretted hydrogen present in coal gas could be converted into sulphur dioxide by oxidation, and the resulting gas led into ammonia. If this could be carried out satisfactorily, it would do away with the necessity for oxide purifiers. Sulphuretted hydrogen is most readily oxidized to sulphur dioxide by burning; but this application is, of course, impossible. In any oxidation process, too, the supply of oxygen would have to be carefully regulated, and only the requisite amount for complete oxidation admitted. Excess of oxygen would act as a diluent on the gas; while a shortage of oxygen would leave the gas still contaminated with sulphur.

Another method which could be used for the production of sulphur dioxide is by burning the free sulphur contained in the spent oxide, and also by burning the spent oxide itself. This latter consists chiefly of sulphides of iron, FeS and Fe<sub>2</sub>S<sub>3</sub>, both of which on burning yield sulphur dioxide. Thus—



The sulphur dioxide so obtained can be dealt with in two ways. In the first process, it might be passed directly into the ammonia, and so form ammonium sulphite; or, secondly, it could be passed into the coal gas after leaving the scrubber, and the mixture then passed into a solution of ammonia. The sulphur dioxide would be taken out, and the coal gas left purified. An extra washing would be necessary so as to eliminate any ammonia carried over with the gas. In this process, too—assuming that "theory" would work completely in practice—no oxide purifiers would be required. The sulphur dioxide passed in would purify the gas from sulphuretted hydrogen; for these two gases react with each other with production of free sulphur. This sulphur would be deposited in the flues or mixing-chambers, and could be collected and burned to give more sulphur dioxide. The reaction which takes place is represented by the following equation:

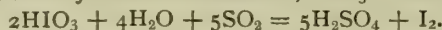


Excess of sulphur dioxide would, of course, be present, and would be carried on into the ammonia.

Sulphur dioxide is a bleaching gas in presence of water, and



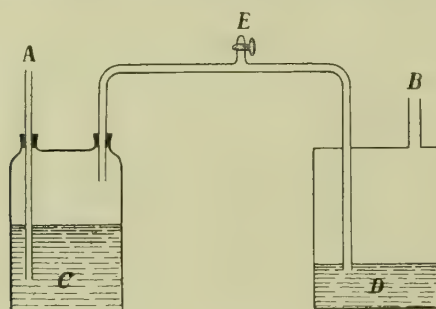
forms sulphuric acid during the process. It can also be oxidized to sulphuric acid by means of iodic acid,  $\text{HIO}_3$ . Thus—



Neither of these processes, however, is likely to find application on a commercial scale.

The second direct process referred to above, and one which has been worked successfully on a small scale, depends on a property of all gases—viz., that one gas acts as a vacuum to another gas. If, for example, we had a jar full of hydrogen, and it was exposed to the air, the hydrogen would escape into the air whatever the relative pressures of the gases might be. Similarly, if a current of air is passed through a solution of ammonia in water, the air will displace most of the ammonia from the solution. It is difficult to get rid of all trace of ammonia by this method; but a very large percentage can be so evolved. This principle is also applied in the case of persons who have been "gassed" with poisonous gases, such as coal gas, &c. A stream of oxygen is forced through the lungs, and this displaces the poisonous gas, and renews the circulation.

From the experiments described in the previous article, it was found that the presence of sulphuretted hydrogen had a deleterious effect on any direct process, and that this gas ought to be eliminated. This practically means that the crude coal gas must be purified from sulphuretted hydrogen in the ordinary way—viz., by passing through the oxide purifiers. Before going through the oxide purifier, however, it is necessary to remove all the tar from the gas, as the deposition of this would spoil the oxide. But the removal of the tar by condensation necessitates the removal also of most of the ammonia in the form of ammoniacal liquor; and the gas remaining is almost ammonia free. For the direct process, this gas must be recharged with ammonia; and this was done by applying the principle above referred to.

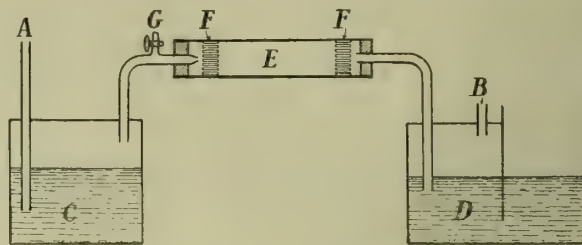


A. Gas Inlet. B. Gas Outlet. C. Ammonia. D. Sulphuric Acid. E. Bye-Pass Tap for Testing Gas for Ammonia.

#### Laboratory Apparatus.

The process was tried first on a laboratory scale as follows. A two-necked Woulff's bottle, with the attendant delivery tubes, and a porcelain jar, were the only pieces of apparatus necessary. The bottle was almost filled with a solution of ammonia of specific gravity '9, equivalent to about 28.3 per cent. by weight of ammonia; while in the jar was placed sulphuric acid of specific gravity 1.67, corresponding to 74.51 per cent. by weight of acid and 134° Twaddel. It was found that the best results were obtained, as far as the production of solid sulphate was concerned, by using acid of about this strength. A slow stream of gas was passed through the ammonia from an ordinary laboratory service-pipe, and then into the acid. This was allowed to pass for some hours, and the ammonia twice renewed. The sulphuric acid was completely neutralized; and a beautiful specimen of sulphate of ammonia was obtained. Of course, it must be remembered that the conditions here were ideal, and were such as would not obtain on a gas-works scale. Still, the results were sufficiently encouraging to point to the possibility of a process based on this principle. The ammonia was completely absorbed by the acid, provided the gas stream was not allowed to pass too quickly. Nessler's reagent was used for testing for the ammonia; and no coloration at all was given by the gas issuing from the acid chamber, provided the rate of flow of the gas was sufficiently slow. Analysis of the resulting sulphate by independent workers showed a practically pure salt.

The process was tried on a larger scale on the gas-works, using ammoniacal liquor and commercial sulphuric acid. The strength of the former was not tested; but the acid was of about the same strength as that used in the first experiment—i.e., 134° Twaddel. The liquor was light brown in colour, and contained tar, &c., in suspension, and some sulphuretted hydrogen in solution. It was found that a small quantity of tarry matter was carried over on passing a stream of coal gas through the liquor. To prevent this being carried forward into the acid, a filter tube similar to the one described in the previous article was interpolated between the vessel containing the ammonia and the one containing the acid. The arrangement of the apparatus used is shown in the following sketch. It consisted of an iron vessel to contain the ammonia, fitted with an inlet-tube dipping well into the liquid, and an outlet-tube which was quite clear of the liquid. The outlet-tube was provided with a bye-pass, so that the gas could be tested for ammonia, and so that it could be easily seen when the liquor required changing. The outlet-tube was then connected with a long filter-tube packed with coke,



A. Gas Inlet. B. Gas Outlet. C. Ammoniacal Liquor. D. Sulphuric Acid. E. Filter Chamber to Remove Tar. F. Plugs of Lime to Remove Sulphuretted Hydrogen. G. Tap for Testing Gas for Ammonia.

#### Works Apparatus.

&c., to remove any tar; and a loose plug of lime was placed at each end to absorb any sulphuretted hydrogen which might be present. If present at all, it would only be so in very minute quantities, so that the cost of lime purification would be almost negligible, even on a large scale. From the filter, the gas was led into a partitioned chamber, as shown, containing the acid.

This form of saturator was used so that the acid could be renewed, and the solid sulphate removed, without discontinuing the process. The acid used was previously tested for arsenic, as this substance affects the quality of the sulphate produced. No arsenic was, however, found in the acid. The apparatus was connected with a side gas-outlet immediately after the gas had left the last purifier. The gas passed through the ammoniacal liquor, and became charged with ammonia. It was then led through a small pressure tube, and into the filter. A very small amount of tar was deposited at the entrance end of the filter-chamber; and slight traces of sulphuretted hydrogen were detected on testing the gas at the side tube. A slow stream of ammoniacal coal gas was passed through the sulphuric acid for some time; and eventually some solid sulphate was produced. The acid was slightly discoloured, probably owing to imperfect filtration of the gas; and the resulting sulphate was not quite pure. A second experiment with more efficient filtration yielded a much better sample of sulphate.

By using the form of saturator shown, the solid sulphate can be removed as it is formed, and dried in the usual way in a centrifugal machine. The potentialities of this process are evident, as, if it could be worked successfully on a larger scale—and there seems no obvious reason why it should not—a good deal of expensive apparatus in sulphate manufacture would be done away with. No heating is required to drive off the ammonia from solution. Further experiments will be necessary to decide what is the best working strength of liquor to be used. Though all the ammonia is not displaced from the liquor, yet the loss need be very small indeed. It would be quite feasible to syphon the liquor from the washer, hydraulic main, or settling tank into the vessel C, and, when most of the ammonia had been evolved, to re-fill the washer with this used liquor.

During the experiments, the temperature of the vessel containing the ammoniacal liquor fell from 12° C. to 1° C., owing to some amount of evaporation. The temperature of the saturator, however, rose considerably, owing to the evolution of heat during the process of neutralization. The progressive dilution of the acid by the water vapour carried over with the gas from the liquor may have some effect on the production of solid sulphate when the experiments are carried out on a larger scale. In this case, however, very little (if any) such interference was noticed; and so it was not investigated. The sulphuric acid would thoroughly free the gas from moisture, and this should increase the net calorific value of the gas.

At the students' meeting held at the Institution of Civil Engineers on the 4th inst., Mr. A. J. Hart read a paper entitled "Reinforced Concrete as Applied to Retaining Walls, Reservoirs, and Dams." The author discussed generally the methods employed in the erection of reinforced concrete structures, and the principles governing their design, and dwelt on the economy of reinforced over mass concrete construction. The paper was illustrated by a number of diagrams and several lantern slides. A well-sustained discussion followed.

A recent number of the "Zeitschrift für physikalische Chemie" contained a paper, by Mr. J. T. Barker, on the determination of the vapour pressures of toluene, naphthalene, and benzene at temperatures ranging from -78° C. to 25.8° C. According to an abstract in "Nature," at the lower temperatures the statical method is not sufficiently exact, and hence the vapour pressures were measured by saturating pure oxygen, prepared electrolytically, with the vapour of the substance; the latter being maintained at a constant temperature. The amount of vapour carried away by the oxygen was determined by combustion; full details being given of the precautions necessary for exact working. The method was shown to be capable of measuring vapour pressures down to 0.005 mm. of mercury. The experimental results were compared with Nernst's formula for the calculation of vapour-pressure curves, and for toluene, naphthalene, and benzene; and the agreement was found to be quite satisfactory.



# SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

The Annual Meeting of the Association was held last Thursday, at the Hotel Cecil, W.C. There was a large attendance of members; among them being the President of the Institution of Gas Engineers (Mr. James W. Helps, of Croydon). At the opening of the proceedings, the retiring PRESIDENT (Mr. James Paterson, of Redhill) occupied the chair.

In the first place, the minutes of the last meeting were taken as read, and confirmed.

## REPORT OF THE COMMITTEE.

Mr. R. BEYNON (Torquay) proposed the adoption of the annual report of the Committee; and, in doing so, he thanked them for the full statement they had made.

Mr. C. F. BOTLEY (Hastings) seconded the motion; and it was unanimously agreed to.

The report reviewed the proceedings of the year. In referring to the autumn meeting, the following allusion was made to the retirement of Mr. A. F. Browne from the office of Hon. Secretary and Treasurer:

The Committee had previously endeavoured to persuade Mr. A. F. Browne (Vauxhall) to continue in office as Hon. Secretary and Treasurer (and it will be remembered that only by the urgent request of the Association was he deterred from relinquishing these offices before), but without success, as he did not see his way to continue any longer. The Committee wish to acknowledge most heartily Mr. Browne's valuable services to the Association, extending over a period of four years, and to which are due in no small measure the continued prosperity of the Association. They feel that his resignation is a real loss to the members; but they are glad to be able to record that he consented to serve on the Committee. A very sincere vote of thanks was passed to Mr. Browne for his arduous and untiring energy in the interests of the Association. Mr. James Paterson was elected to the vacant offices; and the Association may be congratulated on the acceptance of these posts by one who is so well fitted for them.

The final paragraphs of the report were:

Since the issue of the last list, three names have been added to the roll of membership, four members have resigned, two have become disqualified, and three—viz., Messrs. W. A. Valon, J. Meiklejohn, and J. Nicholls—have passed away; leaving a total of 165, as compared with 171.

The balance standing to the credit of the Association at the beginning of the year was £95 8s. The receipts amounted to £85 11s. 6d., and the expenditure to £125 8s. 7d. (inclusive of £42 subscribed to the Sir George Livesey Memorial Fund); leaving a balance of £55 10s. 11d. to carry forward. The usual copies of the "Reports of Gas Associations" were presented to members, absorbing a sum of £41.

The attendance at, and interest shown in, the meetings of the Association have been fully maintained; and the Committee feel that the year has been one in which the Association has afforded real help to members in the dissemination of practical and technical knowledge under pleasant and congenial circumstances. For this, sincere thanks are due to the President, who has promoted the interests of the Association with all his ability and energy; to Mr. A. F. Browne, until recently the Hon. Secretary and Treasurer; and also to those who, by giving time and thought to the preparation of papers, or by leading discussion, have contributed so materially to the pleasure and enjoyment of the members.

The Commercial Section of the Association was started in October under the direction of Mr. W. E. Price, of Hampton Wick, as Chairman, and a representative Committee. Fortnightly residuals returns are made by the members and circulated in due course by the Hon. Secretary. General meetings have been held, at which discussions of matters of commercial interest have been found of great use by the members. The total number of gas undertakings on the register is 46.

## NEW MEMBERS.

Mr. P. P. CHANNON (Haywards Heath) moved, and Mr. R. S. TOBEY (Horley) seconded, the adoption of the following nominations for membership: Mr. W. J. Carpenter, of Great Yarmouth; Mr. R. H. Collins, of Eltham; Mr. D. C. Cross, of Leyton; Mr. Joseph Fisher, of Tottenham; Mr. F. W. Taylor, of Harpenden; and Mr. A. E. Williams, of Poplar.

## THE NEW AND RETIRING PRESIDENTS.

The PRESIDENT said he now came to the last duty he had to perform as President. It was a very pleasant one indeed. It was pleasant to him because he was releasing himself from the cares of the office; and, pleasant as it had been, he was glad to think that a gentleman so well qualified as Mr. Ellery was taking it. His name needed no recommendation from him (Mr. Paterson), as it was known far and wide throughout the country, if not further. He was sure the interests of the Association would not suffer in the slightest degree at Mr. Ellery's hands, and that it would prosper well beyond its present state.

Mr. C. STAFFORD ELLERY (Bath) then took the chair; being enthusiastically received by the members.

The PRESIDENT remarked that his first pleasant duty was to propose a vote of thanks to the retiring President. It seemed to him that the word "retiring" should be transposed into "untiring." He (Mr. Ellery) was interested in the word, because he was looking forward to the day when he should be the retiring President. He could understand that, in putting off the burden of office, there

was a certain sense of relief. But Mr. Paterson, as an "untiring" President, seemed to have passed through his year of office without much personal harm. He (the President) hoped he should similarly survive. They were indebted to Mr. Paterson not less for what he had done for the Commercial Section. It did not, however, need any words from him to emphasize the fact that it was a useful movement inaugurated he believed by Mr. Paterson himself in connection with the Association. They had therefore to thank him not only for his services in the chair, but for his services in connection with the Commercial Section.

Mr. C. F. FRANKS (Bankside), in seconding the proposition, said Mr. Paterson had fulfilled their expectations when he was elected to the chair. He had indeed most worthily upheld the traditions of his name.

The proposition was heartily agreed to.

Mr. PATERSON, in reply, asked the members to accept his hearty and sincere thanks for the vote. He could assure the members that nothing could be more pleasurable than to hold office as the President of the Association. Though he entered upon the position with many misgivings a year ago, little knowing what was in front of him, yet he knew he had with him a splendid, energetic Committee and an excellent Hon. Secretary in Mr. Browne. They constituted what he might call the permanent staff of the Association; and he could tell the members "in the strictest confidence," but with the fullest assurance, that no President would attempt to carry through a year of office without this permanent staff. In them, the new President would find his greatest stronghold in carrying out his duties. The President had made kindly remarks with reference to the Commercial Section. This had been a work of pure pleasure and love to him (Mr. Paterson). Whatever had been done by him had been with the greatest amount of pleasure. He felt that when one threw his energies into any movement—whether it was a new movement or the carrying on of an old one—the greatest reward one could have was the knowledge that it had been of some use to those who had been connected with it. He thanked the members from the bottom of his heart for the kind way in which they had passed the vote of thanks, and for the manner in which they had supported him throughout the year.

## VISIT TO BATH.

The HON. SECRETARY (Mr. Paterson) said he rose again in quite a different capacity. At the last meeting, the members did him the honour of electing him as Hon. Secretary and Treasurer; and he believed from this moment he had to take over the office. His first duty as Secretary was to inform the members that the President had that afternoon conveyed to the Committee a cordial invitation to the Association from his Chairman and Directors to pay a visit to Bath for the May meeting. He (the Hon. Secretary) was sure they would all enjoy the visit to Bath; and that they, one and all, would be looking forward with pleasure to seeing their President in his works. [Applause.]

The PRESIDENT then delivered the following

## INAUGURAL ADDRESS.

Gentlemen,—To be quite candid, I must confess that, while appreciating very highly the honour of being elected President of this important Association, the task of preparing an address worthy of the occasion fills me with a gloomy foreboding. In these days of constant advance, I cannot help thinking it would be wise to select younger men, with more leisure than some of us can find to devote to the interests of the Association. Your kindness, however, having placed me here, I ask your indulgence while attempting to touch upon a few subjects which appear to me to be of practical interest at the present moment.

The report of the Committee deals with various points of interest to which I need not now add any remarks, except to refer to the loss we have sustained by the death of three members: Mr. W. A. Valon, Mr. J. Nicholls, of Crewkerne, and Mr. John Meiklejohn, of Yorktown. Some of us who have had the pleasure of knowing Mr. Valon for many years past still think of him as "Valon of Ramsgate." It was at Ramsgate he made his mark; and at Ramsgate he was always ready to extend a hearty welcome to visitors, who never left without some food for reflection in what they had seen or heard. He was President of this Association in 1883, having become a member in February 1876; and although not actively associated with us of late years, yet he will be long remembered and much missed in the various spheres of professional work in which he has been engaged since leaving Ramsgate. I feel sure I do but express the feelings of all the members of this Association when I say that our sincere sympathy goes out to the members of the families of each of the deceased gentlemen.

## ORGANIZATION AND INDEBTEDNESS.

In trying to arrange my ideas on paper, two questions were present in my mind: (1) What are the objects on which these Associations were originally based? and (2) is the need for such Associations as great to-day as when they were first founded? A most cursory glance over the records and experiences of the past year, soon proved conclusively that more than ever in the history of the gas industry it is necessary to find opportunities for inter-



change of ideas on the many and varied items that go to make up the routine of our profession. I am glad of this opportunity to express my indebtedness to writers of papers, and to other members, for much information which has been of the greatest use to me personally, and of very considerable benefit to the Company I serve.

In this connection, I also wish to place on record an expression of appreciation of the service rendered to the industry by the Technical Press. Never before have we been furnished with such a mass of matter meriting careful study. The difficulty is to find time for reading, even in the most cursory manner, all that is so admirably written. If any of the following remarks should appear to be a mere repetition of what has been already better said, I can only plead for pity, and say that, in my opinion, it would add much to the interest and usefulness of these occasions if the Presidential Address was open to merciful discussion; and, if not out of order, I would cordially welcome such discussion to-day.

RAPID MARCH OF INVENTION.

The rapid march of invention and discovery in recent years is almost bewildering. Take the retort-house as an illustration. The engineer who has just now to undertake the construction or reconstruction of carbonizing plant is faced by most embarrassing problems. Is the gas to be produced from coal or oil? If coal, what is to be the shape and size of the retorts or chambers; should they be built horizontally or vertically, or at some angle between these two extremes; should they be machine or hand made, or constructed of bricks, or built-up in segments? Of scarcely less importance is the selection of the most suitable and economical means of mechanically handling the coal and coke, and fixing the point at which to fall back on manual labour.

One of the healthiest signs of the times is to be found in the enterprise of those who are striking out on entirely new lines, and putting down installations of vertical retorts and other modern plant. Our "Transactions" have been greatly enriched already by the record of what has been done; and we look for further valuable information in the near future. But while sweeping changes are being made in some works—both at home and on the Continent—it is gratifying to know that steady advance in carbonizing results is also taking place in works still using what may be styled old-fashioned plant. This increased efficiency—achieved by obtaining a larger output from existing retort-houses—spells reduced capital charges per 1000 cubic feet of gas sold.

In Bath, the reduction in the amount required to pay interest and dividends on the capital expended, as compared with twelve years ago, amounts to rather more than 2d. per 1000 cubic feet of gas sold. The wisdom of keeping down capital expenditure, and regularly wiping off sufficient sums for depreciation, cannot be too insistently urged—not only in the manufacturing department, but perhaps more so still in connection with stoves, meters, and slot installations.

COKE-CONVEYING COSTS.

While upon the question of retort-house economies, it may not be without interest to give some figures which have recently been taken out of the comparative cost of working two different types of coke-conveyors in Bath. The figures cover a period of four years—a single year does not give a fair average, as renewals vary so considerably from year to year. The machinery is driven in each case by gas-engines, and conveys the coke from the retorts to the storage yard or overhead hoppers as required. The figures include the cost of power, labour, maintenance, and renewals.

	Quantity Coke Conveyed.	Cost per Ton of Coke Conveyed.	Gas Used per Ton of Coke Conveyed.	
Plant A	84,239 tons	4'1d.	38'4 cub. ft.	Gas charged 2s. per 1000 cub. ft. No charge for water.
Plant B	50,816 "	5'4d.	52'0 "	

The interest on capital outlay may be taken at about 2d. per ton in the case of Plant A, and about 2½d. per ton in the case of Plant B. In the second case, a cross conveyor accounts for some part of the extra cost. In making comparisons with hand labour, it should be borne in mind that by the use of hoppers, considerable economy is secured in loading carts and railway waggons; but, on the other hand, the quantity of breeze produced is increased.

TAR-SEAL RESTORED.

Before passing from the retort-house, some remarks on the hydraulic main may not be out of place. Much has been written—both for and against this part of the plant; and yet it still remains, and seems likely to outlast, every attack and criticism.

It will probably come as a surprise to some present to hear any words in favour of reverting to a tar-seal; but many years of close and continuous observations have brought me back to this method of working. It would be a long and perhaps tedious tale to give details of the stages passed through before arriving at this conclusion. In a word, after working with tar-seals, and experimenting on a large scale for some years with anti-dips and later with liquor seals, the results appeared to prove: First, that some sort of seal was desirable, whether considering the effect on the tar, the retorts, or the gas made; and, secondly, that tar was the most suitable material with which to form a seal. Having decided to abandon anti-dips, numerous expedients were tried in attempts to maintain a liquor seal and keep the main free from tar. I should perhaps add that registers were fixed at various points to

record continuously the actual working conditions in the retorts and mains.

Shortly after the tar had been withdrawn from the hydraulic main and the weir-valves set to as fine a seal as was considered desirable, the unexpected happened. Rising pressures in various parts of the works indicated a rapid and very considerable increase in the quantity of naphthalene in the gas; and it soon became necessary to allow tar to again accumulate in the hydraulic main. It may also be mentioned that, during the continuance of liquor seals, it was observed that the ascension pipes gave increased trouble to the men using the auger, and, what was perhaps of still more importance, the hot gases passing from the retorts showed a marked tendency at times to evaporate the liquor at a greater rate than it was being made, lowering the seals somewhat inconveniently, and requiring, at times, the addition of fresh water or liquor. While recognizing the advantages attending the use of water-seals and their extensive adoption in many works, we determined to try the effect of sealing the dip-pipes with the liquid products as made—the seals being regulated by adjustable weir-valves, over which the surplus tar and liquor flowed to the tar-main.

During the time these experiments were proceeding, the tar was closely observed, and it was discovered that a judicious admission of steam into the tar-mains was attended by most satisfactory results—the tendency to thicken being lessened, and the condition of the tar-mains improved. Steam-pipes were consequently connected to the underside of the hydraulic main and to the tar draw-off pipes, and steam admitted in quantities varying according to the temperature of the atmosphere. This sufficed to maintain the tar in a very fluid condition, and the gas in its passage from the dip-pipes agitates the contents of the hydraulic main so thoroughly that no trouble is experienced with thick tar or stopped tar-mains. Careful attention is necessary, and the valves fitted to connections from the syphons on the underside of the hydraulic main, are regularly opened to test the consistency of the tar, and prevent the accumulation of any sediment. Working under these conditions, the registers indicate a regular seal with a minimum pressure in the retorts, and a choked pipe is a rarity.

But the main point in this reference to the hydraulic main, is the effect of a tar-seal on the naphthalene contents of the gas. It is interesting to note that the tar when drawn off from the hydraulic main, while steam is being admitted has a temperature of about 184° Fahr., and contains about 5½ per cent. of naphthalene, and without steam the temperature is about 138° Fahr., with about the same percentage of naphthalene. Although the steamed tar from the overflow becomes viscid when exposed to the atmosphere, no trouble is experienced in the mains, which is doubtless due to the fact that it becomes mixed with the lighter tars in its passage to the well, before the temperature is reduced.

SEEKING FOR A NAPHTHALENE SOLVENT.

The experience thus gained appeared to indicate the direction in which to look for a cure for the naphthalene plague, and confirms the ideas of some members of this Association and others who have been working out the problem of solvents elsewhere. In seeking to ascertain the most effective and economical solvent for naphthalene, a number of laboratory tests were carried out by my assistant, Mr. Bingley, to whom I am indebted for much help in these investigations. The following figures are given in the hope that they may be of some service.

A known quantity of each was distilled, and 10 per cent. fractions were taken off at the temperatures noted, with the exception of petrol and benzol, which it will be seen were treated somewhat differently. Some of the samples tested were found to contain a certain quantity of naphthalene when received from the makers. It would be difficult to enumerate the "cures" tried during the many years we have been contending with this enemy, but temporary relief was found by injecting one or other of these oils, by means of live steam, at various points on the works' mains.

Name of Oil.	Saturated at 52° Fahr. (room Temp.) Naphtha- lene dissolved.	Specific Gravity.	Grains Naphtha- lene Dissolved at 52° Fahr. by 1 Gallon.	Grains Dissolved at Cost of 1d.
	Per Cent.			
Rocklight	8'7	·8247	5507	1159
Royal Standard	9'23	·8117	5784	1220
Kerosene	9'1	·810	5687	928
Scotch oil	11'3	·7685	6886	1148
Royal daylight	9'20	·8017	5690	1084
Crown diamond	7'78	·8158	4820	988
Benzol (commercial)	24'9	·8827	20513	2413
Petrol (or motor spirit)	10'18	·709	5628	625
Heavy naphtha (commercial, refined)	13'5	·925	10133	921
Tar oil	9'74	·9027	6824	682
Creosote oil	3'15	·9693	2211	340
American gas oil	5'89	·8606	3771	1371
Oil gas tar	23'5	1'035	19760	1606

OIL-GAS TAR PREFERRED.

The publication of the report of the Naphthalene Investigation Committee, and the helpful remarks of Dr. Colman, led later to the systematic use of oil-gas tar, maintained at a temperature of



### Results of Distillation.

Fraction.	Reclight Oil.	Royal Standard.	Kerosene.	Solvine Scotch Oil.	Royal Daylight.	Crown Diamond.	Petrol or Motor Spirit.	Commercial Benzol.	Heavy Naphtha (Refined).	Tar Oil.	Creosote Oil.	American Gas Oil.
1 . . . . .	266-320° F.	284-356° F.	220-290° F.	220-280° F.	230-297° F.	230-298° F.	90-212° F. 325 c/cs. = 81·25 % Up to 212° F.	295 c/c = 74·0 40 = 10·0 40 = 10·0	248-311° F.	218-286° F.	266-356° F.	230-500° F.
2 . . . . .	320-349	356-374	290-310	280-302	297-340	298-347	40 = 10·0	212-234	311-320	286-304	356-379	500-538
3 . . . . .	349-370	374-397	310-320	300-310	340-350	340-358	40 = 10·0	234-288	320-331	304-320	379-396	538-563
4 . . . . .	370-378	397-413	320-332	310-322	365-386	368-430	30 = 7·5	288-383	320-336	320-339	396-408	563-595
5 . . . . .	379-387	413-433	332-342	320-330	386-396	380-471	Difference 5 = 1·25	* 4 } Solid Naphthalene	336-340	320-334	408-421	595-608
6 . . . . .	387-406	433-446	342-358	330-340	396-450	471-500	400 = 100·0	Difference 5 }	330-345	334-343	*421-433	608-630
7 . . . . .	400-417	450-473	358-390	340-348	450-486	500-523		400 = 100·0	345-349	343-352	*433-446	630-646
8 . . . . .	417-430	473-487	390-422	348-360	486-523	523-545			349-358	352-363	*440-462	646-669
9 . . . . .	430-482	487-545	422-464	360-380	545-572	545-590	* containing r % Naphthalene, 5 c/cs.		358-370	363-379	462-484	669-686
10 . . . . .	482-572	545-698	464-560	380-410	572-626	590-626			* containing r % Naphthalene, 4·6 % Naph., 2 c/cs.	*379-397 *containing 6·3 % Naph., 7 c/cs.	*484-536 *containing 5·6 % Naph., 7 c/cs.	680-689
Loss and difference	5 c cs. .8247	10 c cs. *.8117	2 c cs. *.810	2 c cs. *.7685	5 c cs. *.8017	6 c cs. *.8158	5 c/cs.	.8827	.925	.9027	8 c/cs. *.8606	
Specific gravity . . .	77° Fahr.	74° Fahr.	79° Fahr.	98° Fahr.	86° Fahr.	79° Fahr.	Under 59° Fahr. (temp. of room).	Under 58° Fahr. (temp. of room).	120° Fahr.	76° Fahr.	125° Fahr.	153° Fahr.

about 90° Fahr. in a Livesey washer. The happy result has been that for some time complaints of naphthalene stoppages have practically ceased. What the future may have in store, and whether greater extremes of temperature than have been experienced this winter, or the equally testing time of summer, will bring a recurrence of the trouble, remains to be proved. It should, perhaps, be added that some care is necessary to keep the tar as free as possible from water, which has been found to reach as much as 60 per cent. of the bulk. This for a time misled those in charge of the investigations. Although carefully measuring the daily quantity put into the washer, sufficient allowance was not made for this water. A convenient and simple remedy, and one that has proved quite successful, is to measure the tar, in tanks open for constant observation, before and after use in the washer. By thus maintaining a constant tar-seal, the naphthalene is kept to about 4 grains per 100 cubic feet of gas passing into the holders, using at present from 50 to 60 gallons of oil-gas tar per million cubic feet of gas made.

The naphthalene in the crude gas varies very considerably from time to time, and tests show unaccountably sudden changes, which explains the reason for using what may appear to be a large quantity of oil-gas tar per million cubic feet. The further precaution is taken of vaporizing into the gas about 10 gallons (varying according to the temperature of the atmosphere) of benzol per million cubic feet of gas made, in a specially constructed vaporizer, heated by steam, and fitted inside the cover of the last catch purifier. This may appear an unnecessary expense; but although later on, when the mains and services are thoroughly cleared, it is hoped to lessen the quantity of both oil and benzol, at present the cost is amply repaid by the freedom from stoppages and the added illuminating value of the gas.

## HIGH-PRESSURE SUPPLY TO VILLAGES.

Although following so closely upon the very interesting communications which have recently appeared on high-pressure distribution and the discharge of gases through pipes, I trust a few details of a high-pressure supply to three villages necessitating something over 6000 yards of main, may not be without interest. The first 2000 yards pass through a growing suburb of Bath, and for this distance are laid of a size sufficient to afford assistance by way of "boosting" in the near future.

After estimating the probable requirements of the three villages at about 10,000 cubic feet per hour, the first question for consideration was the size of pipes to be laid. Opinions seem to differ on this point among those who are advocating high-pressure distribution. The idea of using small pipes, supplied at somewhat heavy pressure, evidently fascinates the more daring engineers. But it is an intricate problem; and, in arriving at a solution, many points have to be taken into consideration. A 2-inch pipe supplied at sufficient pressure might suffice, but the compressing plant would need to be kept running continuously during the hours of the smallest demand, as well as when all the consumers are drawing a supply. It was, therefore, decided to lay pipes sufficiently large to distribute gas at holder pressure through the night and other hours of small demand—using the compressing plant only during the hours of heavy consumption. The main was therefore laid as follows:—

About 2000 yards of 5 inch	
" 2250 "	" 4 "
" 1860 "	" 3 "

Compressors designed by the Bryan Donkin Company were laid down in duplicate, each estimated to pass 15,000 cubic feet of gas per hour at 100 revolutions per minute with 40 lbs. per square inch steam pressure (the pressure available from the existing boilers), against 10 lbs. per square inch pressure at the outlet of the receiver.

The following is a brief description of the plant. The compressors are of the rotary type, designed on Hodson's patent. In exterior the machines resemble roughly an ordinary exhauster. The internal construction differs, however, considerably. The cast-iron drum, which forms the driving member of an ordinary exhauster, in this compressor is driven round by the double slide which takes the place of a piston. The double-ended slide is directly rotated by a block of large dimensions keyed-on to a steel-driving shaft which passes through from one end plate to the other. While, therefore, the simplicity of an ordinary exhauster is retained, the design of the compressor is specially adapted for running against the much heavier outlet pressures involved; and all wear is concentrated on the driving block. The design permits of slides being used of very deep section, with a consequent increase in strength, and the broad ends running in contact with

## THE GOVERNING ARRANGEMENTS.

At present, three villages are being supplied with gas from the high-pressure main. At the end of the 4-inch main, a governor pit is arranged, from which low-pressure mains branch off to the two smaller villages. Two-inch diaphragm governors are in use here, of the simple Reynolds type. Two governors serve each village—one being in reserve. The third village (Saltford), the most important place, is supplied by the high-pressure main. A governor pit is arranged at the end of the 3-inch main, in which a 3-inch Reynolds district governor is in use; a reserve governor of the simple type being at present fixed, which can be replaced later with the district type. At each governor pit safety mercury seals are provided, with vent pipes leading into the atmosphere. In the event, therefore, of a governor failing for any reason, these safety seals would prevent the possibility of the low pressure rising beyond a given limit.

### TESTING THE CAPACITY OF MAINS.

Before connecting any service pipes, some tests were made of the capacity of the plant, and the discharge of air and gas at varying pressures, with a view to confirm or otherwise the theoretical formulæ at present in use. The results have been tabulated as follows.

First the plant was run at a maximum speed of 125 revolutions



per minute with the outlet of the cylinder fully open to the atmosphere. The air was measured through a station meter; and the result was found to be a discharge at the rate of 36,000 cubic feet of air per hour. This test was then pushed further, by closing the outlet valve and observing the discharge against varying pressures.

	Outlet Pressure, Inches.	Discharge of Air, Cub. Ft. per Hour.	Revolutions per Minute.
In all cases	3½ water	31,300	100
omitting	26 "	31,100	100
figures	4½ mercury	30,300	100
under the	10½ "	26,300	100
hundreds.	about 16 "	24,500	97

The mains were then coupled up to the outlet of the receiver, and a series of tests made on the 2000 yards of 5-inch main. In the first column are given the figures of actual discharge of air, and in the second the theoretical discharge by Cox's formula.

Pressure on Outlet of Compressor.	Revolutions per Minute.	Actual Discharge of Air through 2000 Yards of 5-in. Pipes.	Theoretical Discharge by Cox's Formula.
2 lbs. per sq. in.	54	14,900 cub. ft. per hr.	14,460 cub. ft. per hr.
4 lbs. "	76	21,500 "	20,150 "
6 lbs. "	100	27,800 "	25,380 "

The theoretical discharge for given pressure losses is not given from this point onwards, because the pressure loss in each section of the main was not observed. The theoretical loss of pressure for each section of main has, therefore, been worked out according to Cox's formula for the discharge observed. The sum of the pressure losses for each section of main gives the total loss estimated in the third column. The 2250 yards of 4-inch main was then coupled up, making, with the 2000 yards of 5-inch, 4250 yards in all, and the compressor put to work, with these results.

Pressure at Outlet of Compressor, Lbs. Per Square Inch.	Actual Discharge of Air, Cubic Feet Per Hour.	Total Theoretical Loss of Pressure Calculated by Cox's Formula, Lbs. Per Square Inch.
1	4,800	1'17
2	6,600	2'03
4	10,300	4'75
6	13,300	7'25
8	16,100	10'50
10	18,500	13'25

The third length of main (1860 yards of 3-inch) was then coupled up, making a total of 6110 yards under test, and experiment carried forward, with the following result.

Pressure at Outlet of Compressor, Ins. of Water.	Actual Discharge of Air, Cub. Ft. per Hour.	Total Theoretical Loss of Pressure by Calculation, Ins. of Water.
4	720	2'8
6	840	3'8
8	1030	6'1
12	1285	8'3
14	1530	12'5
18	1670	14'1
22	1930	19'9
25	2100	22'5
28	2300	27'7

Lbs. per Sq. In.		Lbs. per Sq. In.
2	3288	2'0
3	4500	3'5
4	5320	4'6
5	5750	4'9
6	6600	6'8
7	7390	8'6
8	7950	9'4
9	8748	11'0
10	9474	13'0

Having completed these tests with air, a final test was made (on the full length of 6110 yards) with gas of specific gravity about .45, at 10 lbs. per square inch at the outlet of the compressor. The gas was measured through a station meter in a similar manner to the air, and a series of observations taken showing an average discharge of 251 cubic feet per minute or equal to (say) 15,000 cubic feet per hour. By Cox's formula, the theoretical loss would be 13 lbs. per square inch when passing this quantity.

Loss in 5-inch main : 1 lb. per square inch.  
" 4 " " 3 lbs. " "  
" 3 " " 9 " " "  
13 lbs. total loss.

At this pressure—viz., 10 lbs. per square inch, 9474 cubic feet of air were passed. Multiplying this by the formula

$$\sqrt{\frac{\text{sp. gr. of air}}{\text{sp. gr. of gas}}}$$

will give the equivalent discharge of gas. Assuming the specific gravity of the gas at .45, this factor becomes 1.49, which gives an equivalent discharge of gas at 14,200 cubic feet per hour, whereas in the actual test 15,000 cubic feet per hour was the discharge—showing results fairly in agreement. For the sake of knowing the possibility of working on gasholder pressure, should the compressors be stopped, a short test was made with 6½ inches water pressure at the outlet of the cylinder, maintaining 2½ inches pressure at the end of the 6110 yards of main; and it was found that the meter registered a discharge at the rate of 1000 cubic feet of gas per hour, with a loss of 4½ inches of pressure. By Pole's formula, the total loss should have been 2.4 inches.

This result, combined with the other tests, shows that even for low pressures, Pole's formula gives too low a pressure loss, where the length of main is considerable, as in these tests. Another

point to be noted—to which my attention was drawn in testing the discharge of gas through pipes of small diameter, at low pressure, some years ago—was the irregularities in the sectional area of the gas-way through the pipes. All pipes are not of uniform bore; and the difference materially affects the discharge.

When comparing the following figures with various others recently published, the difference is very striking. It should also be noticed that in these tests about 10 to 20 per cent. of carburetted water gas was present.

Quantity of Gas (about 16.4 Candle Power) Passed per Hour through Compo. Pipe Discharging into the Atmosphere.

Coal and Carburetted Water Gas mixed from 10-20 per Cent. Carburetted Water Gas.	20 Feet.	30 Feet.	60 Feet.	90 Feet.	150 Feet.	170 Feet.
1-inch pipe { 10-10ths pressure .	353	297	257	240	175	135
{ 20-10ths " .	486	423	400	330	250	200
¾-inch pipe { 10-10ths pressure .	273	222	140	109	98	92
{ 20-10ths " .	375	303	210	187	144	132
½-inch pipe { 10-10ths pressure .	100	80	50	40	34	31
{ 20-10ths " .	140	110	70	58	57	57
⅓-inch pipe { 10-10ths pressure .	46	38	20	19	11	..
{ 20-10ths " .	54	46	40	25	12	..
⅕-inch pipe { 10-10ths pressure .	30	23	15	12	..	..
{ 20-10ths " .	47	38	23	19	..	..

The discharge from wrought-iron pipes of nominally equal size was considerably greater than the above figures for compo. pipe; and it is evident that the actual bore of tubing on the market varies considerably.

#### VARYING CONSUMPTION OF COOKING-STOVES.

Before passing from the question of pressure-raising plant, I may add that some time ago we were faced by such an increasing demand in a district some seven miles from the distributing station, that the mains were overtaxed during the hours of cooking on Sundays in summer only; the gasholder pressure affording an ample supply at all other times. It became a question whether a larger main should be laid for this occasional demand; but the alternative of a compressing plant driven by a gas-engine was decided upon, and has indefinitely and most satisfactorily postponed the inconvenience and outlay which larger mains would have involved—the compressor being put to work only when the gasholder pressure is insufficient.

This occasional heavy draught on the distributing mains for purposes of cooking and heating, raises an important question as to its effect on overworked consumers' meters. In order to determine the quantity of gas which can be taken through a cooking stove a number of interesting tests were carried out. It was found that stoves from various makers differed considerably in this respect. Without wearying you here with too many figures, it may be stated that small stoves, as supplied to slot consumers, at a pressure of 20-10ths, will pass from 48 to 60 cubic feet per hour; the quantity increasing with the size of the stove, until the largest used by ordinary consumers was found to burn as much as 160 cubic feet per hour, with all the jets burning. Gas-fires vary from 25 to 180 cubic feet per hour, and geysers from 40 to 180 cubic feet.

#### METER TESTS.

The object of these experiments being to ascertain the work a consumer's meter might be called upon to perform, the investigation was completed by testing several meters to ascertain the percentage of error when working beyond the normal capacity.

Size.	Nominal Capacity Cubic Feet per Hour.	Gas Passed at 25-10ths Pressure Open Outlet, Cubic Feet per Hour.	Percentage of Error.
3	18	About 180	Varied from 3.5 per cent. fast to 20 per cent. slow.
3 auto	..	120	
5	30	250	
10	60	310	
20	120	660	
30	180	800	
50	300	1320	

It will be seen from these figures the quantity of gas meters will pass when working with practically an open outlet, and while some, when tested under such conditions, show most excellent results, yet, in the majority of meters, the error in registration is very considerable, and usually on the "slow" side. The tests confirm what is already so well known—that the rules to be observed by inspectors in testing meters under the provisions of the "Sales of Gas Act" need amendment. This Act was passed when dry meters were little known, and when the conditions of supply differed greatly from to-day.

Dry meters will pass gas in quantities so much in excess of the nominal capacity without inconvenience to the consumer—but, in the majority of cases, with considerable loss to the suppliers—that, until some amendment is made, it is necessary to keep a vigilant eye on the quarterly readings to detect cases in which meters are being overtaxed.

#### BURNER TESTS.

In these days of keen competition, the question of burners and mantles is one calling for careful attention. The profusion of



Results of Tests of Various Incandescent Burners.

Burner.	Conditions.	Consumption. Cubic Feet per Hour.	25/10.		30/10.		Remarks.
			C.P. Cor- rected.	Candles per Cub. Ft.	C.P. Cor- rected.	Candles per Cub. Ft.	
A	XXX mantle and small mantle protecting glass not made for use with a Chy. . . . .	4* G.A.	65'53	16'38	66'33	16'58	Mantle not fully illuminated.
	XXX mantle and 6-inch Jena Chy. . . . .	4* G.A.	75'71	18'93	81'63	20'41	
B	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass . . . . .	4* G.A.	55'22	13'80	63'05	15'76	Mantle not fully illuminated. Burner absolutely silent and mantle well illuminated.
	XXX mantle and 6-inch Jena Chy. . . . .	3'9‡ governor	78'10	19'52	81'19	20'29	
C	XXX mantle and 6-inch Jena Chy. . . . .	4* G.A.	84'02	21'00	88'04	22'01	Burner hisses slightly. Burner hisses slightly and mantle not fully illuminated.
	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass . . . . .	4* G.A.	63'32	15'83	70'35	17'59	
	XXX mantle and 6-inch Jena Chy. . . . .	3'9‡ governor	82'89	20'72	85'83	21'46	Burner quite silent. Top of mantle not quite fully illuminated.
	XXX mantle, "C" bulb, enamelled Chy., and small "C" glass . . . . .	3'9‡ governor	66'73	16'68	70'63	17'66	
	XXX mantle, 6-inch Jena Chy., placed inside "C" bulb and enamelled Chy. . . . .	3'9‡ governor	79'05	19'76	89'32	22'33	Do. Burner practically silent.
	XXX mantle and 6-inch Jena Chy. . . . .	4* tap	69'32	17'33	69'92	17'48	
D†	Do. 8-inch do. . . . .	4* tap	65'14	16'28	65'14	16'28	Burner practically silent and mantle fairly well illuminated.
	Do. "C" bulb enamelled Chy. and small "C" glass . . . . .	4* tap	52'41	13'10	59'84	14'96	
E†	XXX mantle and 6-inch Jena Chy. . . . .	3'9‡ governor	72'21	18'05	72'64	18'41	Burner absolutely silent. Mantle not quite illuminated.
	XXX mantle, "C" bulb enamelled Chy. and small glass . . . . .	4‡ governor	61'82	16'40	69'32	17'33	
F	XXX mantle, no glasses at all . . . . .	4‡ governor	58'89	14'72	63'59	15'90	Burner practically silent. Mantle not quite fully illuminated.
	XXX mantle, "C" bulb enamelled Chy. and small "C" glass . . . . .	4* G.A.	43'57	10'89	45'18	11'29	
G	Plaissetty mantle, "C" bulb enamelled Chy. and small glass . . . . .	4 tap	62'07	15'52	64'10	16'02	Burner hisses slightly. Mantle not quite fully illuminated.

G.A.—Gas regulated by means of gas-adjuster on burner.  
Tap.—Gas regulated by means of tap on photometer (there being no gas-adjuster on burner).  
Governor.—Gas regulated by means of governor. Result afterwards corrected to 4 cubic feet.

Air adjusted in each case except those marked † (which had no air-adjuster) to give best results.  
Marks \* and ‡ indicate that same mantles were used for all tests so marked.  
Harcourt's 10-candle power pentane standard used and Simmance-Abady flicker photometer in all cases.  
Gas used had an illuminating power of about 15·5 candles.

types and makes upon the market, has reduced prices to remarkably low figures; and if cost were the sole consideration, the public would indeed be well served. But when samples of those in every day use are tested for lighting power, the difference in efficiency is found to be so great that systematically testing each burner sold is becoming almost a necessity, if the full value of the gas used is to be secured to the consumer.

The figures in the above table give tests recently taken of some well-known burners.

The effect of increasing the pressure and properly regulating the air and gas supply, and of changing the mantle and chimney, is so marked on the illuminating results, that it is safe to say that a burner and mantle testing department is becoming increasingly necessary in all up-to-date works. Experience suggests that samples of mantles should be taken from every consignment received into the stores, and tested for strength, durability, shrinkage, and capacity for becoming fully illuminated without waste of gas. The length and fitting of mantle rods, although apparently a small matter, is one that deserves consideration. Loose fitting rods doubtless are answerable for the shortened life of many mantles. A slight difference in the length of a rod affected the illuminating power of the mantle from 2 to 3 candles per cubic feet of gas consumed.

METERS AND BYE-PASS CONSUMPTION.

I have been rather curious to learn a little about the actual consumption of bye-passes, and the proportion of gas so used which gets registered by the ordinary consumer's meter. It is reasonable to assume that in these days few houses are without some burners having bye-passes consuming gas night and day. The question has doubtless presented itself to the minds of most managers as to how much of this gas gets paid for.

The following figures may therefore be of interest. Meters were taken haphazard from stock and connected to a bar furnished with "C" burners; the bye-passes being tested just as they were received into the stores. The gas was carefully measured from a test-holder, and the registration of each meter was noted before and after the bye-passes had been kept alight for eleven hours—the first day with one bye-pass only, the second with two burning, and so on daily up to six.

According to these figures, the average bye-pass consumes

rather more than 4 cubic feet per twenty-four hours. The results speak for themselves, and add emphasis to previous remarks on the need for revising the methods of meter testing. Although much of the gas passed without registration, it was gratifying to find how satisfactorily certain meters stood this somewhat severe test. In consequence of the increased pressure under which gas is now supplied, makers no doubt find it necessary to more carefully pack the stuffing-boxes with a view to prevent escape of gas round the rods; and this accounts, in a measure, for the failure of some meters to register when one bye-pass only was burning.

MUNICIPAL COMPETITION—COST TO RATEPAYERS.

Our friend the electric light still remains an attractive subject for discussion; but the few remarks I have to make deal not so much with the electric light itself, as with the methods adopted by municipal authorities carrying on such undertakings. No serious objection is raised to legitimate competition; but in the interests of ratepayers, attention should be drawn to present day methods of municipal trading. It seems to be forgotten or ignored that gas companies have still to be included in this category, and are not only among the largest ratepayers in every town, but take a leading place as employers of labour. As such, they may surely claim to have some voice in municipal affairs.

I have recently been looking back through the annual statements of the accounts of the City of Bath. Municipal methods, I imagine, are much the same in other places; and certainly the figures furnish food for serious reflection. Although the electric light has been in the streets since 1891, the concern has been owned by the Corporation for some ten years only, and already has cost the city rather more than £162,000 in capital outlay, without reckoning some £5000 to £6000 taken from the rates from time to time, to meet (a) deficits in the early years, (b) the cost of obtaining Provisional Orders, (c) alterations to mains, lamps, &c., and (d) the fitting-up of various municipal buildings with electric appliances. Although it is claimed that the concern has not become a direct charge upon the rates, yet the expedients adopted to avoid this deserve notice. With an income last year on revenue account of rather more than £20,000, considerably more than £5000 of this amount was drawn from the city purse for lighting a few of the street and various public buildings. This fact of itself would not constitute any cause of complaint, if the result was economy

6 a.m. to 5 p.m. Size of Meter.	1 Bye-Pass.		2 Bye-Passes.		3 Bye-Passes.		4 Bye-Passes.		5 Bye-Passes.		6 Bye-Passes.	
	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.	Meter.	Test Holder.
3 Light . .	Cub. Ft. 2'0	Cub. Ft. 2'9	Cub. Ft. 3'6	Cub. Ft. 4'2	Cub. Ft. 5'4	Cub. Ft. 6'0	Cub. Ft. 6'6	Cub. Ft. 7'1	Cub. Ft. 8'3	Cub. Ft. 8'7	Cub. Ft. —	Cub. Ft. —
5 " . .	3'75	2'25	3'7	4'2	—	—	—	—	—	—	—	—
5 " . .	2'3	2'6	3'5	3'8	4'7	4'8	6'2	6'4	8'2	8'4	11'1	11'2
5 " . .	2'5	2'9	3'7	4'0	5'2	5'6	6'7	6'9	9'3	9'4	11'2	11'3
10 " . .	2'0	2'8	3'7	4'1	5'1	5'6	6'6	6'9	8'7	9'0	11'0	11'3
20 " . .	1'5	3'0	5	4'2	2'5	5'6	6'5	7'2	7'6	9'4	11'0	11'8
30 " . .	2'5	3'0	3'4	4'1	4'3	5'0	6'0	6'8	8'0	9'0	11'0	12'0

All tests made at 30-roths pressure.



in lighting or heating; but, on comparing the cost now with the figures when gas only was used, the result is not comfortable reading from a ratepayer's point of view.

The cost of public lighting has gone up from about £5000, the year before any electric light was introduced, to about £8500 for year ending March 31, 1909, notwithstanding reductions in the price of gas from 2s. 8d. in 1891 to 1s. 11d. in 1909, equivalent to about £1000 per annum on the present number of lamps. It will, of course, be said that the city has grown, and more light—that is a greater number of lamps (and incandescent burners in all the lamps) is needed. But after making such allowance, it is no over-estimate to state that if only gas were used, the city could be equally well lighted at a saving to the ratepayers of more than £2000 per annum.

Another point. By some arrangement (the secret of which many of us would like to learn), the amount paid in rates and taxes is so controlled that the figure shown in the accounts is lower by upwards of £1000 than it should be if the Gas Company is fairly rated on profits shown.

But that is not all. If I read the figures correctly, something like 500,000 units are being sold at less than cost price, if in speaking of cost price we include interest on capital equivalent to 0·84d. per unit, and contributions to sinking fund equal to 0·85d. per unit sold. These two items added to the manufacturing and distribution costs, make a total cost of 3·36d. per unit sold. The bare cost of manufacture, distribution, &c., works out to 1·67d. per unit sold, and yet some consumers have been attracted to the municipal electricity by a charge of a mere 1½d. per unit. At this price over 250,000 units were sold last year, not taking into account a trifling sum of £500 given away as discount. If my figures are correct (and I have taken some pains to keep well on the safe side), the ratepayers are paying some thousands of pounds for the luxury of indulging in municipal trading to which the Gas Company has to contribute its large share—thus in reality paying for forging the weapon with which an attempt is being made to cripple its resources, if not to end its existence. The attempt, though comparatively harmless, is costly, and confirms the remarks of the Governor of the Gaslight and Coke Company, who, in referring to this question of municipal trading, said “the situation, for which there is no legislative remedy, calls for searching investigation and prompt action.”

#### STANDARD TEST-BURNER.

A word should perhaps be said as to the new standard burner and the Bill at present before Parliament authorizing its use by a number of companies. The facts that the existing standard burner No. 1, after doing duty for more than forty years, has become obsolete and unfit for testing the gas to-day, and that a large proportion of any advantage which may result from the use of the new burner must ultimately pass to the consumer, also that the No. 2 burner is now imposed in all Acts and Provisional Orders granting fresh powers to companies or—and this should be noted—local authorities, and is the prescribed burner in the Model Gas Bill, seem to be entirely lost sight of by the local authorities opposing the measure.

Whether gas companies should oppose the imposition of the calorific test (without penalties) is, to my mind, an open question, assuming the standard was a reasonable one and the illuminating power standard dropped. In this connection, it is interesting to note that there does not appear to be any burning desire on the part of local authorities to ask for greater stringency in testing the heating and lighting value of electrical appliances. A suggestion has been made to me by a director of an important company recently, that, for the sake of efficiency and uniformity, the time has come for the Institution of Gas Engineers to seriously take up the question of the promotion of a Consolidation Bill embracing such matters as the standard burner, sulphur clauses, and the amendment of the Gas-Works Clauses Act and the Sales of Gas Act. Representing as it does all the gas undertakings in the United Kingdom, its usefulness would be greatly increased, and the industry be considerably benefited by such action. The necessary financial support would doubtless be forthcoming, and no one can dispute the need for amendment in these directions.

#### LABOUR EXCHANGES.

During this year, the Labour Exchanges Act has come into operation. It is interesting as a national experiment to provide employment for those able and willing to work. The Exchanges will probably be useful as an organized effort to attract capable men to places where their services are required; but the gas industry has its regular army of workers, recruited at times from suitable men in their own towns who have already registered their names in the books of the company as applicants for work. Such a register, I imagine, is to be found in all large gas-works; and a most useful addition to it is found in a systematic entry of each man's character as he leaves the employment after the winter season. Whether keeping a central register, and thus placing the responsibility for finding work on the State, instead of on individuals, will be for the good of the nation, remains a question which we must wait for time to answer.

#### SUNDAY LABOUR.

Before closing, may I be permitted to touch on a question which for many years has deeply interested me. It may be that few works to-day carry on gas-making on Sunday; but if any present

are still of the opinion that Sunday labour is necessary, I would like to say that for a long period the works under my charge were closed-down every Sunday from 6 a.m. to 10 p.m. in the summer, and from 6 a.m. to 6 p.m. in the winter. A further step has been found possible during recent years, and no work has been done on any Sunday before 10 p.m. excepting that required to the fires or in connection with repairs which could not be undertaken when the plant was at work. The effect is all for good; and although it may be that in some works such a closing-down is not possible, yet, whether considering the well-being of the workers or the comfort of the executive, I strongly recommend for your consideration—and this after long experience of the result—the achievement of a silent gas-works on every Sunday in the year.

At the close of the address,

Mr. W. E. PRICE (Hampton-Wick) said the high position the Association had held from year to year and for many years, he was sure, had not suffered, and would not suffer, in any degree at the hands of the gentleman they had chosen to be their President for the ensuing year. The address to which they had listened, he was certain, would rank as one of the best, if not the best, that had been heard in this or any other similar Society. He thought they might say that the range of subjects that had been dealt with by Mr. Ellery might be called a “King's Treatise” condensed. The food for study and inquiry that had been supplied in it would keep them occupied for a long time. He did hope there would be a discussion on the address, because he felt sure there were many present who were anxious to say something on many of the points raised. The subject of naphthalene had not been kept out of the address, and that was one that must be attractive to many members, but he hoped to a less number of them than a few years ago.

Mr. FRANK LIVESLEY (Maidstone), in seconding, said the address was one of the most valuable they had heard for many years. Year by year presidential addresses were becoming more and more a *résumé* of the most important things appertaining to their work that were current in their minds. The experience with naphthalene and the washing by means of water-gas tar was interesting to him (Mr. Livesley), because it almost entirely coincided with his own experience. He should like to add that the spirit which dominated the Bath Corporation in their methods of trading was similar to that dominating the Maidstone Corporation.

The motion was cordially passed.

The PRESIDENT, in his acknowledgment, said he would take the members into his confidence by saying that having got through the address was a great relief to him; for “it was a poor thing, all mine own.” That was what had been on his mind the last two or three weeks, since he had been struggling with the preparation of it; but members of Gas Managers' Associations were always very kind. It was extremely good of the members to receive the address as they had done. If he had said anything in the address that would be useful, he was pleased. There might be some points in it upon which members would like to say something; and, if so, it would make the afternoon more useful.

#### ON GAS WASHING AND OTHER MATTERS.

Mr. JAMES W. HELPS (Croydon), invited by the President, said he was not at all sure that he entirely agreed with the subject-matter of presidential addresses being discussed. He could not help remembering that before long he should have to prepare an address; and if what happened at the present meeting were taken as a precedent at the meeting he had more particularly in mind, he should be extremely sorry. [Laughter.] He did not intend, therefore, to discuss or criticize any of the points that had been raised by Mr. Ellery. He could only agree with those who had already spoken that this was an address that teemed with information, and that would supply subject for a considerable amount of thought and study for every one of them in the future. He had had a good many opportunities during the past thirty years of seeing Mr. Ellery's works at Bath. Frequently in his office he had talked over with Mr. Ellery a great many of the points with which he had dealt in his address that day; and he (Mr. Helps) knew that their President had given much attention to every one of the matters treated upon. With regard to the question of the use of tar or liquor in the seals, he knew that Mr. Ellery had changed from one to the other a good many times. He took the fact that Mr. Ellery now retained the tar-seal as clear proof of his conviction that the tar-seal represented “the survival of the fittest.” With regard to the use of water-gas tar in washers for dealing with naphthalene, the President might supplement what he had said by stating where he placed the tar-washers. There were two methods of dealing with the washers. At Croydon they placed a Livesey washer in front of the condensers; the plan the President had adopted, he rather fancied, was to place the washer after the condensers, using it purely as a naphthalene washer. As could be imagined what they were trying to get at differed in the two cases. In his own case, he did not use it entirely as a naphthalene washer. He used it more with the idea of putting into the gas those light hydrocarbons with which the tar oil was charged. So that when the gas went into the water-tube condensers, and was there suddenly cooled, these light oils kept the naphthalene in solution, and prevented any trouble from it. He did think that naphthalene was a lesser difficulty now than it was some time ago, because there had been so much said and written on the subject, and so much work had been done in relation to it, that the trouble had now nearly reached the vanishing



point. In his own town, where, a few years ago, they used to talk of naphthalene complaints weekly in hundreds, they now found hardly any complaints at all. Mr. Caddick, his Chief Assistant, only the week before brought him a return which showed that in the previous fortnight they had only had two complaints with 40,000 consumers. In reference to high-pressure distribution, it was a point that was receiving very great consideration from everybody now. It was a matter of supreme importance, because it avoided the necessity, if they adopted it, not only of enlarging mains, but sometimes of adding considerably to the storage capacity of their holders. In this connection he could only say, regarding the concluding paragraph of the address, that the use of the booster was going to enable gas undertakings that were unable to do so before, to do away with Sunday labour. They must recognize when the storage capacity was small, that it was necessary to make sure, when they stopped on Sundays, that they would not be put in a difficult position by finding the holders too low at night to give the necessary pressure. With a booster in use, there never need be any fear of such a position. It was a step in the right direction. He congratulated the Association upon their President's address.

Mr. H. W. WOODALL (Bournemouth) said there was one question as to the formation of breeze by coke-conveyors, fear of which he believed had kept a good many people from using them. The matter was alluded to in the President's able address; and it seemed to him (Mr. Woodall) that it all depended upon how much breeze was wanted as to whether or not it was going to affect them to any considerable extent. For instance, they all at the present time had to use a lot of steam on their works; but at Bournemouth they only made enough breeze to meet their requirements. This being so, they were in the same position that they were in before putting in coke-conveyors, though a little more breeze was now made. By the use of under-feed stokers, they were able to get an actual evaporation of 6 lbs. of water per pound of fuel. He would therefore like to know if the President considered the formation of breeze was a serious item; and if he considered it one that should be brought forward as an objection to coke-conveyors.

The PRESIDENT, in answer to Mr. Helps, said at Bath they had the Livesey washer after the condensers and before the scrubbers. He was inclined to think that steaming the tar in the hydraulic mains did liberate some of the lighter oils, and that, when these were carried forward with the gas, they did their share in bringing down the naphthalene. But naphthalene was always such a treacherous jade that one was almost afraid to mention her, because, just when one thought one had got her, there was disappointment. At any rate, at the moment it seemed to him they had got her, and had tarred her out of existence. What did get through the condensers was intercepted by the oil-gas tar in the Livesey washer. He knew that this was different to the way Mr. Helps was working; but each of them had reached the goal by his own road. As to the use of coke-conveyors, in their case it had tended to increase the quantity of breeze—perhaps because they were passing the coke over mechanical screens. He was not quite sure, if he were re-designing this particular plant, that

he should again put in a mechanical screen. He thought if the coke was allowed to find its way down a fixed screen, the tendency would be to produce less breeze, though it might not take it out quite so completely from the larger coke. As to this being a sufficiently serious matter to interfere with the introduction of coke-conveyors, he did not wish to infer that for one moment.

Mr. WOODALL observed that he did not suggest that the President had inferred it. He merely wished to know whether the President regarded the small amount of additional breeze as a serious matter.

The PRESIDENT said he did not think it was serious; but it was a fact. It would be understood, too, that he did not wish to make comparisons with other methods of handling coke. There was such a considerable saving attending the use of conveyors that a little extra was not by any means a serious matter.

Mr. W. E. PRICE (Hampton Wick) remarked as to the position of the washer, that he had for the last two years had his in exactly the same position as the President; and it had had the effect of absolutely clearing naphthalene off the works. He had done nothing else. Previous to using the washer in this position—after the condensers and before the scrubbers—he had the outlets of the holders interrupted and had naphthalene deposits in other places. Since he installed the washer in the position named, he had not seen naphthalene on the works. They considered they had chosen the better position of the two, though he was not prepared to state that it was actually so. In his own case, it had been a good position. But to guard against trouble in the district, after the gas left the holders they saturated it with the vapour of kerosene. That was to say, the gas was passed over the surface of kerosene, which was kept hot by steam. The effect of doing this for about three years had been that the condensed heavy oil charged with naphthalene was found in, and was pumped from, the syphons three miles from the works. It began by depositing quite close to the works, and it gradually had receded until now it was only discovered at the remote ends of the district. It was always to be found in the oily film on the water pumped from the syphons. Now instead of the complaints being about 3 per cent., they had been reduced to 0.3 per cent. He could not say he only had two complaints from 40,000 consumers; he should like to. But he thought that in his case he had had an undue proportion of naphthalene remaining in his mains; and it had taken all this time to get it out.

This concluded the proceedings.

In the evening the members dined together. A toast list and a programme of music were afterwards passed through, and a felicitous time was spent.

Subsequently, several of the members made their way to Blackfriars Bridge approach to inspect the new high-pressure gas-lamps there, with raising and lowering gear. They were met by Mr. W. J. Liberty, the Lighting Inspector of the City of London, and President of the London and Southern District Junior Gas Association.

## FELD'S PROCESS FOR OBTAINING AND UTILIZING SULPHUR FROM SULPHURETTED HYDROGEN AND SULPHUR DIOXIDE.

One of the series of English patents taken out by Herr Walther Feld, of Hönningen-on-the-Rhine, was accepted on the 8th ult.—No. 3061, dated Feb. 8, 1909; and the specification has since been issued. It forms interesting reading in conjunction with the article the patentee contributed to our columns last September (Vol. CVII., p. 816); and though somewhat lengthy, it will bear reproduction to a large extent *verbatim*.

The invention relates principally to the treatment of sulphuretted hydrogen and sulphur dioxide so that the sulphur obtained may, if desired, be utilized for the regeneration of the sulphur dioxide used in the process, or to obtain sulphuric acid or sulphuric acid salts. The sulphuretted hydrogen and the sulphur dioxide may be in a pure condition, and either or both may be mixed with other gases. For example, the sulphuretted hydrogen may be contained in coal gas, and the sulphur dioxide in gases from sulphur ovens, in which sulphur is burned with air.

To carry out the invention, the gases containing sulphuretted hydrogen and sulphur dioxide respectively—presuming that the gases are not taken in their pure condition—are treated, either simultaneously or one after the other, with a liquid containing, in solution or suspension (or partly one and partly the other), compounds of metals, the sulphides of which, on the one hand, are insoluble in basic, or in neutral, or in some cases in weak acid, solutions, and, on the other hand, are decomposed by sulphur dioxide alone, or by sulphur dioxide in the presence of air, or other oxidizing agent, or sulphur, or basic, or acid, substances, or of a mixture thereof. Such compounds are, for instance (subject to the disclaiming note preceding the claims\*),

\* This says: "I am aware that it has been proposed to recover sulphur from sulphuretted hydrogen by adding an equivalent proportion of sulphurous acid gas thereto and passing the gaseous mixture through a chamber containing oxide of iron or bricks at a high temperature, and also to add oxygen and inert gases in suitable proportions to the said gaseous mixture; and I make no claim to this."

the oxides, hydroxides, carbonates, sulphites, thionates, and all basic salts, as well as the neutral or weak acid salts of zinc, manganese, iron, or other metals, the sulphides of which answer the before-mentioned requirements. For example, precipitated iron sulphide is insoluble in neutral or basic solutions, but is dissolved by sulphur dioxide. Zinc sulphide is insoluble in basic, or in neutral, or in dilute, acid solutions—particularly if they be weak acids. Therefore sulphuretted hydrogen will precipitate zinc sulphide from a basic, or an acid, or a neutral solution of zinc acetate, or zinc sulphite, or of other salts of zinc with weak acids.

The way of performing the process according to this invention will vary according to the special condition of the gases containing the sulphuretted hydrogen or the sulphur dioxide, or both, and according to the metal and the compound of it which is used. If, for instance, zinc oxide be used for the extraction of sulphuretted hydrogen from coal gas, the zinc oxide is suspended in water, or in other suitable liquid (such as salt solution, oil, or the like), and the coal gas is treated with this suspension. By the action of the sulphuretted hydrogen in the coal gas, zinc sulphide (ZnS) is formed. If the suspension, now containing zinc sulphide (alone or together with undecomposed zinc oxide) be treated with sulphur dioxide, or with gases containing sulphur dioxide, the sulphide is decomposed, forming free sulphur and a soluble thiosulphate, or polythionic salts of zinc, or both. [For brevity, the patentee refers to the thiosulphates, polythionates, and their compounds, as "thionates."] The solution is again used for treating gases containing sulphuretted hydrogen; but the reaction is somewhat different from that already stated. The thionates are decomposed, and zinc sulphide, together with free sulphur, is formed. By treating this solution alternately with sulphuretted hydrogen and sulphur dioxide, the reaction between both gases, by means of the zinc compounds, goes on continuously.

Instead of beginning with the treatment of sulphuretted hydrogen by the zinc oxide suspension, the operation can be started



with sulphur dioxide. In this case, zinc sulphite ( $\text{ZnSO}_3$ ) is first formed from the zinc oxide; and this, if treated with sulphuretted hydrogen, is decomposed—forming zinc sulphide ( $\text{ZnS}$ ). Sulphur dioxide is liberated; and this, in *statu nascendi*, and before accumulating in the liquor, is decomposed—forming free sulphur and water by its action upon the sulphuretted hydrogen. The operations then proceed as already described.

Instead of treating the gases alternately with the liquor containing the zinc compounds, the gases may be treated simultaneously therewith, or they may be mixed together before they are treated with the liquor. The amount of sulphur formed in the liquor is always according to the proper proportion of the respective gases. If there be less of one gas than is necessary to complete the reaction, the excess of the other gas will be nevertheless absorbed by the zinc compounds. By afterwards treating the liquor with gas such as that which was deficient in the gas mixture, the reaction will be completed in the liquor. Whatever may be the intermediate compounds formed, they do not interfere with the final reaction; the result being always free sulphur—that is to say, the sulphur dioxide, reacting upon the zinc sulphide, forms thionates and free sulphur; and the sulphuretted hydrogen, acting upon the thionates, forms, again, zinc sulphide and free sulphur. Both zinc compounds are alternately decomposed and regenerated.

The liquor for the treatment of the gases may be used boiling, warm, or cold; the reaction in any case being complete. The gases may be hot or cool. The liquor will gradually accumulate sulphur. If the sulphur be dissolved by the liquor, it can be separated from it by crystallization; while if it be insoluble in the liquor, it can be separated from it by filtration, or decantation, or by melting it out of the liquor. The separation of the sulphur can be effected at any convenient stage of the process; but it is most conveniently effected after the treatment with sulphur dioxide, when the zinc compounds are dissolved. For the purpose of melting the sulphur, the liquor is heated to a temperature at which sulphur melts—namely, from about  $110^\circ$  to about  $160^\circ\text{C}$ ., or even above the latter temperature—the heating being effected under steam pressure, directly or indirectly by steam or other heat. By the action of the superheated liquor, the sulphur is melted in the liquor and separates and collects at the bottom of the vessel in which the superheating is effected. Air may be blown through the liquor before the melting (or filtering) process, in order to get rid of the excess of sulphur dioxides or sulphuretted hydrogen absorbed in the liquor.

By the alternative (simultaneous) and frequent treatment of the liquor with the gases and air and by heating, some zinc sulphate is formed besides thionates and free sulphur. Such zinc sulphate, if in neutral or acid solution, will have a poor reaction upon sulphuretted hydrogen. In this case, any basic compound (solid, or in solution, or suspension) or a salt with a weak acid, such as sulphite, thionate, or acetate, or a sulphide (in solid form, or in suspension, or in solution), may be added to the liquor, by which the zinc sulphate will be decomposed. The liquor also may be treated with gases containing ammonia alone, or ammonia and sulphuretted hydrogen—such as illuminating gas, coke-oven gas, and the like. In this case, the liquor will simultaneously absorb ammonia and sulphuretted hydrogen; soluble ammonium sulphate and insoluble zinc sulphide being formed, which can be separated by decantation or filtration. There may be more ammonia in the gas, or in the liquor to be added, than is equivalent to the zinc sulphate. In this case, besides ammonium sulphate, ammonium thionates will be formed, which can easily be transformed into sulphate, as will be explained. The ammonium sulphate solution may be used for any required purpose, and it may be distilled, or concentrated, and crystallized. The zinc sulphide (without or after being separated from the ammonium salt solution) is reacted upon by treatment with sulphur dioxide before described.

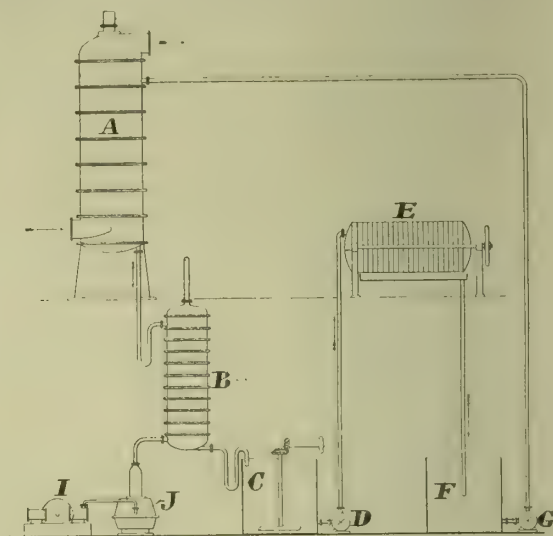
In cases where the gases containing sulphuretted hydrogen contain also ammonia, it may be convenient to increase the formation of zinc sulphate by heating or boiling the liquor which contains the suspension of zinc sulphide and sulphur, or the solution of thionates (which may also contain free sulphur and zinc sulphide) when treating it with sulphuretted hydrogen, or sulphur dioxide, or air, or with a mixture of these gases. Thus the sulphuric acid necessary for the formation of ammonium sulphate is formed from the sulphuretted hydrogen or sulphur dioxide of the gas itself. By regulating the heat and the air supply, the formation of sulphuric acid may be regulated according to the amount of ammonia in the gas. Also ammonia from other sources may be used—such as gases or vapours containing ammonia, or weak acid salts of ammonium, virgin liquor (that is, liquor condensed in the ordinary process of gas purification and containing ammonia in solution), and the like; and this ammonia may be transformed into sulphate by heating it with the zinc liquor and air, during or after the treatment of the liquor with sulphuretted hydrogen or sulphur dioxide. As soon as the sulphate has accumulated in the liquor, this may be treated with gases containing sulphuretted hydrogen, alone or together with ammonia, until all the zinc in solution is precipitated in the form of zinc sulphide; or the zinc in solution may be precipitated in any other way—for example, by adding ammonia or other basic substance which will precipitate zinc compounds. The liquor then containing only ammonium salt in solution is separated from the zinc sulphide by decantation or filtration.

The sulphur recovered by either method can be used as re-

quired. Part of it may be burned to sulphur dioxide for treatment of the zinc sulphide when the process is used for the purification of gases containing no sulphur dioxide, but sulphuretted hydrogen, either alone or together with ammonia. Instead of procuring the sulphur dioxide necessary for this process by burning sulphur, the liquor containing the zinc sulphide may be treated with extraneous gases containing sulphur dioxide. Suitable gases, the patentee mentions, are the gases from boiler furnaces, or from ovens (in which coal, ore, or other matter containing sulphur and yielding sulphide dioxide, is burned), gas-producers, retorts, or the like, and which gases contain sulphur dioxide produced from the sulphur in the fuel or ores.

The foregoing examples do not specify all the ways in which the process may be carried out, as they will vary according to conditions and requirements; but from the said examples the treatment generally will be understood.

The patentee concludes by explaining, with reference to an accompanying drawing, one way in which the process may be carried out.



A is a vertical gas-washer, and B is an absorption tower—both containing a number of superposed chambers. C and F are tanks for liquor. E is a filter-press. D and G are pumps. I is an air-compressor, and J is a sulphur oven. Presuming that the apparatus is to be used for the extraction of sulphuretted hydrogen from coal gas, the gas would first enter the washer A, and be treated in this washer by liquor containing (for example) zinc thionates. By the action of the liquor, the gas is purified and leaves the top of the washer. The liquor is constantly pumped up into the washer by the pump G. When the liquor leaves the washer, it contains sulphide of zinc as well as sulphur and undecomposed zinc thionates; and it enters the absorption tower B by the syphon pipe shown, and, while the liquor runs through it, air, containing sulphur dioxide, is blown through B—the air and sulphur dioxide entering at the lower left-hand side. The liquor absorbs sulphur dioxide, and this acts upon the zinc sulphide, regenerating zinc thionates and forming free sulphur. The liquor leaving B by the right-hand syphon pipe enters the tank C, where it is stirred by the stirrer shown until all, or nearly all, of the zinc sulphide is decomposed. Then the liquor, containing the regenerated zinc thionates in solution and free sulphur in suspension, is pumped by the pump D, up into the filter-press E. The insoluble sulphur is retained in this press, and the liquor runs into the receptacle below, and, by the down pipe, to the tank F, whence it is pumped, by the pump G, again to the washer A. The sulphur from the filter-press E may be dried and burned in the sulphur oven J. For this purpose, air is blown into the oven by the air-compressor I. The gases coming from the oven (which gases contain sulphur dioxide, together with excess of air) enter the tower B; and the waste gases, after having given off their sulphur dioxide to the liquor running through the tower B, leave this apparatus by the pipe at the top.

**Society of Engineers (Incorporated).**—We learn from the Secretary (Mr. A. S. E. Ackermann, B.Sc.) that the new Society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society has now been incorporated under the Companies Act. This necessitated the preparation of a Memorandum and Articles of Association and the framing of fresh bye-laws, which contain many new features. Among these may be mentioned the creation of a new class of Fellows, admission to which is to be by examination, the reduction of the subscription for junior members, the establishment of a lending library, and the starting of a business directory and an employment register. Changes have also been made in the method of voting. The papers read before the Society are now issued in twelve monthly parts, instead of in one volume at the close of the year, as before. They are thus brought earlier under the notice of the members. The new conditions show that the Councils of the two constituent Societies are doing their best to render the usefulness of the new body as great as possible.



## APPLICATION OF HIGH-PRESSURE GAS TO FURNACE USE.

By A. W. ONSLOW, of the Woolwich Arsenal Gas-Works.

[Summarized Report of a Paper read before the London Section of the Society of Chemical Industry on Monday last week.]

Many years' experience in the employment of coal gas for heating purposes have led me to the conclusion that the methods commonly employed—taking the gas from the town mains, and using it in a bunsen burner—were not only wasteful, but quite incapable of giving anything like a constant temperature, or of heating-up an oven or other apparatus to the like temperature in the same given time for consecutive operations. With an ordinary burner, and gas of the same composition, the variation in the time of heating-up a furnace to a certain temperature may vary in succeeding days as much as two hours. I have found large variations in both consumption and temperature, through the pressure and air supply constantly changing. In drawing gas from an ordinary main in which it is at (say) about 20-10ths pressure, using one furnace the temperature may be right, but on putting on a second furnace, the pressure immediately goes down, but the air supply remains practically the same. I have seen furnaces connected up one after the other, and the pressure has been drawn down to 7-10ths. The consequence has been that not one of these furnaces has been properly adjusted for the differences in pressure thus occasioned; and the air supply has been fluctuating between 5 lbs. and 25 lbs. during the whole of the time. Thus sometimes a regular furnace temperature is not obtained in six, seven, or eight hours, when it ought to have been reached in probably twenty-five or thirty minutes.

With the object of obviating these irregularities and fluctuations, I employ a high-pressure gas capable of working up to 160 inches of water. High-pressure lighting has a limit of about 60 inches water pressure. The air supply is at atmospheric pressure in both cases. [The author here described by the aid of a diagram the valve arrangements for maintaining constant pressures notwithstanding the number of appliances in use.] A rotary exhaustor and compressor draws the gas from the mains, and supplies it at any desired constant pressure to the burners—surplus gas being returned; and therefore not interfering with the pressure as delivered from the burner-nozzles, nor is it registered again in the meter. Variation of pressure in the mains has no effect. Until gas is supplied from the gas-works at high-pressure, small compressing apparatus similar to this [the example exhibited] is necessary if high-pressure gas is to be employed for heating. Although some towns have high-pressure gas-mains, the gas is not used at high pressure for heating, but for the convenience of distribution. Dr. Davidson, the Chief Chemist to the Birmingham Corporation Gas Department, and Mr. Barrett, the Lighting Superintendent, are pretty alive to this matter of heating; and a high-pressure main is now being installed in the city.

Describing a small plant for laboratory work, Mr. Onslow said: Assuming the maximum consumption of gas is 500 cubic feet per hour, and a pressure of 100 inches sufficient to meet all requirements, the valve acts directly the machine is put to work. If 300 cubic feet of gas are used, the surplus 200 feet are bye-passed back into the inlet-main. The pressure is a constant one whatever the consumption. The gas-pipe need only be one-half the usual size, or half the size of the compressor outlet. The inlet-pipe to the compressor should be full size. Having fixed the compressor, any temperature can be obtained by simply opening the gas-tap. Assuming that the highest temperature required is 2600° Fahr., a pressure of 100 inches would suffice. Supposing the use of four furnaces, in which different temperatures are required. The first furnace is to be heated to 2600° Fahr.; and the gas would be taken directly from the standard pipe. The second furnace requires 2000° Fahr., 70 inches pressure will suffice; and this can be obtained by a reducing-tap or governor, and the use of a pressure-gauge. In the third furnace, a temperature of 1000° Fahr. is required; and for this a pressure of 35 inches will suffice. The fourth furnace may be for melting lead; and for this 16 to 20 inches pressure is sufficient. Under similar conditions, the same temperatures will be obtained in the same time daily; and after the burners have been once adjusted, there will be the same consumption of gas. Quantities of about  $\frac{1}{2}$  lb. of copper have been melted in six-and-a-half minutes, and re-melted in less time. Suppose the copper is put in the day after, it will be melted and, if required, re-melted in precisely similar times. If larger quantities have to be dealt with, all that has to be done is to turn on a second or third burner, as I do not recommend interfering with the standard pressure.

It is generally found better to maintain the standard pressure high enough for the particular purpose without constantly raising or lowering it. The pressures must be suited to the work. For instance, it is possible to soften the ordinary plumbago crucibles in thirty minutes with 100 inches pressure. But there are cases where the pressure has necessarily to be either raised or lowered. In glass manufacture, 10 to 20 cwt. crucibles should be treated at 60 inches pressure for twelve hours to melt the composition; a pressure of 90 inches for six hours is required to refine the glass, followed by a drop to 40 inches for emptying. Only the cost of town gas has prevented the adoption of this system gener-

ally. If gas could be supplied at 1s. 3d. per 1000 cubic feet, glass could be made more cheaply by it than by coke at 15s. a ton. The use of blue water gas made on the Kramer and Aarts system, and worked at high pressure, would result in glass manufacture being cheaper than by coke. I mention this particular system here because the gas has the highest calorific value among such gases; and is about half that of ordinary town gas. For melting lead in cast-iron pots, 20 inches pressure is quite sufficient. To temper long steel bars, axle trees, &c., they are suspended vertically, and heated at 60 inches pressure for thirty minutes, at the expiration of which time the burners are shut off for five minutes to allow the temperature to equalize. Tempering, case-hardening, and annealing furnaces need not have large combustion chambers. There is a division in each furnace down the centre, so that the gas is confined to each side, and so closely is the heat exerted that furnaces can be equally heated all over without 10° Fahr. difference in any part. It is quite possible with these methods of restricting the air and the gas to reduce the consumption from 600 to 200 cubic feet. Warming plates, instead of consuming 180 cubic feet per hour, now consume 25 feet. Metal melting-pots, demanding one-and-a-half hours to melt with gas at 80 feet per hour, now require gas at the rate of only 45 feet per hour, and melt in 25 minutes; and then the gas is closed down to 25 feet per hour.

With regard to the warming of buildings, if the highly heated products of combustion are carried in a metallic flue-pipe passing through a room for a sufficient distance, nearly all the heat generated may be rendered available for warming the room. With an ordinary gas-fire, this can only be done to a limited extent, because the fire will not draw, owing to the cooled gases having little or no ascending power; and there is also the objection that an unlined metallic flue will become dangerously hot at its base. It is therefore desirable to give the flue gases momentum, so that one part of the flue is not unduly heated above another. In order to accomplish this, Colonel Bagnold conceived the idea that, given sufficient initial pressure either in the gas or air supply, the injector-like action of the high-pressure burner would effect this. Experiments had demonstrated the soundness of the theory. With two high-pressure burners fed with gas at 60 inches pressure, a room of 750 superficial floor space has been heated 30° Fahr. above the outside temperature, with a gas consumption of 80 cubic feet per hour. Outside the building is a small combustion chamber lined with fire-bricks, in which are the burners. From here a steel flue is led through the wall and around the room, and again through the wall to the outer air. On leaving the heating chamber (which reaches a temperature of 2000° Fahr.), the flue passes through a boiler, from which are led water-circulating pipes; and thus part of the room is heated by hot water and part by the hot flue pipe. The gas passes out of the flue-pipe only slightly warmer than the air in the room. The installation has been in use for six months, and has given no trouble whatever. Its efficiency is about 90 per cent.

The objects I have had in view in all my experiments in high-pressure gas heating has been to simplify our present system of gas heating, and by obtaining a higher efficiency and effective flame control to ensure definite results. Temperatures in furnaces or crucibles can be controlled to a nicety. By maintaining a pressure at an absolutely straight line, we get something definite instead of problematical. It is merely necessary to open or close a gas-tap, and wait with confidence for the result. The improvements, displacing uncertainties of the past, and giving better heating results, naturally tend towards economy and a lower cost of production—an end which is furthered by using smaller combustion chambers and the simplification of installations. In the gas industry, we know that the man who designs a furnace is not the man who will have to use it; and if highly-skilled men cannot be employed, it is better that the gas industry should take the matter in hand, and give something that will render more positive results. With the furnaces we have now, and gas at definite pressures, I can absolutely say that if we want (say) 1000° Fahr. over two hours or any other period, it can be obtained and maintained, and at all times. I think we must do something, because I believe a great deal of harm has been done through useless methods of furnace heating that seem almost incomprehensible.

[Mr. Onslow had on view a small compressing plant for working by hand; and with this—although the supply of gas was not plentiful—he demonstrated the action of both the heating and lighting burners. He also showed models of furnaces.]

### Discussion.

Colonel BAGNOLD, C.B., R.E., remarked that a great deal had been achieved at the Woolwich Arsenal by the use of high-pressure gas, of which Mr. Onslow was one of the apostles. He had worked at the utilization of high-pressure gas most assiduously for both lighting and heating, and had attained useful results—results which had been continuous and reproducible, and had realized a considerable amount of economy. He (Colonel Bagnold) had a great belief in the future of high-pressure gas for heating purposes. In his opinion, the present system of using gas for the heating of houses was extremely wasteful and most uneconomical. Too much of the heat was wasted up the chimney. If they could have high-pressure gas laid on to their houses, they could heat them at a fraction of the cost at which they were now



heated. The injector action of the high-pressure gas-burner put a forced draught at their disposal; and the products of combustion could be forced long distances until one had practically exhausted the useful heat out of them. For heating large masses of metal and other things, high-pressure burners were invaluable. The only objection to lighting by the high-pressure system seemed to be that it was accompanied by a certain amount of noise. For use in private houses, therefore, it might not be altogether suitable. But for workshop and factory lighting, he thought his friend (Colonel Barlow) would agree with him that electric lighting was not in it with high-pressure gas lighting.

Dr. W. R. HODGKINSON had hoped Mr. Onslow would have been able to show the effect of this high-pressure gas better than had been possible, as he had no doubt many of the members had not seen the pressure gas at work. Unfortunately, it appeared that the gas supply of Burlington House was of very low pressure. It was worse than it was at Woolwich [laughter]; and so it had not come out at all well in the demonstration. He had an installation of high-pressure gas in his laboratory. It consisted of 3 H.P. motor and a compressing machine; and it really worked beautifully. He obtained all the gas he required for his work; and he could fully corroborate what Mr. Onslow had said about the maintenance of the temperatures. He could maintain temperatures in his little furnaces within 2° or 3° C. throughout a day. He could build up a little furnace suitable for a small crucible, or a furnace to any size—he had some built up to melt 40 lbs. of brass. Such furnaces, for use with high-pressure gas, could be built up with a little fire-clay and some fire-bricks in a few minutes. He could start with the clay wet—in fact, he always started with it wet; and the clay burnt with a sort of glaze over the front surface, and so did not crack. He had one now that had been in use for eight months. It had done a considerable amount of work, and was perfectly sound, although he started it to work five minutes after it was moulded. The only disadvantage (he knew he was rather sensitive) was the disagreeable noise the burners made. When they were in use, he had to shut all the doors to confine the noise within the laboratory. This was the only disadvantage of which he knew. The air supply could be regulated to a nicety. They could set a furnace going, get the temperature required, and leave it the whole day, with confidence as to a constant temperature being maintained. It far exceeded anything he had expected from it when Mr. Onslow first brought it to his notice.

The CHAIRMAN (Dr. J. Lewkowitsch) asked whether Mr. Onslow had considered the advisability of introducing into houses at high pressure gas containing 30 per cent. of carbon monoxide.

Dr. W. B. DAVIDSON (Birmingham) remarked that in the gas industry there was a great deal of brotherly love which one did not often find in other industries. They tried to help each other as much as possible. From Birmingham they had applied to Mr. Onslow for advice, and he had kindly helped them. Now they were very busy there trying to do what they could with high-pressure gas for the purposes of annealing, melting, case-hardening, brazing, and such like, especially for the jewellers' quarter. They were laying a 4-inch high-pressure main, which would be used partly for lighting and partly for heating. They had carried out a great many experiments already; but he was sorry he could not give any results, as they were not so far advanced as he should like to be. He desired to corroborate what Mr. Onslow had said with regard to the economy of high-pressure gas. There was great economy indeed. He should think there was a saving of at least 60 per cent. They could melt 10 lbs. of copper for less than 1d., with gas at 1s. 6d. per 1000 cubic feet. The other great feature was the uniformity of the temperature. If one worked with a high-speed concentric blast-furnace, unless one stood by with a pyrometer and read the temperature every five minutes, one might be there night and day, and not get the temperature wished for. It was necessary to keep on reading the pyrometer; otherwise there was a drop in temperature, instead of a rise. With regard to carbon monoxide in gas, many chemists who were not connected with the gas industry were very much prejudiced against gas-fires and such like. He was sure it was indeed prejudice. Recent experiments at the Leeds University had shown that the carbon monoxide even in the flue gases was only 8 or 10 parts per million. Carbon monoxide was rather like some of the other scares of which they heard so much. It was only in pure water gas there was anything like 30 per cent. of carbon monoxide. In Birmingham, they ran at about 10 per cent. Certainly there was danger with leakage; and no doubt, as the Chairman had hinted, it would be rather a serious matter with a high-pressure service.

Mr. E. GRANT HOOPER (London) said he took it they might look forward to the day when they would have mains from the gas-works supplying high-pressure gas. Was Mr. Onslow acquainted with what might be called the individual application of the high-pressure system? And what class of motor was used for compressing the gas in such a case? Was there a small motor on the market that would be applicable for laboratories where assays were carried on?

Mr. T. H. L. GIRTIN (London) said he was interested in the melting of gold and silver residues and gold and silver bullion itself. He had lately taken up the melting of gold and silver bullion by high-pressure gas, and could corroborate the advantages claimed for it. Gas had been used very frequently before for melting bullion—chiefly in America. But there the air was generally put under pressure, and not the gas; and the result was they had a high velocity for the burnt gases which threw

about considerably the volatilized gold and silver, and made it difficult to collect. It was a very important thing not to dissipate this film of gold and silver. In regard to cost, he had melted a great deal of gold and silver by coke, and had found that high-pressure gas was slightly more expensive. But the great advantage was that one had not the ash to contend with. After one had melted gold and silver by coke, there was as much as 10 per cent. of the ash to treat. He had had to treat in a year the ash of as much as 300 to 400 tons of coke. In his work, he only used the moderate pressure of about 12 to 14 inches of water; and he found no noise whatever.

Colonel Sir HILARY BARLOW (Woolwich Arsenal) remarked that he used furnaces heated by high-pressure gas for the annealing of shell, and for other treatment before hardening. A very accurate temperature came in enormously in the case of projectiles, because it was no exaggeration to say that for certain steels a difference of only 60° C. meant either good results or exceedingly bad ones. It was a little wandering from the subject perhaps to say that a modern armour-piercing projectile was called upon to do very heavy work. Taking a 12-inch armour-piercing shell, to-day it must pierce 12 inches of Krupp's steel, with hardened face and tough back, and come out of the other side unbroken. If they liked to calculate out the class of energy and class of density wanted to do this, it would be seen that it was a tough problem they had to face; and the problem could only be solved with certain steels within a temperature variation of 50° Fahr. On either side of this, there would be failure. It would be understood from this what an enormous value there was in a furnace that could be trusted. He did not say that in all cases he used this high-pressure type of furnace; but for the larger shell he did. For ordinary shell, he was content with the ordinary annealing furnace using coal or coke; but it had to be carefully watched. Colonel Bagnold had mentioned the use of high-pressure gas for lighting. He (Sir Hilary) would never dream of putting in electric light now for lighting factories. With these high-pressure burners for lighting workshops, there was absolutely no comparison. Many people who had been round the shops in the winter time, where he had high-pressure lighting in use, had afterwards written to him to ask how it was done. He would now no more think of putting in arc lights than think of flying. High-pressure gas gave a beautiful, steady, and perfect light.

The CHAIRMAN asked if producer gas could be used with this apparatus for lighting purposes.

Dr. HAROLD G. COLMAN (London) said he might perhaps say, with regard to the Chairman's question, that it would not be possible to get such good lighting with poor gas like producer gas as with ordinary coal gas. With producer gas, owing to the 50 to 70 per cent. of inert gases that it contained, the high temperature obtainable with coal gas could not be realized. He was sorry there was not time for further discussion.

Mr. ONSLOW, in reply, said that unfortunately he had not much to answer. With regard to the inquiry as to small installations, the results he had given in his paper were from some hundreds of experiments. He could not possibly go into details over the whole of the system, and had only supplied a general outline. They had small installations of compressor driving—for instance, for soldering-irons. They employed a  $\frac{1}{8}$  H.P. electric motor, with 500 cubic feet per hour. With this they could do anything they liked. The system was adaptable to any particular purpose. With regard to Mr. Girtin's remarks as to melting gold and silver, he was one of the gentlemen with whom he should like to have a serious talk. At present, he was not sure whether this gentleman and himself were agreed as to the correctness of his method of heating. He should rather fancy they were not. In his (Mr. Onslow's) opinion, gas properly applied in suitable furnaces was cheaper than coke. He had found it so in many cases; and the same applied to anthracite. He knew of one large printing-works that had adopted the high-pressure gas system of heating; and there it had been found to be cheaper than anthracite. Twelve burners were used with a four-ton pot. The pressure was always constant, and so was the temperature. As to producer or suction gas, Dr. Colman had answered that.

A hearty vote of thanks was accorded to Mr. Onslow for his interesting communication.

Last Saturday week Mr. Richard Forster, a former Mayor of Carlisle, died at his residence in the city. He entered the Town Council and distinguished himself as a member of the Gas and Water Committee, of which he was Vice-Chairman and Chairman for seventeen years before he was elected Mayor in 1889. He continued to serve on the Gas Committee for some years afterwards. He had of late been living in retirement.

In the course of the Inaugural Address delivered by Dr. George Beilby, F.R.S., at the thirty-second annual general meeting of the Institute of Chemistry, on the 1st inst., he showed how the Institute had fulfilled the duties imposed upon it by the Royal Charter, by providing for the community a class of properly qualified professional men for public chemical appointments, for general practice, and in connection with industrial concerns. He said the diplomas of the Institute were generally recognized as the outward sign of sound professional training. The Institute had undoubtedly influenced the teaching of the universities and colleges, and had endeavoured to encourage the production of men who could not only talk about chemistry, but who were able to apply their knowledge usefully.



## A VISIT TO THE HORNSEY GAS-WORKS

By the London and Southern District Junior Gas Association.



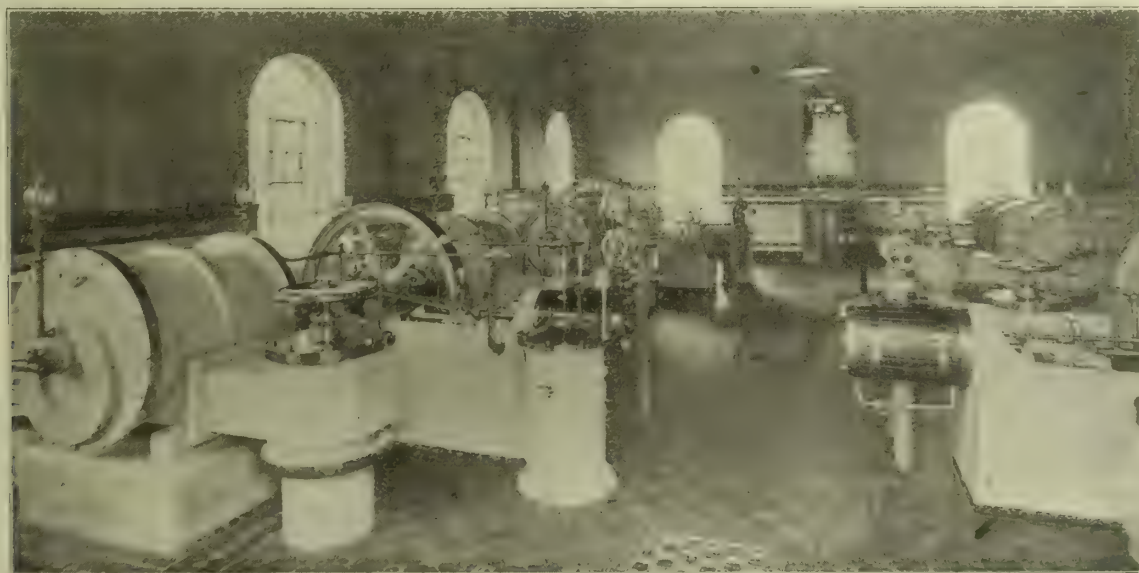
The Relief Holder, the Carburetted Water-Gas House, and Retort-House Nos. 1 and 2.

LAST Saturday afternoon saw the fulfilment of an item in the programme of the London and Southern District Junior Gas Association which had been looked forward to by the members with the keenest enjoyment—to some extent on account of the unique features of the occasion that had been announced. Briefly, the function was a visit to the works of the Hornsey Gas Company; and the unique features were the invitation extended by the Engineer and General Manager (Mr. J. W. Buckley) to ladies to join the party, and a musical entertainment provided at the close of the inspection. But great as was the enjoyment of anticipation, it did not, in this case at any rate, exceed that of realization; for the afternoon was a thoroughly successful one in all respects. This was only to have been expected, however, seeing that everything possible had been done by the hosts to secure the comfort and convenience of the visitors. The cleanliness, roominess, and pleasant situation of the works render them admirable for the purpose of instructing ladies in the science and practice of gas manufacture; and, in addition to this, the district is one that is easily “get-at-able.” Under these circumstances, it was not surprising to find that—headed by the President (Mr. W. J. Liberty)—there was a muster of about 130 at the hour appointed to begin the inspection, in spite of the inclemency of the weather. The arduousness of the task of those who acted as guides (Mr. J. W. Buckley, Mr. F. Mitchell, Assistant Engineer, Mr. W. H. Owen, Mr. H. E. Ratcliffe, Mr. Kenneth Sproston, and Mr. Oreno, Chief Collector), was, it should be mentioned, greatly minimized by the distribution of a nicely got-up little booklet giving a brief account of the works.

The Hornsey Gas Company is not, of course, a new undertaking. The date of its establishment is 1857; and incorporation by Special Act of Parliament took place in 1866. The district comprised within the Borough of Hornsey (which includes Haringay, Crouch End, Muswell Hill, Fortis Green, part of Highgate, and a detached portion of the parish of Clerkenwell) is one that

is growingly sought after for residential purposes, with a consequent steady increase in the demand for gas. The satisfactory condition of affairs that exists in this respect will be gathered from the fact that, whereas the make of gas in the year 1900 was 331,500,000 cubic feet, in 1909 it was 496,818,000 cubic feet. There is municipal electrical competition; but with the exception of two streets, all the street lighting is done by means of gas, which is consumed by the Council (who make themselves entirely responsible for the public lighting) chiefly through inverted burners. Apparently municipal electricity in Hornsey has proved to be as little of a gold mine as has been the case in some other places; for, if we remember rightly, it was necessary on one or two occasions to draw upon the rates in connection with the undertaking. While on the subject of outside lighting, it may be mentioned that there are in different parts of the Company's district several installations (one with 62 lamps of 1000 and 600 candle power) of high-pressure gas, on the Keith-Blackman system, for the lighting of small groups of shops. This arrangement is giving satisfaction at Hornsey, as it has done elsewhere.

To come to the works themselves, it may be remarked that the first thing that strikes one is the scrupulously clean condition of the place generally; and the next, is the extensive area of ground available, which is amply sufficient, not only for present requirements, but to cope with a very largely increased demand. It is pleasant to turn the eye from the gas plant on one side, to the extensive workmen's garden allotments and bowling green on the other. Work and pleasure are certainly intimately combined on the ground of the Hornsey Gas Company. The works are adjacent to the main line of the Great Northern Railway, which runs along a high embankment. Three separate sidings bring the coal directly into the three coal-stores adjoining the retort-houses. The floors of these stores are on a level with the yard; while the rails are 27 feet above. As tip-bottom waggons are used, the arrangement is an excellent one for getting the coal



View of the Exhausting Plant.



from the waggons and storing it with a minimum of labour. With regard to the coke, this is removed in buggies, which run on rails, to a hydraulic crane, by means of which it is raised to the level of the railway for loading into waggons.

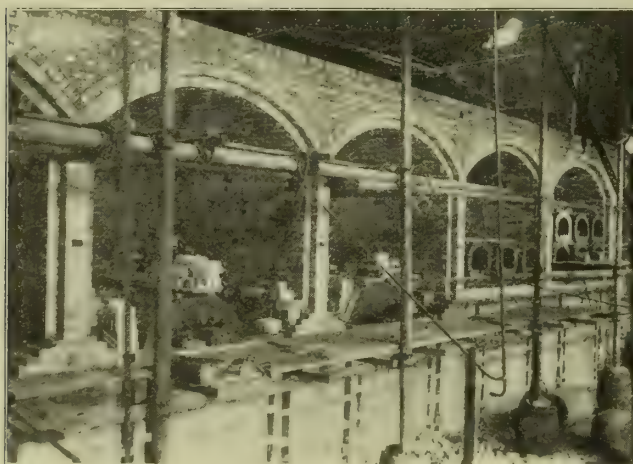
Turning to the retort-houses, the one which is most interesting is No. 2, which contains five through beds of nine retorts (each 23 in. by 16 in. by 20 ft. long), or 90 mouthpieces. These are of the regenerative type, with modern fittings, &c., and were erected last year. The contract for the work was secured by Messrs. Gibbons Bros., of Dudley, who carried out the work in a rapid and successful manner. The photographs show the settings at different dates during their construction. These enable one to see what quick progress was made. As a matter of fact, the work of demolishing the old settings was begun on April 7; and by June 5 the whole of the brickwork of the new benches had been completed. At present, No. 1 house contains ten through beds of seven retorts (22 in. by 16 in. by 20 ft. long), or 140 mouthpieces. They are of the direct-fired type; but there is a probability of their being replaced during this year by nine through beds of nine retorts (23 in. by 16 in. by 20 ft. long), or 162 mouthpieces. These will be on the regenerative principle, with modern fittings, hydraulic mains, retort-house governors, and tar-towers. When this work has been carried out, the maximum make of the two houses will be about 2 million cubic feet per day. A third house has not yet been completed. The charging is all done by hand—six-hour charges in the new, and eight-hour in the old house. The coal that is being used just now is from Yorkshire and Durham. It will be observed that the combined producing capacity of the coal and carburetted water-gas plants will be equivalent to 4 millions per diem.

Conspicuously clean and orderly in a works that are throughout notable for their cleanliness, is the carburetted water-gas house—a capacious building in which there are four sets having a combined capacity of over 2 million cubic feet a day. The engines and blowers, however, are only sufficient for working two

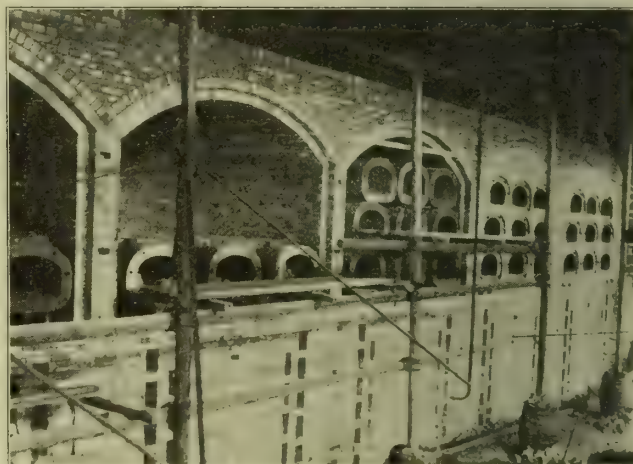
sets at a time. At present, the coke for the water-gas plants is raised by hydraulic crane nearly to the top of the house and then dropped down shoots for loading into the barrows; but a start is about to be made with the erection of an overhead coke-hopper which will run right along one end wall of the house, and will have eight or ten outlets. This will facilitate storage of the coke and the handling of it. The carburetted water gas passes from the plant to a small relief holder.

The exhausting plants for both coal gas and carburetted water gas are housed under one roof; but each is connected to 18-inch yard mains, and deals with the gases separately. The coal gas plant is in duplicate, each set consisting of a horizontal engine, fitted with one 80,000 and one 60,000 cubic feet per hour exhausters. The water-gas exhausters are in duplicate also; the capacities being 50,000 and 30,000 cubic feet per hour respectively. Adjoining are the station meters—one for coal gas, the other for water gas, and each having a capacity of 80,000 cubic feet per hour. At the outlets of the meters, the two gases combine, and pass forward to the gasholders, of which there are two—one of 850,000 and the other of 360,000 cubic feet capacity, thus giving a total storage of 1,210,000 cubic feet. In the coal-gas meter house, are installed the station-governors from which the gas passes to the district through two mains, one 30-inch and the other 18-inch. On these mains is fixed a "Simplex" carburettor. This apparatus is not used as an enricher in the strict sense of the word; the object of it being to volatilize ordinary paraffin into the gas, or, in other words, to increase the amount of vapours of naphthalene solvents.

As to the washing and scrubbing arrangements, these include a tar-extracting washer and a naphthalene extractor. There is also a "Standard" washer-scrubber of a capacity of 2 million cubic feet a day. There are two complete sets of purifiers, one for coal gas and the other for carburetted water gas. Each set consists of four cast-iron boxes of the ordinary lute type, fixed in line, with an 18-inch centre-valve between the two centre boxes.



May 10, 1909—Completion of the Arches.



A Week Later—Building-in the Retorts.

#### The New Settings in Course of Construction.

The boxes are 25 ft. by 25 ft. by 5 ft. The full length of one side of each of the sets is covered by a shed 137 ft. by 21 ft. 9 in. Oxide of iron is employed for purification.

The offices, which are situated at the entrance of the works, are substantial and commodious. Clerks' offices are on the ground floor on either side of the gateway; and there is also an inspectors' room, in which each inspector is provided with his own desk. Passing upstairs, there are the Engineer's office, an excellent lecture room, a large, well-lighted drawing-office, and capacious stores and show-rooms. There is also a comfortable tea-room for the staff, and a well-fitted photometer-room. The Company have, in addition to this, an admirably arranged show-room at Crouch End, with an office for the collectors.

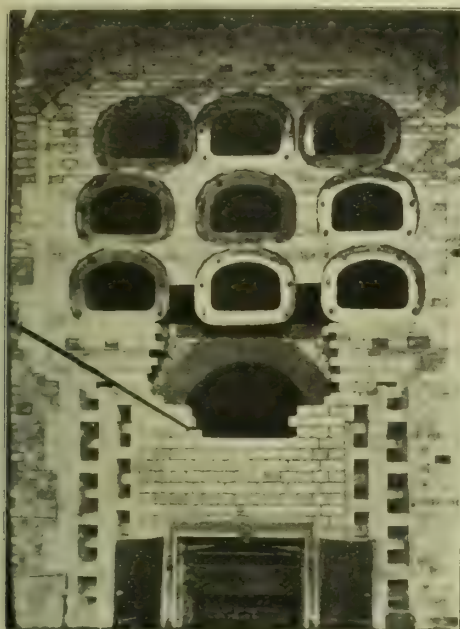
Mr. Buckley has only been at Hornsey some fifteen months; but already there are plenty of evidences of his activity to be seen. With an increasing consumption such as the Company are experiencing, there should be full scope for his energy for a long time to come.

On the completion of the inspection, the large party assembled in the stores for refreshments; and this pleasant function was followed by a musical programme, which was arranged by Mr. W. E. Roberts, the Secretary to the Company. Among those taking part were Mr. H. Ratcliffe, Chemist; Messrs. Tasker Speed, J. T. Horn, and W. Gowing, of the Clerical Department; Mr. George Barker, of the Rental Department; and Mr. Roberts. A number of old English glees were sung by the first four gentlemen, which were thoroughly enjoyed by the audience.

Mr. BUCKLEY, then, on behalf of the Directors of the Company, extended to the visitors a hearty welcome to the works, of which, he remarked, they were already in possession of a concise description, and which they had also had an opportunity of thoroughly inspecting. It was for them to say whether they were pleased or

displeased with their visit to Hornsey. It seemed rather opportune for him to mention at this point that, when the negotiations were proceeding for the visit, one or more members of the Committee of the Association approached him as to the desirability or otherwise of the attendance of lady friends of the members on the occasion. He at once replied that he personally had no objection at all; but he felt he would like to hear what inducement there would be for the ladies to come up to Hornsey, while they did not go to the other works that had been visited. The answer he received was that some of them believed the Hornsey works to be one of the cleanest in the country. With regard to this statement, it would not become him to say whether it was true or not true. The members had seen the works; and they were in a position to judge for themselves. The immediate past twelve months had been an exceedingly busy time for the Company; and perhaps it might not be out of place to quote a few figures to show what had been done. The interior of No. 2 retort-house had been reconstructed; and the rapid and satisfactory manner in which the contract had been performed reflected the greatest possible credit upon the Contractors, Messrs. Gibbons Bros., of Dudley. They commenced on April 7 to take down six through beds of seven retorts, or 84 mouthpieces; and by June 5 they had completed the whole of the brickwork appertaining to five beds of nine retorts, or 90 mouthpieces. The whole of these retorts had been at work during the past winter, and had given most satisfactory results. The old exhausting plant was re-arranged in the present house; and two duplicate sets, especially for water gas, were erected, capable of dealing with a production of about 2 million cubic feet per day. Then, parallel with the purifiers two sheds had been erected for the oxide of iron. A station meter, to pass about 2 million cubic feet of gas per day, had been installed for separately measuring the carburetted water gas; and other minor alterations had taken place. While a busy time had thus been spent on the works, things had been equally active on the district. There could be no possible comparison between the





May 24, 1909—Waiting for the Mouthpieces.



A Sample Setting and Fittings.

attention now given to a gas company's district and what it was twenty-five years ago. Even twelve months back at Hornsey, there were only 21 superintendents, fitters, and boys in the Company's employ; while the number was 67 now. This went to show the intention of the Directors to be progressive and up-to-date. They were determined to do—and, in fact, were doing—everything reasonable to popularize the commodity which they had for disposal. They were not only willing but anxious at all times to give the best possible advice to the consumers, and even do small things free of charge. Some idea of the amount of work accomplished on the district during the past twelve months would be gathered from the following figures. There were 2899 yards of new mains laid, and 544 service-pipes. The net gain of consumers was: Ordinary, 247; and prepayment, 885. Then, the number of cookers fixed was 1,424. With regard to the slot-installation work, he might mention that the whole of it was undertaken by the Company's own employees; and consequently everything was under their direct supervision. The Directors were equally alive to the different times in which their officers and workmen were living, as compared with years ago. For the benefit of the fitters and the outdoor department, they had arranged for the scientific side of their work to be demonstrated by a competent lecturer once a week on the Company's premises; and the past winter's experience of these lectures proved that they were very much appreciated both by the staff and the workmen. The Board had also provided a commodious tea-room for the staff; while the stokers' comforts had not been neglected, as they were well provided with mess, wash, and bath rooms. For the benefit of the workmen, too, garden allotments had been arranged; and 2 or 3 acres of ground had been levelled, and an exceedingly nice grass plot made, on which the officials and workmen might indulge in cricket, bowls, or tennis. With regard to the public lighting, some few words of praise were well deserved. Though it was carried out by the municipal authorities, it was done in a really excellent manner; and certainly what might be called up-to-date street gas lighting was employed. They generally adopted the modern system of inverted gas-burners; and, what was equally important, they kept them in first-rate condition. While he believed it was the proud boast of Hornsey to be one of the healthiest towns in Great Britain, the municipal authorities, on their part, claimed, with some amount of truth, that it was also one of the best lighted. He must congratulate the members of the Association on living in the present enlightened age. He could remember twenty-five years or more ago, when they would not perhaps have been as well received in the different works they visited as was the case now. He could recall an occasion when a certain foreman refused him admission to the photometer-room. Happily, these days were past; and, within reason, he believed that those in responsible charge would offer every facility for what might be known as the junior branch of the profession furthering their knowledge of the industry in which it had been their lot to be cast. He did not intend to detain his hearers much longer; but it just occurred to him that he might offer one or two words of advice to those who might within the near future be placed in responsible charge of a gas-works. The first thing to be done on taking charge of a works was to see that everything was well organized. The second was to see that the works were kept clean. The third was to see that every building, piece of apparatus, or section of plant was capable of meeting the maximum demand, or to find out the reason why not. The fourth was to see that the assistants, the foremen, and the workmen were able to perform the duties they were engaged on, and, further, to ascertain that they received the maximum amount of pay that might be given in the district. In conclusion, he would venture

to express the hope that the members would retain a pleasant recollection of their visit to the Hornsey Gas-Works, which some of those present were proud to be associated with.

The PRESIDENT said they were very pleased to be there that afternoon, making the acquaintance of the Hornsey Gas-Works. This was not the largest works they had visited; but it was certainly one of the cleanest and most orderly. He was glad to note that their progress in output (it had increased from 331 millions to 497 millions in nine years) was continuous, and that the same applied to the public lighting. There was no set-back there; the number of public lamps having increased in two years from 1579 to 1599. Then he was pleased to observe they had gone in for outside shop lighting by high-pressure gas, and also that they were "alive to the times" and not afraid to do small things free of charge. There were evident signs of good organization on all hands. They were reminded that this was one of the early works to adopt carburetted water gas—viz., in 1895. The educational and scientific side of the staff was not neglected; and the lectures provided for the staff and workmen were appreciated. This appealed to him very much. He could assure Mr. Buckley that his words of advice that afternoon to those who would in the near future be taking upon themselves responsible positions in charge of works would not fall upon deaf ears, but would bear fruit. He was glad Mr. Buckley was no party to the "closed door" system that might have prevailed many years since. His experience as a leader among "juniors" was that throughout the country "open doors" was now the order for Junior Associations; and in his opinion it would be a sad day for the industry if young men, full of zeal and energy, desirous of obtaining knowledge that they could afterwards bring into practical use in their daily calling, were barred from entrance into the works. He did not believe, from his happy knowledge of the gas engineers of the present day, that such a thing would ever obtain. In conclusion, he trusted that the 2 acres of playing fields would soon be appropriated for further extensions. He foresaw a great future for the Hornsey Company.

Mr. L. F. TOOTH (Senior Vice-President) said it had given him a great deal of pleasure to be present that afternoon. He was particularly struck with the exhauster-house; it being, in his opinion, one that any works in the country might be proud of.

Mr. D. W. WINSLOW moved that a hearty vote of thanks be given to Mr. Buckley for his kindness in throwing open the works that afternoon and giving his personal guidance. What he had seen had given him the impression that everything was carried on at a high pitch of organization. He was particularly struck with the cleanliness and method everywhere, and noticed the ease with which the coal was brought into the works from the Great Northern Railway adjoining, and dropped through the bottom of the trucks into the retort-house—thus obviating the necessity of hand or machine labour.

Mr. F. AINSWORTH seconded the resolution, and included the kind hospitality they had received.

The resolution, with which Mr. Roberts's name was coupled, was carried with acclamation.

After the concert, Mr. BUCKLEY moved a vote of thanks to Mr. Roberts and the members of the staff who had provided such an excellent programme.

The PRESIDENT seconded the vote, which was heartily accorded, and acknowledged by Mr. ROBERTS.

On Thursday Mr. J. H. Troughton's year of office as W.M. of the Etheldreda Lodge, No. 2107, Newmarket, will be completed by his installing Bro. Charles Waugh as his successor.



## MIDLAND JUNIOR GAS ASSOCIATION.

### Fifth Annual Meeting.

The Fifth Annual General Meeting of the Midland Junior Gas Engineering Association was held at the City of Birmingham Technical School, Suffolk Street, last Saturday afternoon—Mr. A. O. JONES, of West Bromwich, the President, in the chair. Two of the honorary members—Mr. B. W. Smith (Walsall) and Mr. H. E. Copp (West Bromwich)—who attended the meeting, were accorded a hearty welcome.

#### THE REPORT AND BALANCE SHEET.

The HON. SECRETARY (Mr. H. E. Temple) read the report of the Council and the balance-sheet. The former stated that at the present time there were 133 ordinary members of the Association, as compared with 140, 132, 120, and 110 respectively for the four previous sessions. Resignations had been received from 10 members; and 17 had retired from membership under the provisions of Rule 6. The new members elected during the present session numbered 18. The programme had, as far as possible, been carried out as arranged; and the Association were greatly indebted to the President for an able and interesting address, and to the readers of papers for the high standard of the technical matter that had been presented, and which had always given rise to well-sustained discussions. The visit to Beckton was greatly appreciated and enjoyed by those members who were able to be present; and the sincere thanks of the Association were tendered to the Directors of the Gaslight and Coke Company, who extended the invitation and their hospitality, and also to Mr. J. N. Reeson and those members of his staff who conducted parties round the works. In the afternoon, by permission of Mr. W. J. Liberty, and under his guidance, the subways of the City of London, used for the distributing mains of gas, water, and electricity, were explored and inspected. The Association were also greatly indebted to Mr. Fletcher W. Stevenson and to the Directors of Messrs. Hardman Limited, for the facilities afforded to visit the respective works, and for the generous hospitality extended to them, as well as to the Sutherland Meter Company, Limited, whose works the members would have an opportunity of visiting next month. The Council wished to place on record their sensibility of the great loss the Association had sustained by the death of Mr. George Hampton Barber, an honorary member, who always had the interests of the Association at heart. The President attended the annual meeting of the Midland Association of Gas Managers on the 3rd inst., when certain alterations of the rules were under consideration, one of which was for the inclusion of associate members, and read as follows: "Associate members shall be persons who, by reason of their professional knowledge or experience, are, in the opinion of the Committee, qualified to assist in promoting the objects of the Association, and who shall not be engaged in trade." The Council were of the opinion that this rule, as worded, was likely to affect the membership of their Association, and suggested that the Senior Council be approached with a view to receiving a deputation from the Junior Association to obtain further information and to discuss the matter. The statement of accounts prepared by the Hon. Secretary, and audited by Mr. J. H. Hardy, showed that the financial position of the Association continued to be most satisfactory; the balance in hand being practically £34.

The adoption of the report and accounts was proposed by Mr. R. S. RAMSDEN (Burton-on-Trent), seconded by Mr. F. J. WARD (Knowle), and agreed to.

#### PROPOSED ASSOCIATE MEMBER RULE OF SENIOR ASSOCIATION.

The PRESIDENT, referring to the report, said it was thought by the Council that the wording of the proposed rule for the inclusion of associate members in the Midland Senior Association might affect their Association, as members might naturally prefer to read papers before the seniors rather than submit them to the juniors. They were therefore of opinion that they might approach the seniors, with a view to such alteration of the wording as would exclude juniors. When he attended the meeting, he was assured by the President that the rule was not intended to affect the Junior Association, but was meant to apply to men of eminence in the profession. The question was whether the wording could be so altered as to show what was intended.

Mr. WARD asked whether the Council had anything in their minds with reference to what they meant to put before the Senior Association.

The PRESIDENT replied that in the first place they would have to see whether the deputation would be received. When they knew this, it would be time to decide what to say. Perhaps an informal talk would reveal some way out of the difficulty.

The HON. SECRETARY said it was felt by the Council that the qualification set forth in the rule was a little ambiguous; and the deputation would simply ask to be enlightened as to the meaning of the words. Then, of course, the matter could be still further considered.

Mr. WARD said he attended the last meeting of the seniors; and he was bound to say he came to the conclusion that the seniors themselves did not know what was intended.

Mr. H. E. COPP (West Bromwich) remarked that he must confess the last speaker had "hit the nail on the head." His own

idea was that the associate membership should be purely complimentary, and should be conferred as a mark of appreciation on certain gentlemen whose services to the gas profession had been valuable. He thought there was no doubt the Junior Association would be rather premature in taking action before they had seen what the Senior Association intended to do in the matter. He was strongly against the idea of extending the membership of the Senior Association in any large degree, because he happened to be the over-burdened Hon. Secretary. At their meetings, they had an average attendance of between sixty and seventy. The Junior Association would, to his mind, be quite safe in leaving the matter until they saw precisely what the Senior Association intended to do. The rules were not yet accepted.

The PRESIDENT said Mr. Copp's remarks put the matter in a rather different light; and he agreed that that they might safely leave the matter over for the present, and see what the final proposal of the seniors would be.

Mr. COPP: Of course, my remarks are entirely without prejudice as regards the Senior Association. I should not like to compromise the action of the Association in any way; and I am speaking quite unofficially.

The PRESIDENT: Then perhaps it would be quite as well to have a deputation.

Mr. C. C. BARBER (Nechells) suggested that they should wait and see what the seniors intended to do.

Mr. COPP: I think you may take it that in their final form the rules will not be ambiguous at all. They will not be finally accepted until the autumn.

Mr. RAMSDEN: Could we get over the difficulty for the present by writing to the Senior Association, saying we thank them for allowing us to consider the proposed alteration of the rules, and putting our case before them—adding that we shall take it as a favour if, in modifying their rules, they will arrange the wording so as not to deprive the Junior Association of its members?

#### ALTERATION OF RULES.

The PRESIDENT said there were on the agenda two notices of proposed alterations in the rules. The first was with regard to the qualifications of members, the original Rule 4 was to include "any person holding a recognized official position engaged at a gas-works, &c.;" and the alteration was to "any person holding a position at a gas-works, &c." Persons holding more humble positions on works, if they felt sufficient interest in their work to join such an Association, should be encouraged. At present there was a difficulty in knowing where to draw the line. The second alteration was to Rule 6; and it was to the effect that the subscription should be 5s. per annum, to include a free copy of the "Transactions" for the current year. The change was proposed by the Council on account of the good balance-sheet.

Mr. WARD, in proposing the alteration to Rule 4, said he was decidedly of opinion that anyone having sufficient interest in the Association to pay up the subscription, and being engaged in a gas-works, &c., ought to be accepted as a member.

Mr. J. HEWETT (Birmingham) seconded the proposal, and said they would welcome anyone who would come and take part in the discussions.

The motion was carried.

The alteration to Rule 6 was then agreed to, on the proposition of the PRESIDENT, seconded by the HON. SECRETARY.

#### ENGLISH JUNIOR ASSOCIATIONS JOINT COUNCIL MEETING.

The PRESIDENT said the Secretary and he had just attended the Joint Council meeting in London. Among several things proposed, were two on which they desired to have the opinion of the members. He should say that nearly all the items on the agenda were left over for further information to be obtained. There was no voting that was binding in any way on the Association. One point raised was the transfer of members from one Association to another. If a member of one Association who had paid his subscription moved to another part of the country, he should have the option of joining the nearest Junior Association if he liked, without paying a further subscription. It would be a good thing. It met with the approval of the other delegates; but the confirmation of the members of this Association was needed of the vote given on their behalf. The only other resolution actually passed was that a joint conference of Junior Associations should be held in Birmingham in May of next year, and that the Secretary of the Midland Junior Association should see what arrangements could be made to entertain them, in the way of a gas exhibition or something of that nature. The question of printing the whole of the "Transactions" of the different Junior Associations in one volume was held over.

The action of the delegates was confirmed, on the motion of Mr. A. N. COMELY (Windsor Street), seconded by Mr. R. J. ROGERS (Birmingham); it being agreed to omit mention of a "gas exhibition" from the resolution.

#### ELECTION OF OFFICERS.

The following officers were elected for next session.

President.—Mr. R. S. Ramsden (Burton-on-Trent).

Senior Vice-President.—Mr. H. E. Temple (Nechells).

Junior Vice-President.—Mr. R. J. Rogers (Birmingham).

Hon. Secretary and Treasurer.—Mr. G. C. Pearson (Birmingham).

Hon. Auditor.—Mr. J. H. Hardy (Coventry).

New Members of Council.—Mr. W. H. Johns (Saltley), Mr. F. J. Ward (Knowle), and Mr. C. C. Barber (Nechells).



## COMPETITION AND THE DEVELOPMENT OF GAS SALES.

Mr. B. J. BELL (Birmingham) subsequently read a paper entitled "Competition and the Development of Gas Sales;" and this will be found on page 738. The report of the very lengthy discussion to which it gave rise is, owing to want of space in the present issue, left over until next week.

A vote of thanks was accorded to the author, on the motion of the PRESIDENT, seconded by Mr. W. S. SMART (Saltley).

## MANCHESTER JUNIOR GAS ASSOCIATION.

## Visit to Wigan.

The members of the Association paid a visit to Wigan on the 5th inst., and first inspected the Kirkless works of the Wigan Coal and Iron Company, and later in the day went through the gas-works of the Wigan Corporation.

On arrival at the railway station, the party were met by Mr. Betley, the Assistant-Engineer of the Wigan Gas-Works, and conveyed by special cars to the Kirkless works, where the coke-ovens, &c., are situated. Here they were heartily welcomed by Mr. Percy, the General Manager, and his staff (Messrs. Byrom, Christopher, and Mather), who, after dividing the party into groups, conducted them over the works, describing the plant and explaining the methods as they proceeded.

The extensive coke-works were first visited; the arrangements for elevating the washed slack and pressing it into huge cartridges of  $5\frac{1}{2}$  tons weight, being specially commended. The charging and discharging of the ovens was done for the benefit of the visitors. The carbonizing tank consists of three batteries, each containing 44 Semet-Solvay coke-ovens, which are capable of producing a weekly output of 3600 tons of hard, close-grained coke, made of washed and ground Arley slack. Each oven is 33 ft. by 6 ft. by 17 in., and burns off a charge of  $5\frac{1}{2}$  tons of slack in about 22 hours. The following is a percentage analysis of the coke: Ash, 10.94; sulphur, 1.40; volatile matter, 0.60; fixed carbon, 87.06. The excellent character of the coke was remarked upon by the visitors, who expressed the wish that they had such coke for their carburetted water-gas plants. The bye-products obtained per week are approximately: Sulphate of ammonia (24.8 per cent.  $\text{NH}_3$ ), 48 tons; tar, 200 tons. Some of the coke-works liquor is worked up to concentrated ammoniacal liquor of 16 to 18 per cent.  $\text{NH}_3$ . The surplus gas, having a calorific value of about 500 B.Th.U. per cubic foot, is used, with the waste heat from the ovens, to generate steam for power plants. Enough steam is obtained in this way for the whole of the coking plant, sulphate making, power for the fitting-shop, saw-sheds, and pumps—the last dealing with a total of 2 million gallons per day.

The iron and steel works were next inspected, where the huge blast-furnaces, ten in number and 80 feet high, much impressed the visitors. Here are made the following varieties of metal: Basic pig iron, foundry and forge pig iron, spiegeleisen, silicon spiegel, ferro-silicon, and ferro-manganese. By the courtesy of Mr. Percy, a 50-ton charge was run off from a furnace for the members' benefit, during the inspection. As the stream of white-hot molten metal, at a temperature of  $2200^\circ$  Fahr., passed through the channels into a huge wheeled receptacle, the visitors could not refrain from showing their appreciation of such a spectacle, and of the kindness of Mr. Percy in providing it.

After the members had partaken of some refreshment,

Mr. HEALD (Preston) proposed that thanks be given to the firm and to Mr. Hewlett (the Managing-Director), for allowing the visit; also to Mr. Percy and his staff, for the able way in which they had described the various parts of the plant. He specially referred to the kindness and ability of their guides, two of whom (Mr. Byrom and Mr. Christopher) are joint authors of a treatise on coke-ovens.

Mr. MASSEY (Oldham) seconded the proposition.

Mr. D. V. HOLLINGWORTH (Salford), who took for the day the place of the President (Mr. J. Taylor), put the motion; and it was carried with applause.

Mr. PERCY, in reply, said he hoped the visitors would note that all the slack coal was used in the coke-ovens, and all the good coal sold to gas-works. Alluding to the observations of some of the members as to the good quality of the sulphate of ammonia, he said he had been asked if he had had a special "brew" for their benefit. He wished to say he had not. Every day's "brew" was special—specially good.

The party were then taken by tramcar to the gas-works, where the Engineer and Manager (Mr. J. Timmins, M.Inst.C.E.) cordially welcomed them, and, with his Assistant (Mr. Betley) conducted them round the works.

The carburetted water-gas plant was first visited, and proved very interesting to most members. All parts of the works were in turn inspected and equally well described; the neatness and orderliness of the place being often commented upon.

After a thorough survey of the works had been made, the party were entertained at tea by the Gas Committee and Mr. Timmins. The repeat over,

Mr. HOLLINGWORTH, after apologizing for the absence of the President and the Hon. Secretary (Mr. J. Alsop), said the fact of

the Gas Committee of the Wigan Corporation and men of the eminence of Mr. Timmins and Mr. Percy having honoured and welcomed the Association in the way they had done, was a matter of pride for the members. The visit had lifted the Association a step higher.

Mr. GINMAN (Birkenhead), in moving a vote of thanks to the Gas Committee, Mr. Timmins, and Mr. Betley, said he hoped the members would appreciate the great kindness Mr. Timmins had manifested towards them, not only by showing them round his own works, but also by using his influence to enable them to see the coke-ovens and iron-works, as it was a difficult thing to get into these works.

Mr. CARTER (Garston), in seconding the motion, remarked that, though all the retort-charging at the gas-works was done without machinery, the results obtained at Wigan would compare very favourably with those of any gas-works in the country. He thought Mr. Timmins and Mr. Betley were to be congratulated on getting such good results with so little mechanical assistance.

The motion having been cordially agreed to,

Mr. TIMMINS, in reply, said he was pleased to think the members had so much enjoyed the visit to Wigan. Everything on the gas-works was up-to-date, with the single exception of the retort-house; and he hoped soon to modernize this. Indeed, it would have been done long ago, but there was a strong feeling in his Committee (with which he quite agreed) that the introduction into the retort-house of labour-saving devices was not desirable, when there was so much unemployment in the town as there was in Wigan just then.

Mr. BETLEY also responded, and said he was convinced that the day's programme had been something of an eye-opener to the members.

## ELECTRICAL POWER HOUSES AT NIAGARA.

An interested audience, consisting of members of the Association of Engineers-in-Charge and some visitors, listened last Wednesday evening, at St. Bride's Institute, E.C., to a lecture by Mr. Jacques Abady on the "Niagara Falls and their Electrical Power Houses." Fresh from a visit to the States, Mr. Abady had every point of his subject at his fingers' ends, and made all the details shown on a long series of lantern slides abundantly clear. The lecture was arranged for at a moment's notice, in place of one on "Boiler-House Practice" which Mr. Abady had undertaken to deliver, but had been unable to prepare owing to his absence from England.

In a few general remarks at the outset, it was pointed out by the lecturer that the question of electrical power assumes a somewhat different aspect in America from that which it occupies in this country—chiefly owing to the difference in the character of the buildings. Very many of the buildings there are, as is well known, constructed on a vast scale, and are provided in the basement with a power station supplying heat, power, and light. In New York alone, there are said to be about 7000 buildings of this type; and these represent a good slice cut out of the possible business of a central station. This, in his opinion, is one of the reasons why electricity is higher in price in many parts of America than we are accustomed to over here.

An interesting point brought out in the course of the lecture was that 25,000,000 tons of water per hour pass over the Falls; and this is estimated as being equivalent to nearly 5,000,000-horse power. Under an arrangement which has been made, the Ontario Power Company of Niagara Falls are to make a minimum charge of 36s. per horse power per annum for current supplied to the Hydro-Electric Commission for transmission to various towns in Ontario. But to this has to be added the cost of distribution, &c.; so that power users will have to pay probably 80s. per horse power per annum in Ontario as a minimum. This rate will be increased if the demand is less than that on which the minimum charges for current and transmission are based. At the close of his lecture, Mr. Abady had some good things to say about the States. "It is," he remarked, "a matter of absolute bewilderment and wonderment where all the capital and support comes from for the works put up there every day. In America, the last thing they have to trouble themselves about is anything coming in from the outside. Whether it is the protective tariff, or whether it is abundance of natural resources, I do not know; but the business aspect seems to be very much easier and less competitive than it is here."

**Gas Coke or Anthracite for Suction-Gas Plants.**—There has been some correspondence in the "Electrical Times" regarding the use of gas-engines in electricity stations. One of the correspondents who has charge of an electricity plant driven by suction-gas engines, referring to a statement by a previous writer, says that that writer "is not conversant with the working of suction-gas engines, or he would not say that they can only be worked on expensive anthracite coal. For the past eighteen months we have been using ordinary gas-works coke, costing (delivered) 10s. 6d. per ton. Our fuel-costs for this time (including stand-by losses and uneconomical loads) are 0.2d. The reliability of the plant has also been vastly improved since anthracite was abandoned."



COMPETITION AND DEVELOPMENT OF GAS SALES

By B. J. BELL.

[A Paper submitted to the Midland Junior Gas Engineering Association.]

During recent years, a great change has taken place in the business methods of the gas authorities; and although it is probably still true that profits are made in the retort-house, we must admit that if they are to be retained the commercial side of the undertakings must be thoroughly organized. Not many years ago, good carbonizing results and a low leakage account were the most important factors in the working of the concern; but now that competition is met in every department of gas supply, it is absolutely necessary, if gas is to retain its present position, that consumers and their requirements should be considered in much the same way as any ordinary manufacturing business caters for its customers. While the demand for gas is greater year after year, there is also a growing increase both in the number and output of electricity supply stations; and the endeavour of the latter to obtain more substantial loads is necessitating greater activity on the part of the gas industry generally.

It is not my intention to enter into comparisons of statistics in this paper, but it is interesting to note that the number of Board of Trade units sold for all purposes in the United Kingdom in 1895 was approximately 30 millions, while in 1908 the figures had increased to nearly 955 millions; and the number of undertakings, from 60 to 455. On the other hand, the make of gas according to the 1895-6 returns is given as 121,422 million cubic feet, and in 1907-8 188,486 million cubic feet; the number of undertakings increasing from 632 to 771 in the same time. A method adopted by electrical engineers for comparative purposes is that of reducing connections made to their equivalent in 8-candle power 30-watt lamps; and though the value of these figures is questioned by those responsible, they are a means of showing progress made. The following diagram has been arranged upon this basis, from the figures given in Garcke's "Manual of Electricity Undertakings," and demonstrates the growth in the number of connections made during the past twelve years.

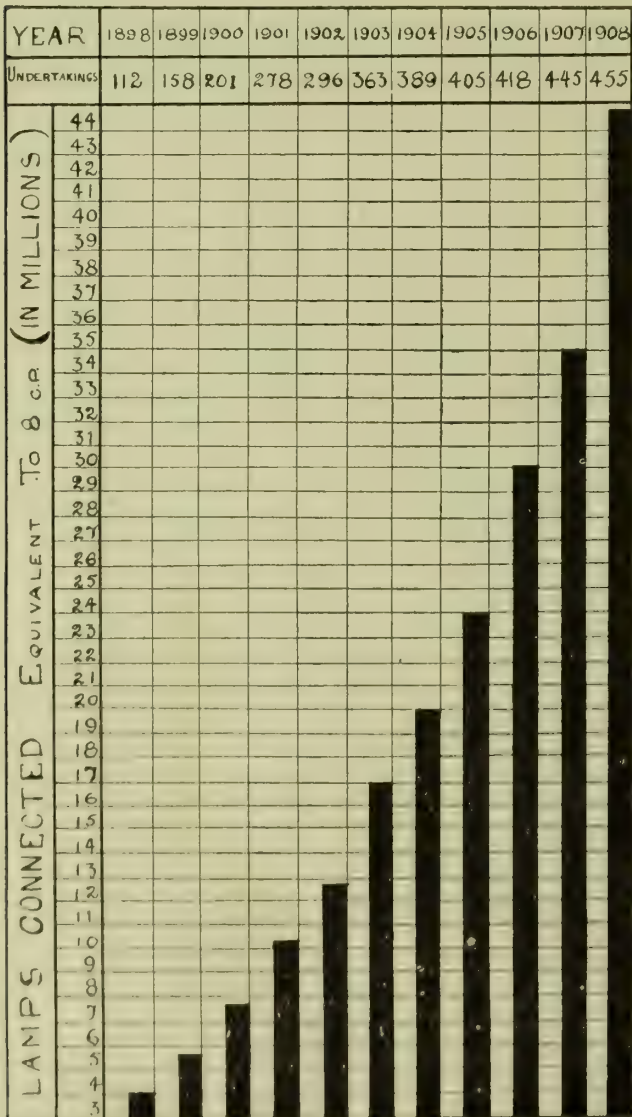


Diagram No. 1.

Before leaving this matter, it may be mentioned that, taking seven provincial towns—Birmingham, Bolton, Bradford, Glasgow, Leeds, Liverpool, and Manchester—the total sales for lighting

and power purposes have been doubled in the five years ending 1908; the Birmingham undertaking alone having increased its output nearly 300 per cent. in the same time. The following diagram shows this increase at a glance.

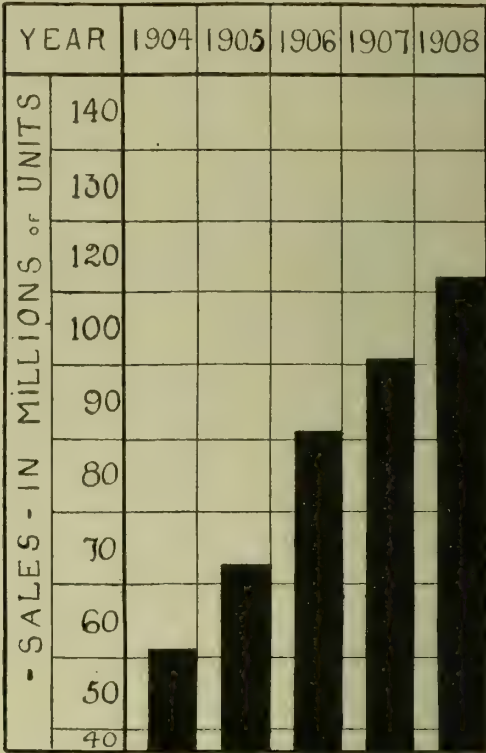


Diagram No. 2.

Obviously, these facts must be taken into consideration as pointing to the increased competition to be met with, though at the same time we have to remember the increasing prosperity of gas undertakings, which demonstrates the popularity of gas with the public generally.

The methods of charging for electric current are varied; and all manner of propositions have been brought forward and tried at different times, in order to obtain greater demand. Consequently, we have that known as the Wright system, which is a fixed rate for the first period of use and a decreased price for current used after that time; and charges are also based on the maximum demand, or, again, on a contract price and a small charge per unit. These methods do not require much consideration, as the flat-rate, with a sliding scale for large consumptions, is now more generally adopted.

Recently, however, a novel method of obtaining a class of consumer not hitherto secured has been introduced at Rotherhithe by the "Fixed Price Company." Under this scheme, the Company buys energy from the local supply station, transforms it, and supplies workmen's dwellings right along the terrace at an inclusive charge. The O.S. system of wiring is adopted, and consumers are expected to have at least three rooms wired; the prices charged for the service being 2½d. per light per week from April 1 to Oct. 31, and 3½d. per week for the remainder of the year. As the tenant is expected to have at least three lamps, and as these are tantalum lamps of 12-candle power, it will be easily seen that the consumer would be much better off with a prepayment gas-meter; for if an average of 10,000 cubic feet per annum were used, the cost, at 2s. 9d. per 1000 feet, would be 27s. 6d., against a minimum of 39s. under the proposed rate for lighting only, while the figure for gas would include that used for cooking purposes also. Under the agreement, the tenant is expected to purchase his own lamps for renewals; and although this forms a check against excessive use, the maintenance problem will considerably hamper the new venture, as the consumer will not appreciate the extra expense incurred.

Ordinary free wiring, however, has been adopted to a considerable extent; and this is more especially pushed in developing districts—the builders being persuaded to have the wiring installed while the house is in course of construction. An electricity supply company, which is looked upon as being one of the most successful in its operations, pushed free wiring of new houses to a considerable extent; the builder generally being quite willing to have his houses wired. But very often when the tenant took possession, gas was preferred. An agent of the electric company was speedily informed when a house had passed from the builder's hands, and every effort was made to secure the contract. Needless to say, the prospective consumer received the same attention from the suppliers of gas; and the fact that free wiring is practically abandoned in that district is sufficient to prove that the scheme was not successful. It is still adhered to, however, by some undertakings; and the cost of the installation is generally passed on to the purchaser of current, either as an extra charge for the current (this in some cases being 1d. or 1½d. per unit), or at prices varying from 3d. to 6d. per point. There is no doubt that, by



whatever name the system is known, the consumer pays in some way. The class of house selected for free wiring is not generally such as would adopt prepayment gas-meters; and it would not be worth while for gas authorities to enter into competition with the system by piping houses under such terms. The problem of free wiring is one for which experience is the best solution; and many electric supply authorities have, after sinking considerable capital in this way, abandoned the scheme.

When gas undertakings proved the enormous success of the prepayment meter, their competitors considered that there was a field to be exploited in the same direction, and electric prepayment meters have been introduced. Many of these installations have been fitted in houses where prepayment gas-meters are in use; and an investigation proved that, while the amount obtained for electricity did not exceed 6d. per meter per month, the gas-meters collected from 2s. to 3s. in the same period. The electric lamps were used in the scullery and bedrooms; but for the living-rooms gas was the preferred illuminant. In the offer for these installations, it was stated that the charge was based on 8-candle power lamps which could be used for eight hours for 1d. But in some districts five or six hours is the length of time an 8-candle power lamp will run for the same sum; and where every item of expenditure is so important, working-class consumers soon recognize the high cost of their light at these rates. The only conclusion to be derived is that, for this type of consumer, apart from the fixed price scheme (still in an experimental stage), there is no probability of electricity proving a serious competitor.

Houses of a better class must therefore be the field in which electricity will be pushed; and it is here that a careful watch must be kept in the future. There is a tendency on the part of architects to specify electric light in the estimates for houses they design; and it is only to be expected that the average man will accept without question recommendations made in this way, if he is not informed of the possibilities and cheapness of gas. It has been mentioned by those supposed to think otherwise, that it might be better for electric supply authorities to frankly recommend gas for all domestic purposes except lighting; and it is only that this would be a confession of weakness which prevents them acknowledging that the heating and cooking appliances now on the market are not favourably received by the majority of the public. The generation of heat by resistances presents difficulties which have not been yet solved; and if the apparatus is to be of permanent value, it must be able to withstand the hard wear and tear incidental to use in the kitchen. This cannot be claimed for the present electrical cooking apparatus, as the elements are likely to break down, whether the heat is generated by wire coils or thin resistance strips. The appliances are being improved, but have not reached the stage of perfection for even electrical people to speak very enthusiastically of the possibility of their being of such universal use as gas-cookers. The items are very costly to purchase; and it follows that hire and hire-purchase rates will be proportionately high where these are in force, and must be such as will deter the average consumer using these appliances—apart from the high consumption of current for the work done. Small copper kettles of only 3 pints capacity are listed about 32s., and these consume upwards of 800 watts; while a hot-water urn of 1 gallon capacity, which will consume upwards of 1100 watts, costs £3 7s. 6d.

It would appear that the use of current for domestic purposes is restricted to such articles of general use as electric irons. But even an ordinary household iron weighing 5 lbs. is listed at 25s., and uses about 280 watts; so that one hour for ironing with electricity, at 3d. per unit, would cost over 3d., while a gas-iron obtainable for 7s. 6d. would use about 6 cubic feet per hour, and with gas at 2s. 6d. per 1000 cubic feet would mean an outlay of 0.18d. per hour. An appliance recently introduced is provided with four boiling-rings and a small cooker with an available space of 9½ in. by 10 in. by 14½ in.; the cooker alone using nearly 2 units per hour. Altogether, we may take it for granted that the high price and great depreciation of these appliances, along with the cost of working, will not prove attractive to consumers at present. Even heating apparatus labours under the same disadvantages; and whether convectors or glow-lamp radiators are recommended, the price, compared with gas-fires, places them beyond the reach of the general public.

But, at the same time, we must recognize that it is not sufficient merely to rely upon these factors. Consumers must be educated to use gas more fully for domestic purposes. It is a remarkable fact that this side of the business has to a great extent been left to the makers of gas cookers and appliances; and there are few towns which have not at some time had the benefit of cookery lectures given by the manufacturing firms. There is no doubt the present popularity of the gas-cooker is due to some extent to this pioneer work. Now, however, when it is not so profitable to hold exhibitions, these are not pushed as they once were; and it is a question of some importance as to whether the gas authorities, by combined action in different areas, should not take up the work in a more systematic manner.

The number of gas-cookers in use is increasing each year; but we must see to it that these are used to the greatest possible extent, and an occasional series of cookery lectures would no doubt have a beneficial effect on consumption. One difficulty experienced is that houses are built without any provision in the way of space for gas-cookers; and it is sometimes nearly impossible to find a position in which one can be conveniently fitted, as the kitchens and sculleries are cramped to provide more spacious reception-rooms. Under these circumstances, some awkward

place is selected, as may best be arranged; but the ideal position is that now occupied by the kitchen coal-range. A design was submitted to builders in which, by the arrangement of the fire-place, more room was provided, and a space was left next to a small coal-range where the gas-cooker could be fixed. The place provided was fitted with enamelled back and sides; and the supply-pipes were laid in position ready for the cooker to be connected. But the scheme was not taken up very favourably, owing to the extra width required in the fire-place. There should be some possibility, however, for a fire-place of this type being arranged for districts where closed ranges are used; and the convenience provided thereby would in the end be appreciated.

The use of gas wash-boilers should be encouraged. Where they have been brought prominently before the notice of those responsible for the design of houses, they have proved exceedingly useful; and large numbers have been installed, and are giving great satisfaction. As the boilers can be purchased and fitted at less cost than the ordinary set-pot, builders are not difficult to persuade to instal them; and a good gas consumption results in this way.

The more general use of gas-fires is somewhat retarded by the fact that supply-pipes are not fitted in convenient positions for the purpose; and the cost and trouble incurred in the process deter many consumers from adopting them as a means of heating their homes. The only way of overcoming this difficulty is to arrange the supply-pipes so that gas-fires may be readily fitted in the more important rooms. Perhaps the best method is to have a separate supply for cooking and heating stoves and wash-boilers; and if a lower rate could be granted for gas used by these appliances, a secondary meter of the "Rotary" type would be a cheap method of measuring the amount consumed.

These "Rotary" meters occupy but little space, and register with sufficient correctness for the purpose. Perhaps it is expecting too radical a change in present conditions to advocate differential charges; but having regard to smoke abatement problems, it is more than possible that some development in gas supply along these lines may be seen.

Shops and factories require special consideration; and it is very important that the varied requirements of business premises should be carefully studied. As lighting of shop windows by outside lamps has come very much to the fore, every endeavour must be made to instal gas for this purpose. For ordinary shop window lighting, inverted lamps are excellently suited; and where they are supplied upon hire-purchase terms, shopkeepers are not slow to realize the advantage of having outside illumination. There is no doubt that it is a profitable scheme for the gas undertakings; for if the lamps are used on an average of ten hours per week, the consumption of four three-light lamps, using about 12 cubic feet each, would mean the respectable total of 24,000 cubic feet per annum, which compares favourably with the average slot installation.

The supply of gas for power purposes is worthy of great consideration; for it is here that electric supply stations are making headway. Specially low rates are in force for current—in some cases 0.75d. per unit; and contracts are entered into at even a lower scale of charges. We can hardly understand how it is possible to sell current at a lower rate than the total costs, excluding capital charges; but there is no doubt that many of the

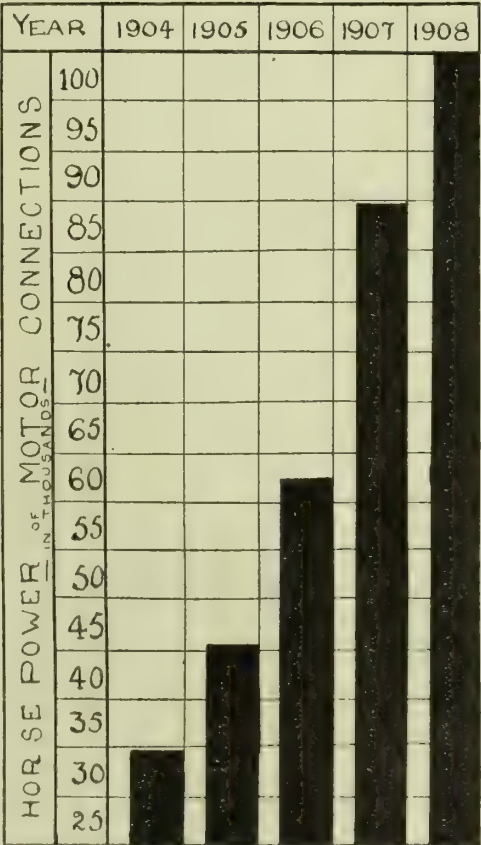


Diagram No. 3.



special contracts are obtained at a price which does not cover these charges. Diagram No. 3 gives at a glance the progress in power connections in the seven towns previously mentioned.

It must not be considered that gas-engines have been displaced to such an extent; but every effort must be made to retain the present power consumption where it is threatened, and also to induce more consumers to adopt gas for this purpose. While electric motors are generally hired or supplied on hire-purchase, it is not often that gas-engines are obtainable upon the same terms; but there seems no reason why competition in power should not be met in this way. The capital outlay is perhaps against such a scheme; but engine makers would possibly arrange terms whereby an allowance would be made for an engine in the rare event of the consumer returning one before the purchase-money was fully paid. Every user of gas for power purposes should be called upon occasionally, and his engine inspected, as the practice of keeping in touch with this important class of consumer means that any cause of dissatisfaction he might have would be readily explained away. If necessary, his engine ought to be indicated, in order to assure him that the machinery in his factory is driven at a very cheap rate.

The use of gas for commercial purposes is becoming a great factor in all manufacturing districts; and it is here that we may look for considerable development. Consequently, an intimate knowledge of the varied trades carried on in the area of supply, and the appliances especially fitted for use in the process of such manufactures, should be brought prominently before the notice of the industrial community. No doubt in the Midlands, where factories are connected with the working-up of metals, much remains to be done before we can rest satisfied; though a large number of lacquering stoves, blow-pipes, furnaces for jewellery and enamelling work, and special apparatus, are in use.

High-pressure gas is eminently suitable for trade requirements, as it abolishes the necessity of air-blowers where high temperatures are required. Though distribution has been carried out at high pressure in different parts of the country, it is not the general practice to supply gas consumers direct from the main with high-pressure gas. But this is to be done shortly in Birmingham, and the development will be watched with great interest. From experiments which have been conducted, it is found that, with high-pressure gas used with furnaces of cheap design, operations which require high temperature can be carried out with satisfactory results.

Now, the main point in the development of the gas industry is the necessity of having, in connection with every undertaking, trained men skilled to advise consumers upon all matters relating to gas supply. A connection should be established with architects and builders, in order to induce them to fit premises with supply-pipes, so that gas appliances may be easily installed; and when premises of any kind are being erected, the prospective occupier should be interviewed, with the aim of getting gas used to the fullest advantage. Manufacturers should also have special attention in connection with power and trade appliances, as well as lighting. Churches and public buildings are often supplied with electricity at a lower rate than the ordinary consumer; and the advertising possibilities of good lighting systems in places where the public gather are such that no effort should be spared to see that gas is represented to the fullest extent. An electrical engineer of some standing said that there was no need for him to employ canvassers for his work, as every contractor was practically filling that position in connection with the undertaking; and there is no doubt that this is the case. Hardly any electric installation is carried out without the public being informed of the fact by signs displayed on the premises; and sometimes we wish that gas-fitters were as enterprising.

With regard to advertising, there is to be increased activity on the part of the electrical authorities; but it is questionable whether such methods produce any valuable results. Gas people are not behind in this respect. But wordy pamphlets are seldom read by those for whom they are intended; and a more likely method of reaching the consumer is by detachable leaflets sent out with the quarterly account. Of course, catalogues should be prepared containing information as to appliances on hire and hire-purchase; and the makers of the apparatus are generally willing to provide the printed matter relating to their own productions on sheets which may be bound together under one cover. For trade purposes, separate sections may be prepared, so that inquirers get the information they need in convenient form.

Schemes for the cleaning and maintenance of incandescent burners are being generally adopted all over the country; and there is no doubt that the facilities offered will be greatly appreciated by the consumer. In some towns, free maintenance is offered; but, at the same time, it is generally thought that the consumer should pay something for the service, if inclusive rates per burner are not in force. The difficulty is that people view with dissatisfaction any addition to their quarterly account; but perhaps there is room for a scheme whereby, for a nominal fee of 1s. per annum, the incandescent burners in the house would be regularly cleaned and adjusted, or, if desired, a visit could be made only when requested. For business premises, however, the extra attention required could not be expected at this low rate. In Birmingham, the charges for periodically cleaning and adjusting incandescent burners are fixed at 1½d. to 3d. per burner per quarter, according to the number contracted for—mantles or other material supplied being charged at current rates.

There is no doubt that every point whereby beneficial results

may be obtained is now being carefully considered by the gas undertakings all over the country; and great effort is being made to satisfy consumers by giving them the benefit of long experience as to the best methods of using gas economically. Considerable saving is thus effected in the quarterly accounts. Competition has only stimulated the desire for development of gas sales on the part of the industry; and instead of adversely affecting the output, the methods adopted have increased the popularity and use of gas for all purposes to which it may be applied.

## DETERMINING SULPHUR IN SPENT OXIDE.

In the last number of the "JOURNAL" (p. 664), we gave a paper read by Dr. A. H. Elliott, the Engineer-Chemist of the Consolidated Gas Company of New York, before the New York Section of the Society of Chemical Industry, in which he described his apparatus for the analysis of illuminating gas. On the same occasion, he brought under the notice of the members his apparatus for determining sulphur in spent oxide. For the following illustration of it, and the accompanying description, we are indebted to the "Journal" of the Society.

The apparatus is a modification of that used by Dr. E. Graefe for determining the volatile sulphur in coal. It consists, as will be seen, of a large bottle holding about 8 litres, fitted with a rubber



stopper held in place by a flat brass spring slipped on sideways. Through the stopper is a hole to carry a 100 c.c. separating funnel and two perforations for copper wires. One of these wires is short, reaching about one-third down the height of the bottle; the other carries a brass deflagration cup, as used in experiments with phosphorus in oxygen. At a point where the short wire comes near the longer one, it is covered with platinum foil, and the adjacent deflagration wire is also covered. Between these platinum terminals a connection is made with very fine iron wire, capable of being melted by the current from six dry cells.

Into the deflagration cup the operator should put a very little dry cotton wool, then connect the cotton by strands of cotton wicking with the iron at the terminals. Using 1 gramme of dry spent oxide, mix it with 1 gramme of a mixture of chlorate and nitrate of potassium (3 to 1) and place on the cotton. To start the apparatus, the bottom of the bottle is covered with distilled water, and the bottle then filled with oxygen by displacement. The deflagration spoon and wires are inserted into the bottle, the spring adjusted, and the charge fired by means of the battery. The action is immediate, and the bottle must be cooled to condense the vapours. The separating funnel contains 50 c.c. of 10 per cent. solution of sodium peroxide, which is allowed to run into the bottle when it cools. The bottle is washed out and the solution made to 300 c.c. To 10 c.c. of it are added methyl orange and 5 c.c. of dilute hydrochloric acid, and the volume made up to 100 c.c. One gramme of barium chloride crystals is added, the whole allowed to stand from 15 to 30 minutes, and the turbidity determined. A table of barium sulphate turbidities is used for the determination. Or the solution may be filtered, the barium sulphate washed, dried, and weighed as usual.

## The Late Emile Leclerc.

The prominent position in the gas industry of France occupied by the late M. Emile Leclerc, whose recent death was briefly recorded in the last number of the "JOURNAL," justifies a fuller notice of his life-works than we were then able to give. He was born at Lyons in 1837, but was educated in Paris, where his family subsequently resided. He was admitted into the Ecole Centrale des Arts et Manufactures in 1857, and left it three years later with one of the first diplomas in his special subject—metallurgy. He afterwards went to Spain to take an appointment with the Seville-Xeres Railway Company. In May, 1863, he became the Engineer-in-Chief of the Compagnie Centrale du Gaz, of Paris; and for forty-four years he was the collaborator of M. Eugène Lebon, and worked for the prosperity of his Company with an amount of ability and devotion which did not diminish with advancing years. He was admitted a member of the Société Technique du Gaz in 1874, and the following year was placed upon the Committee. He was Secretary from 1878 onwards, Vice-President in 1884, and President in 1885-6. When the Syndicate de l'Industrie du Gaz was formed, M. Leclerc was chosen by the Compagnie Centrale to represent it on that body, and give to the new organization his moral and financial support. In 1896, he became President, in succession to M. Mallet, and held the position four years. At the Exhibition of 1889, he was awarded a bronze medal for his system of washing gas; and at the ever memorable one held in 1900, he obtained, in the Social Economy Section, a diploma for his works on the subject of workmen's superannuation. The decoration of the Legion of Honour was conferred upon him during the siege of Paris in 1870, when he was lieutenant of a company of volunteer engineers; and he was justly proud of the distinction.



## SCOTTISH JUNIOR GAS ASSOCIATION.

## EASTERN DISTRICT.

The Seventh Annual General Meeting of the Eastern District of the Association was held in the Heriot-Watt College, Edinburgh, on Saturday—Mr. H. RULE (Falkirk), the President, in the chair. There was a good attendance of members.

The HON. SECRETARY (Mr. J. Dickson, of Kelty) read the report of the Council, in which it was stated that the number of members was 91, consisting of 81 ordinary and 10 honorary members. There was a net gain in membership of six, compared with the preceding year. As usual, four meetings had been held throughout the session—two in Edinburgh and one each in Dunfermline and Perth; and the change of meeting-place periodically continued to be received with favour. The attendance of members at the meetings had been gratifying. The Council desired to inform the members that the Circulating Library, started this session, was being much taken advantage of; and the scheme would, no doubt, be found to be of great assistance to members, in enabling them to readily obtain the best books dealing with the gas profession. The thanks of the Council were due to the various companies and corporations for kindly throwing open their works for inspection. They likewise desired to express their indebtedness to Principal A. P. Laurie for the continued use of the Heriot-Watt College; also their hearty thanks to Mr. W. R. Herring for his handsome contribution of books to the library, and to Mr. W. B. McLusky for his promise of Mr. Newbigging's "Handbook." The Council desired to place on record the fact that during the year the following members of the Association had been promoted to larger spheres of influence: Mr. W. Brown, of Lasswade, to Cardenden; Mr. J. D. Luck, of Broughty Ferry, to be chief meter inspector for the Hawick Gas Company; Mr. F. N. Oakley, of Granton, to be Engineer and Manager of the Berwick Gas Company; Mr. F. A. West, of Kirkcaldy, to be Works Superintendent of the Peterborough Gas Company; and Mr. J. Dickson, of Kelty, to be Engineer and Manager to the Forfar Gas Corporation.

Mr. J. R. MOYES (Edinburgh) moved, and Mr. W. GEDDES (Edinburgh) seconded, the approval of the report; and the motion was agreed to.

The HON. SECRETARY read the Treasurer's report, in which it was stated that the income for the year, including £12 6s. brought forward, amounted to £35 19s.; and that there was a balance on hand of £10 15s.

On the motion of Mr. D. BISSETT (Edinburgh), seconded by Mr. R. B. WADDELL (Dunfermline), the report was adopted.

The following were elected office-bearers for next session:—

*President.*—Mr. W. Dunlop, of Kirkcaldy.

*Vice-President.*—Mr. John R. Moyes, of Granton.

*Hon. Sec. and Treasurer.*—Mr. W. Geddes, of Granton.

*Members of Committee.*—Messrs. R. W. Cowie, of Dalkeith; H. E. Doran, of Granton; and T. W. Harper, of Dundee.

## LUTELESS PURIFIERS AT THE DUNDEE GAS-WORKS.

Mr. A. MORTON FYFFE, Assistant Engineer and Manager at the Dundee Corporation Gas-Works, read a paper descriptive of the new luteless purifier system there.

The author said he had chosen this as the subject of his paper because he considered it would be of interest to the members to have a description of the plant recently completed at the Dundee Gas-Works, and also because it was one of the most interesting pieces of work with which he had had the pleasure of assisting Mr. Yuill. He would first of all describe the plant as it formerly existed. It consisted of three sets, having four purifiers in each, measuring 30 ft. by 20 ft.; and two sets, also of four purifiers each, measuring 20 ft. by 20 ft., and giving a total capacity of about 4 million cubic feet per diem. These purifiers were all on the ground level, with the revivifying floor overhead. When it was mentioned that one of the larger sets had to be reserved as part of the carburetted water-gas plant, it would be seen that the purifiers were taxed to their utmost capacity when dealing with a winter load of fully  $4\frac{1}{2}$  million cubic feet per diem.

In first considering any suggested alteration or addition to any part of the plant or apparatus constituting the Dundee Gas-Works, the first procedure was inevitably to refer to the "prospective" plan of the works. This was a plan prepared about seven years ago, showing the adaptation of the ground area of the works as it would be when the maximum daily demand was 10 million cubic feet, compared with the present maximum demand of 5 million cubic feet per day. This plan was the object of much thought and careful consideration when it was first drafted; and since that time numerous and extensive alterations and additions had been carried out, all in strict conformity with the plan—thus ensuring that no future alterations would be prejudiced by any structures erected. The plan showed the purification of the final make of 10 million cubic feet per diem provided for by the introduction of three sets each of four luteless purifiers, each purifier 45 ft. by 35 ft. and 6 ft. deep, and the retention of one of the present sets for carburetted water gas.

It was decided to proceed with the erection of one of the large luteless sets, or one-third of the whole, which would for the immediate future be operated in conjunction with the existing purifiers. The north portion was selected as the first to be dealt

with, as it would necessitate the least interference with the old purifiers; involving only the removal of one of the small 20 feet square sets, which, as a matter of fact, was almost beyond use. Accordingly, in the spring of last year a start was made to remove this set, and also the corresponding part of the upper floor and the roofing. The new structure being designed with the purifiers overhead, and supported by cast-iron columns, it became necessary to provide foundations of ample strength, as the completed load, including the material in the purifiers and on the upper revivifying floor, was calculated at 1600 tons, which, supported on 42 columns, meant a load of fully 38 tons on each column.

Part of the erection was on ground where the natural rock bed was 10 feet from the surface. The column foundations there consist of monolithic concrete, raised on the rock with foundations 6 feet square, and "stepped in" according to the varying depths, until the top portion to receive the column base measured 3 feet square. In this final block four foundation bolts with bed-plates were embedded, to receive the base of the column, which was 2 feet square. The other part of the foundation came on the site of an old gasholder tank, evidently long since filled up; and to ensure a reliable foundation there, piling of the following description was resorted to: The foundation for each column consisted of four Hennebique ferro-concrete piles, each 14 inches square and 16 feet long, driven so that the exterior sides formed a square 3 feet in dimension; the piles being driven until ten blows of a 3-ton "monkey," with a fall of 4 feet, gave a set not exceeding one-eighth of an inch. After these piles had been driven to the proper set, the concrete was stripped from the top 18 inches; and the steel rods thus exposed were embedded in a concrete block 4 feet square; this being then reduced to 3 feet, as in the simple concrete foundations.

There could be no doubt as to the entire suitability of ferro-concrete piling for such a piece of work, from the standpoints of both strength and economy. The piles were made on the site, and allowed to harden for six weeks in the open; and, after being driven, it was impossible to detect any flaw or even any mark on the heads. It might be of interest to mention that the foundation bolts built into the concrete foundations were each surrounded by a slim wooden box, 2 inches square, and the same length as the bolts, to allow of easy placing of the columns; and when these were being placed, the wood was broken out, and the space grouted with cement.

Having described in detail the iron and steel structure constituting the purifier-house, the author proceeded to give the following description of the purifiers: There are four luteless purifiers, in pairs; the internal dimensions of each pair being 90 ft. by 35 ft. and 6 ft. deep. The length of 90 feet is divided into two sections by centre plates—forming two purifiers in each stretch (four in all), each 45 ft. by 35 ft. and 6 ft. deep internally. They are erected on rolled steel girders, forming the first floor of the structure. The bottom plates are 5 feet square, with flanged joints—the jointing being on the under side, resting on girders; thus making the bottom of the purifiers a plain surface. The side and end plates are 6 ft. 3 in. by 5 ft., flanged, and having moulded panels. The top plates are also flanged on the under side, and are supported by cast-iron brackets at the sides, and by cast-iron pillars and brackets at the centre. All the plates are 1 inch thick throughout, with flanges  $3\frac{1}{2}$  inches wide, strengthened by angle webs at 6-inch centres. All flanges are planed and finished true, with the exception of a longitudinal groove 1 inch wide and  $\frac{1}{2}$  inch deep, to form a bed for the red lead, which is the only jointing material used, the plates being connected by 1-inch bolts placed at 6-inch centres.

Each purifier has four covers, the openings for which are 18 ft. 6 in. by 13 ft. 6 in. The framework of the covers is formed on the top plates round the edges of the openings, by cast-iron channels 6 in. by 4 in. by 1 in. thick web, strengthened at every 6 inches, and flanged for bolted joints at the end of each length. The covers are constructed as follows: External framework, 6 in. by 5 in. by 17 lbs. per foot steel angle; bottom bracing, three longitudinal stretches of 6 in. by 5 in. by 12 lbs. per foot T steel; top bracing, seven cross stretches of 8 in. by 5 in. by 18 lbs. per foot bulb tees; covering,  $\frac{1}{2}$  inch steel plate, riveted to the bottom tees and to the top bulb tees. The jointing device employed is Clapham's joint and fasteners of the standard type.

On the top of each purifier, two relief-valves are fitted, 12 inches diameter—the covers to open horizontally, and with planed faces. On the bottom, four discharging openings are fixed. These are 15 inches in diameter, and are similar in construction to the relief-valves. Iron standards and railings are fixed round the outside and the ends of the purifiers. The valve was of the Weck type, having 30-inch main inlet and outlet connections with 24-inch inlets and outlets carried through the bottom of each purifier.

In connection with this part of the plant, it may be interesting to mention an arrangement provided to prevent loss of gas which would otherwise be inevitable in opening the purifiers. On the inlet and outlet pipe of each purifier, a 6-inch flanged branch is formed, and to each of the branches a valve is fixed. These valves are all connected to one common pipe, which is carried to the foul main at a point between the retort-house and the condensers. It is operated as follows: Before a purifier is opened, the 6-inch valves on its inlet and outlet are opened, when the gas remaining therein is drawn back to the foul main, instead of escaping into the atmosphere, as it otherwise would. To prevent over-exhaustion, gauges are connected to the 6-inch pipes, and the valves are closed immediately a level gauge is attained. Similarly, when



the purifier has been recharged, and just before being put to work, the operation is repeated; thus exhausting the air to the foul main, where its presence is not appreciably felt, and preventing it going forward direct to the holder. This arrangement has worked very well in actual operation. The 6-inch valves are fitted with a locking arrangement to prevent any interference by unauthorized persons.

The grids used are of the hurdle pattern, supported on a first tier of common grids, and arranged so that, if desired, another tier of common grids may be placed on the top of the hurdles, to allow of 12 inches of lime being used on top of the purifier.

The lifting arrangement for the covers is a very simple one, consisting of runners of broad flanged 12 in. by 12 in. steel girders suspended from the underside of the second floor. On these girders, light four-wheeled carriages run; and from the carriages are hung 3-ton ball-bearing pulley-blocks. Two of these easily lift and remove a cover weighing about  $4\frac{1}{2}$  tons; the operation being conducted comfortably by two workmen. It might be considered that some sort of power lifter would have been used for these covers; but, on second thought, it will be realized that this would be both unnecessary and expensive. The covers will only require to be removed (say) three times a year; consequently, if power lifting were adopted, capital charges would be incurred for plant constantly standing idle, which, in any case, would require two workmen to operate it; whereas by the simple hand-operated arrangement, complication and expense are avoided and working costs are not in the least increased. It is well to bear in mind that mechanical or power plant does not necessarily mean labour-saving plant.

A gravity bucket elevator, driven by a gas-engine, conveys the material from the railway in the lime and oxide shed, which is alongside, and parallel to, the purifier-house, to the top floor, where it is received by an overhead hopper, from which it is drawn as required. When a purifier is to be emptied, half of the oxide is allowed to fall through the bottom discharge-doors to the ground floor, and the other half is taken up to the second floor; thus giving two floors for revivification. The whole of the material can, of course, be taken up or down to either floor if desired. The material is carried to the top floor by means of hydraulic jiggers, consisting of a ram geared up 12 to 1.

The author next indicated as follows the procedure adopted in connection with the work he had described: First of all, general design plans were drawn; and when these had been carefully adjusted, full detail drawings of every single part were prepared. Specifications, embodying every condition, every dimension, and the composition of each material, were prepared and issued to contracting firms, together with a complete copy of the drawings. Firms offering thus knew the dimensions of every bolt and nut to be used, the exact length of every girder, and the tensile strength, the elongation, and even the chemical composition, of all parts. The offers were capable of instant comparison, and every offerer was assured of fair dealing. This is impossible when contractors are asked for offers on their own design, or on incomplete specifications and drawings. Moreover, all materials were examined, tested, and analyzed by myself at the various contractors' and makers' works before being delivered.

In conclusion, the author mentioned that the old purifiers and buildings were first interfered with at the beginning of March, 1909, when a start was made with their removal. The work was completed by the end of August, and cost £13,497, against an estimated cost, reported before the work was specified, of £13,500.

#### Discussion.

Mr. R. W. COWIE (Dalkeith) said he had seen the purifiers described in the paper, and what struck him most was the way in which they had been built with a view to future extension. He could understand this now, when he heard that there was a "prospective" plan made before the work was undertaken. The idea of such a plan was a very good one. He was impressed by the saving of the gas that was within the purifier at the time it was shut off, as in the case of large purifiers the loss was considerable. With oxide, of course, the air that was sent back to the foul main when a purifier was turned on would act in the way of revivifying *in situ*. He did not know that such an arrangement could be used in small works; but this subject could be thought out.

Mr. D. BISSET (Edinburgh) asked whether luteless purifiers had been found an improvement upon water-luted boxes.

Mr. J. DICKSON (Kelty) said what struck him was the minute care with which the work described had been undertaken, and the very particular way in which Mr. Fyffe saw to the testing of the materials before they were delivered at the works, and also supervised the work. He saw the arrangement to which Mr. Cowie had referred, and thought it an excellent one. At the same time he did not know whether it would be profitable to apply it to small works. In the case of the Dundee purifiers, he found that about 5000 cubic feet of gas would be lost each time a purifier was shut off. If the purifiers were emptied three times a year, this would be 15,000 cubic feet for each box. But he supposed that the main idea that Mr. Yuill had was to avoid blowing gas away at a place where there was fire. He thought that the chief point in the arrangement was safety from explosion; but for small works it might not pay, on account of the capital cost.

Mr. R. B. WADDELL (Dunfermline) remarked upon the unsuitability of ferro-concrete for certain classes of work, more particularly for the second floor.

THE PRESIDENT said that though most of the members had not had, and might possibly never have, experience in the erection of

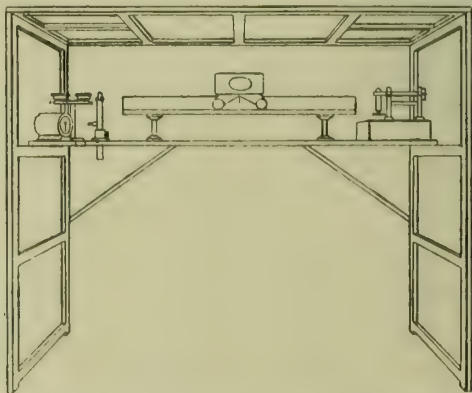
so large an installation of purifiers as the one described, they had nevertheless appreciated the contents of Mr. Fyffe's paper. So far as the constructional part of it was concerned, there was perhaps little that was controversial in it, and especially as Mr. Fyffe had informed them that everything had turned out so satisfactorily. In the case of rubber jointing, great care had to be exercised, both in the selection of the design and in the subsequent use. The life of the joint had to be taken into account, because the price of rubber was such that renewals were a matter of consideration. Care must be exercised not to screw the corners down too tight, because this would flatten out the rubber too much. The method of holding the rubber to the lift by means of a T-bolt was of little use. Between the bolts the rubber only got a hold of the cover by means of a solution, which eventually gave way; and the result was that festooning between the bolts took place. He noticed that they had adopted a Weck valve in Dundee. This might be found to be a very good arrangement; but, of course, it required attention to the spindles and screws. He would advise the members to see, during construction, that all bolts were screwed up tight, because he knew of a case where a bolt was left out, and there was considerable trouble with foul gas passing. Hollow columns inside purifiers should be filled with cement. In one case of which he knew, they were not filled up, and they had considerable trouble and anxiety in finding out where the foul gas was coming from. They discovered that it was passing up through the hollow column. He thought Mr. Yuill was to be congratulated on the cost of the work turning out to be less than was estimated.

Mr. FYFFE, in reply, said he was glad if the members had derived any benefit from his paper. Had Mr. Bisset had experience of the two forms of purifiers working side by side, he would have found there was no comparison between them. The luteless was far before the water-luted purifier in many ways. First of all it meant that the covers could be made much lighter; and this involved a very simple arrangement for lifting. With this size of purifier, the weight of the covers would be enormous. Powerful apparatus would be required for lifting them. Then, the covers only requiring to be raised about three times in the year, a large amount of capital expenditure would be lying idle. With luteless purifiers, they had no risk with frost in winter. They had found the rubber joints to work quite satisfactorily, and to give no trouble at all; but they had to be properly adjusted before being brought into use. Everything required to be dead-true, and almost mathematically correct; but this having been once done, he thought there was no comparison between the luteless and the water-luted covers. No doubt the first cost of the luteless cover was less than the other, apart from working costs. The only ferro-concrete in the work was in the foundations. He agreed with what had been said about taking the gas and air back to the foul main—that it would be hardly worth while adopting this method in small works. But when they had purifier-houses 30 or 40 feet square, there was no doubt that, apart from saving, they ran less risk of blowing gas into the air; and they also avoided sending a large quantity of air into the holder, which might affect their supply. When taken back to the foul main, the air mixed with the gas, and its presence was therefore not felt.

A paper on the "Formation of Coal" was then read by Mr. H. E. DORAN. An abstract of this communication, and a note of the few remarks to which it gave rise, will appear next week.

#### Portable Bar Photometer.

In the course of the proceedings at a meeting of the New York Section of the Society of Chemical Industry, an account of which appears in the current number of the Society's "Journal," attention was directed to the portable bar photometer used by Dr. E. G. LOVE, the Chief Gas Examiner for the City of New York. As will be seen from the accompanying illustration, it consists of a wooden framework supporting a platform on which



is placed the bar and sight-box, the candle-balance, gas-pillar, governor, and special small wet meter. The whole is enclosed with opaque black curtains (not shown in the illustration). In these there are openings at the top over the gas-pillar and the standard light. The operation of the photometer does not differ from that of any ordinary open-bar photometer constructed for a dark room.



## REGISTER OF PATENTS.

### Purification of Gas.

FELD, W., of Hünningen-on-Rhine, Germany.

No. 3061; Feb. 8, 1909.

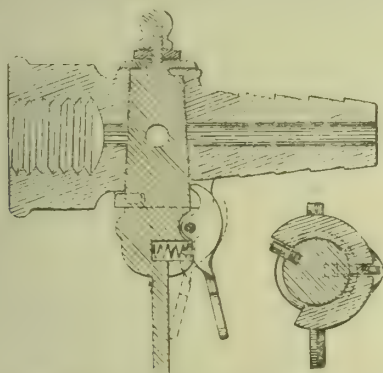
The patentee claims as his invention: "Obtaining or utilizing sulphur from sulphuretted hydrogen and sulphur dioxide for the treating of gases with a compound of a metal, the sulphide of which is on the one hand insoluble, and on the other hand is decomposed by sulphur dioxide, either alone, or in the presence of sulphur, or air, or other oxidizing agent, or basic or acid compounds, or of a mixture thereof." The specification is abstracted on p. 729 of to-day's issue of the "JOURNAL."

### Safety Gas-Burner Cock.

JAKOBSON, M., of New York City.

No. 3319; Feb. 10, 1909.

This invention relates to safety-cocks for gas-burners of the type in which the plug has a pawl or locking lever pivoted centrally to it, with the handle end of the locking lever arranged sideways of the plug handle; the locking lever being acted on by a helical spring in a socket in the plug so as to engage a recess in the plug-casing to lock the plug in its closed position. The cocks are thus locked when the plug is closed so as to prevent their accidental opening and an escape of gas, while it permits the easy operation of the cock when opening and closing it. As shown, the fixture or bracket has a tapering socket open at its lower end and provided at its lower edge with a notch. The plug



Jakobson's Safety Gas-Burner Cock.

(provided with a key or handle) turns in the socket, which is cut laterally above the handle. There is a finger lever fulcrumed intermediate of its length to the plug, the construction of which is such that, by bending it intermediately (so as to form two portions which extend at right angles to each other), the upper portion extends into the notch of the bearing sleeve, while the lower portion extends alongside, and parallel with, the plug handle. A projection is formed on the lever at its inner edge opposite the socket (immediately below the pin on which the lever is pivoted), so as to engage a helical spring seated in the socket and fitting over the projection.

### Pressure-Controllers for Automatically Lighting and Extinguishing Gas-Burners.

SPARKS, E., of Tufnell Park, N.

No. 4218; Aug. 19, 1909.

This invention relates to pressure-controllers for automatically lighting and extinguishing gas-burners of the kind described in patent No. 8690 of 1908 [see "JOURNAL," Feb. 9, 1909, p. 391]. The invention comprises certain details of construction in connection with the movement of the piston within the controller, to facilitate and assist its movement when required and to ensure its remaining stationary at other times.

### Manufacture of Incandescent Gas-Mantles.

MULLER, J. L., of Sannois (Seine et Oise), and BONNET, J., of Paris.

No. 6556; March 18, 1909. Date claimed under International Convention, March 20, 1908.

This invention relates to improvements in machines of the kind described in patent No. 24,218 of 1901, for calcining mantles intended for gas lighting by incandescence, after they have been previously prepared and soaked in a solution of oxides of rare metals.

The improved machine effects the following operations mechanically: Singeing at the upper portion of the mantle; singeing at the bottom portion of the mantle, in case the first singeing should be incomplete; incineration of mantles in three successive stages; calcining the mantle and burning the head of the mantle; cutting the mantle at a variable height; soaking the mantle in collodion; and drying the mantles.

A construction of the machine according to this invention is illustrated by twelve sheets of drawings (containing forty separate figures); while the printed specification extends to sixteen pages of print.

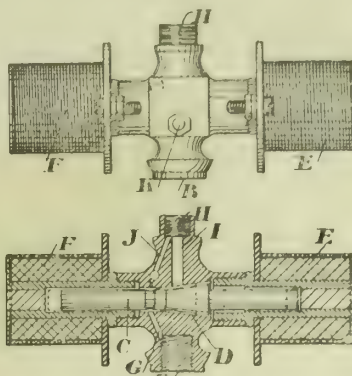
### Lighting and Extinguishing Gas-Lamps.

HARRISON, J., of Gomersal, near Leeds.

No. 7242; Sept. 16, 1909.

This invention relates to electrically actuated gas cocks or valves; the novel feature lying in the employment of a horizontal valve stem or spindle having a conical plug or valve-head adapted to register in a correspondingly shaped seat in the valve casing, so as to ensure a tight fit

between the valve-head and its seat and positively prevent the escape of gas when the valve is closed. Very little movement of the spindle suffices to open or close the valve.



Harrison's Gas-Lamp Lighter and Extinguisher.

The valve casing is screwed on to the gas-supply pipe at B, and C is a horizontal stem or spindle adapted to slide within the casing, and provided with a conical plug normally registering in a correspondingly shaped seat D. Into opposite ends of the casing are screwed a pair of solenoids E F, into which the ends of the spindle C projects. The solenoids are provided with terminals connected to separate switches (not shown) situate in a central station, from which a series of the cocks or valves may be synchronously actuated. G is the gas-passage from the supply pipe to the central cavity in the valve casing. I is a passage from the cavity to the burner pipe (which is screwed on to the valve casing at H). J is a bye-pass. The valve is earthed by a wire connected to the terminal K.

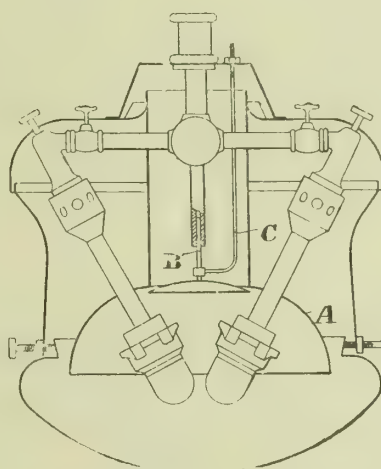
Normally the valve stem occupies a position (shown in dotted lines), so that the cavity D is plugged and only a small pilot light at J issues from the burner. On the operation of the switch controlling the solenoid E, the stem C is moved to the right (position shown in full lines), and the full stream of gas is allowed to pass to the burner. The operation of the solenoid F, on the other hand, returns the valve stem to its original position, and reduces the flame to a mere pilot light.

### Incandescent Gas-Lamps.

JIROTKA, B., of Berlin.

No. 9434; April 21, 1909.

This invention relates to incandescent gas-lamps of the class in which the burners carried by sloping tubes are located in an enlargement at the lower part of the chimney; a baffle-plate, serving also as a reflector being above the burners.



Jirotk's Incandescent Burner Lamp.

In the enlargement A at the lower part of the chimney are the burners fixed to tubes in which the gas is mixed with air. The burners are fixed at an angle to the vertical axis of the lamp. "In consequence of this position, the holes through which the fresh air enters the mixing-tubes come to lie at a place where the air contains much oxygen." By means of the reflector, which can be moved up and down, the escape of the hot gases can be regulated. It is fixed to a spire B, sliding in a tube and moved upwards and downwards by the rod C.

### Inverted Incandescent Gas-Lamps.

EHRRICH AND GRAETZ, of Berlin.

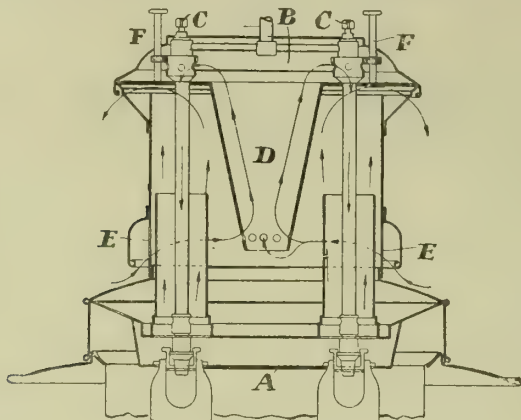
No. 10,946; May 8, 1909. Date claimed under International Convention, Feb. 6, 1909.

This invention relates especially to inverted incandescent gas-lamps intended for use in the open air. The collecting chamber is supplied with air drawn from a point within the chimney casing and out of the path of the burnt gases, so as to avoid the danger of drawing the burnt gases into the collecting chamber. Further, the air supply connection to the collecting chamber is provided with a narrow part so as to damp wind currents. The arrangement proposed consists of an inverted conical pipe having its wide end fixed to the collecting chamber, and its narrow end opening into the interior of the lamp casing at a point below the free exit of the burnt gases into the casing.

The lamp casing is closed at the top by a cover and at the bottom by



a plate on which the reflector A is mounted. On the top plate is an air-collecting chamber B, in which the suction chambers of the burner-tubes are arranged. The gas is controlled by externally arranged screws C, which pass outside the upper cover plate of the air-collecting chamber. The burnt gases from the mantles pass upwards through pipes arranged around the burner-tubes. To the cover plate, which also forms the bottom of the air-collecting chamber, there is fixed a conical pipe D, which narrows downwardly, and is conveniently provided with holes near its lower end. These holes, and the lower end of the conical pipe, are arranged to open into the interior of the lamp casing below the free exit of the burnt gases; and these burnt gases pass from the casing through openings below the air-collecting chamber B. Air



A Modified Graetzin Lamp.

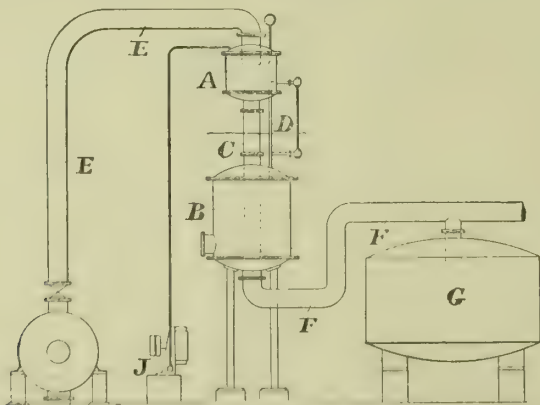
enters the interior of the lamp casing through openings E over which a hood is arranged. By providing the pipe D with a narrowed portion, or with the holes shown, the air passing to the collecting chamber is throttled in its passage, and thereby the burner-tubes are not affected by impacts of the wind. At the same time, all ingress of burnt gases to the air-chamber is prevented by arranging the openings and the open end of the pipe D well out of the path of the burnt gases and below it. The parts of the lamps which require inspection and regulation are readily accessible. Thus the nozzle controls C may be readily adjusted without detaching any part of the lamp; and, further, the air-control rings for the suction chambers are adapted to be adjusted by means of a spindle F carrying a toothed wheel engaging suitable gearing on the ring.

### Preventing Shocks or Vibrations in Liquid Pipes, &c.

GUNN, G., of Heywood.

No. 11,785; March 19, 1909.

This invention relates to a device for the prevention or reduction of vibration or pulsation, or other abnormal disturbances, owing to the working of pumps or from other causes, being transmitted through the medium of the flowing liquid to the point of delivery. It is particularly applicable for the prevention of disturbance in filter-beds caused by the pumps supplying them with water, but may be adapted for the use of other liquids and gases than water and air.



Gunn's Apparatus for Preventing Vibrations in Reservoirs, Pipes, &c.

The proposal is to break the flow of the liquid at any point between the source of the shocks or vibrations and the point of delivery, by causing the liquid to flow through an air-vessel having the inlet for the liquid in the upper portion, and an outlet at the lower portion. The air-vessel consists of two chambers (preferably cylindrical) as A and B—one placed vertically over the other. The upper chamber is of less capacity than the lower one, to which it is connected by a pipe C, which comes direct from the bottom of the upper chamber and passes through the top of the lower one to a point near the bottom. The pipe is of such diameter that it will pass the maximum quantity of liquid required. An air-pipe D connects the top of the lower chamber with the upper one. The inlet pipe E enters the top of the upper chamber and projects internally to about one-third of its depth; while the outlet pipe F is connected direct to the bottom of the lower chamber. The pulsating liquid from the pump enters the top of the upper chamber and falls through an air space, then passes down the connecting pipe C to the lower chamber, and from thence, through the pipe F, to filters G. If the pressure increases in the air-chamber A and B, the liquid gradually rises until it is about half-way up the air-pipe D, where it should be maintained, if necessary, by pumping in air from the air-compressor J at intervals.

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### Objectionable Pressure in Intermittent Vertical Retorts.

SIR,—In your editorial remarks on Mr. Harris's paper read before the Midland Association, you say "that devices for grading the charges into large and small on opposite sides of the retort have cured the trouble in this regard, though it has introduced an additional operation." Our porous charging shoot patent No. 19,437, illustrated in the "JOURNAL" for Oct. 5 last (p. 27) obviates the necessity for this additional operation, saves all cost of screening coal, and, in practical use, is certainly reliable and automatic.

On reflection, readers will see that if during charging, a retort be fed by a stream of slack and a stream of nuts simultaneously, a column of nuts will be built up in the retort from the bottom to the top only if the two streams deliver precisely the same bulk of coal in precisely the same time. Even a slight fluctuation in the rates of flow will cause the surface of the coal in the retort to form at an inclination, and the nuts will roll to the bottom and become mixed with the slack; and thus the effect of the previous screening of the coal will be largely nullified, and the porosity of the charge impaired.

With our patent porous charging shoot, unscreened coal is fed into the retort in such a manner that a bank is always formed at the surface of the coal as the charging proceeds. The momentum of the nuts is arrested as they impinge upon the uppermost portion of the bank; and they then roll gently down the sloping bank into position on the opposite side of the retort. The action continues until the retort is charged; and it results in a very porous column of nuts being formed within the retort.

This is not a theoretical assertion; it is a practical truth. We have proved experimentally that the column thus formed contains 84 per cent. of very lightly laid nuts, which, in appearance, look all nuts.

In one bed of our retorts over 3000 tons of various sorts of coals have been carbonized, and the maximum pressure so far recorded at the bottom mouthpiece has been 12-10ths, and with most coals 5-10ths to 7-10ths, and this for a short period of the carbonization period only.

ROBERT DEMPSTER AND SONS, LTD.  
per J. W. Broadhead, Managing-Director.

Elland, March 12, 1910.

### Direct Sulphate of Ammonia Manufacture.

SIR,—In reply to your correspondent's query in the current issue of the "JOURNAL" (p. 642), might I say that I have not examined any specimens of sulphate of ammonia made by the processes to which he particularly refers.

I have from time to time examined various specimens, and I might add that only on rare occasions has the percentage of ammonia been as high as 25.5. In my opinion, a salt of that "consistent" standard of purity in the ordinary manufacturing process, is exceptionally good. But your correspondent only gives the result of one analysis. If he could give a number of analyses made independently, and preferably by different methods, and so obtain a good average percentage, his results would be much more convincing. Another important factor, too, is the quantity of salt used for analysis; for while one crystal may be perfectly pure, another might be found to contain a moderate amount of impurities.

I would also suggest that, if this has not been done, an estimation of the amount of  $\text{SO}_4$  in the salt be made, as this will act as an additional check. If the amount of  $\text{SO}_4$  found corresponds with the amount of  $\text{NH}_3$ , then the results will be looked upon as much more reliable from a chemical point of view.

With regard to my own experiments, no analyses of the salt obtained were made, as the process was not considered to be quite satisfactory. In the second process (described in an article you already have for publication\*), analyses were made; and in the case of the works experiment the salt obtained contained 25.48 per cent. of ammonia and 72.1 per cent. of  $\text{SO}_4$  (theoretical = 71.94 per cent.). Adding in the theoretical percentage of the extra  $\text{H}_2\text{O}$ , i.e., 1.64 per cent.—it brings up the total salt to 99.22 per cent. This leaves less than 1 per cent. for impurity. I must add, however, that only a small sample of sulphate was analyzed; and the results given are the mean of two analyses only. As the work was in a purely experimental stage, it was not considered necessary to perform further analyses.

I should be interested to know also by what tests your correspondent proved the absence of tar and free sulphur.

G. STANLEY COOPER, B.Sc.

March 10, 1910.

SIR,—Referring to the article by Mr. G. Stanley Cooper, B.Sc., contributed to the "JOURNAL" for Feb. 22, on p. 496, I was hoping something more would have been written to extend this valuable research; and I do hope some of your readers will not allow the matter to drop. I refer to gentlemen such as Mr. Owen Jones, of the Chatterley Gas-Works, who I know has been at work upon this class of salt-making for some considerable time—I having made a saturator for him for direct working.

I shall not be doing any harm, if no good, by laying a few practical hints before your readers regarding the tar-extraction business. In the first place, some 38 years ago it was my good fortune to meet Mr. Fish, then Manager of Hornsey Gas-Works, who had a lot to do with tar troubles in different ways; and so from practice I have come to the conclusion that the following is the best method of extracting the tar before the ammonia enters the saturator. It may be new to thousands of your readers.

I made a cylinder, 12 feet long and 3 feet diameter, and fixed it on end. Within this, I fitted a tier of dome-shaped strainers, made like gongs or inverted cones having 1-12 inch holes. These strainers, made

\* This article appears on p. 721 of to-day's issue.—ED. J.G.L.



of sheet lead, were arranged on a revolving spindle; and the edges of the strainers just cleared the sides of the cylinder. In the bottom of the cylinder I fixed a 2-inch pipe to form a lute, into a corresponding pipe sufficiently deep to withstand the gas pressure, and with a spout at the upper end.

The ammonia gas is first forced into or through an old boiler, heated to 220° Fahr., and then into the cylinder, where it passes the sieves and away to the saturator. The tar which is not in bubbles of themselves, but smaller atoms carried with the ammonia and gas bubbles become thinned out in the warming-up boiler, and are carried forward into my cylinder. They adhere to the metallic sieve holes, where the tar accumulates and is flung off to the cylinder sides and falls into the lower part of the cylinder to the lute, while the ammonia is freed ready for the saturator.

I at one time—while at Ramsgate, I think it was, under Mr. Valon—had some tar troubles; but I got over them by heating alone and flotation.

Perhaps Mr. Wilton would assist us in the matter, as I know he worked a lot at this business when I was at Beckton.

117, Galloway Road, W., March 9, 1910.

P. J. DAVIES.

### The Flow of Gas.

SIR,—I am pleased to note that Mr. Foulger, in his article on "The Flow of Gas through Pipes," in the last number of the "JOURNAL," coincides with the view I expressed in a previous article, as to the band, or lining, or coat, of stationary gas—"dead gas" I termed it—round the inside of the pipe, reducing the space for the travelling gas—"active gas" I termed it—in the centre, and as illustrated in the sketch accompanying my article in the "JOURNAL" for Feb. 22. It is also gratifying to learn that Mr. Foulger's experience tends to justify the acceptance of Dr. Pole's formula, under the conditions to which it was intended to apply, and that, for all practical purposes, it has hitherto done good service. But that this formula is open to improvement and to correction to meet other conditions, I think we have all long agreed.

The suggestion emanating from Mr. H. E. Jones (in his letter to the "JOURNAL" for Feb. 15), that experiments should be made under practical conditions, is therefore worthy of the support of gas engineers; and if Mr. Chandler is in a position to take charge of them, I am confident—judging from his article in the "JOURNAL" for Feb. 8—that good would result.

We must, however, bear in mind the extreme difficulty of making experiments which accord with actual practice. The one factor which it is most desirable to take into consideration is the one most difficult of attainment. I refer to the withdrawal of gas *en route* by branch mains and services.

To test a long, conveniently arranged, stretch of straight pipe is one thing; to arrange for testing it with innumerable branch mains and services, tapping it in ever-varying quantities, is quite another. Therefore, beyond determining the simplest cases, we can never hope to do more than devise rules, more or less approximate, and which have in their application to be tempered with engineering instinct, coupled with a vast amount of common sense, derived from experience.

In the descriptive pamphlet accompanying my "Gas Flow" diagrams published in 1892, I treated the simplest cases involving the effect of branch mains, leading up to more complicated ones. That was, I believe, the first attempt of the kind to elucidate this phase of the subject; but to test its accuracy by actual experiment would involve very complicated arrangements.

71-72, King William Street, E.C., March 9, 1910.

F. S. CRIPPS.

SIR,—With regard to the discussion which has been taking place in your columns, *re* the "Flow of Gas through Pipes," we would venture to call your attention to the fact that weldless steel tubes, such as were used and referred to by Mr. George Helps, of Nuneaton, have been proved, by actual experience, to have 30 to 40 per cent. greater delivery capacity than that of cast-iron pipes. This, of course, is due mostly to the smoother surface, reducing friction to a minimum; and the extent of the difference would apparently be explained by the opinion given by many of your readers—*i.e.*, that friction produces a band of stationary gas round the inside of the pipe, thus reducing the space for the travelling cone of gas in the centre (to use Mr. Foulger's wording).

March 9, 1910.

BRITISH MANNESMANN TUBE CO., LTD.

### Mr. Kendrick's "Coalexid" Tests.

SIR,—I have had my attention called to an error in Table IV. of the "Coalexid" tests (*ante*, p. 580) in my Inaugural Address to the Manchester Institution. The figures should be:—

	Gas, B.Th.U.		Coal.		Coke.	
	Gross.	Net.	Calories.	B.Th.U.	Calories	B.Th.U.
Without chemicals.	699.7	524.4	3687	14,600	3753	14,861
With	602.3	528.2	3687	14,600	4113	16,287

The tests were made with the Lewis Thompson calorimeter; and further tests have confirmed the first series. The coke figures appear to be too high and require further investigation. We have not a bomb calorimeter, which has since been recommended for the purpose.

Stretford, March 8, 1910.

H. KENDRICK.

### Charco.

SIR,—In your issue of the 1st inst., there are two references to charco, to which I desire to call attention.

On p. 558 a reference is made to the less weight of charco obtained in a given experiment, than a like quantity of coke would have been if treated in the ordinary manner. This is quite correct; but, in order

to avoid misunderstanding, it should be added that the charco was absolutely dry, whereas the coke would have contained some 15 or more per cent. of water.

The loss of weight by continued incandescence out of contact with air is immaterial in view of the advantages gained by the process.

In his address as President of the Manchester District Institution of Gas Engineers, Mr. Kendrick suggested (see p. 580) that it might be an advantage to cool the red-hot coke in air-tight chambers. In order to avoid disappointment, I desire to say that this is an old suggestion, but does not ensure the conditions which result in the production of the peculiar class of fuel now being introduced by my Company. The method has been frequently tried, and is the subject of patents, which, however, have failed to justify themselves in practice.

March 11, 1910.

For CHARCO LIMITED, T. Meylan, Secretary.

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Abertillery and District Water Board Bill, Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Garnant Gas Bill, Gas Companies Standard Burner Bills (Nos. 1, 2, and 3), Gowerton Gas Bill, Great Grimsby Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, Southend Water Bill, Thorne and District Water Bill, Wicklow Gas Bill.

The Maltby and Tickhill Water Bill has been withdrawn.

The Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Gowerton Gas Bill, Southend Water Bill, Thorne and District Water Bill, and Wicklow Gas Bill have been referred to a Select Committee, consisting of Lord Hylton (Chairman), Earl Cathcart, Lord Lilford, Lord Templemore, and Lord Seaton; to commence sitting to-day.

The Bill introduced last session by Lord Desborough, and not proceeded with, "to determine the rights and liabilities of persons supplying water under the authority of Parliament in certain cases," has been re-introduced by his Lordship, and read the first time.

### HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Brighton and Hove Gas Bill, Bristol Gas Bill, East Grinstead Gas and Water Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Fylde Water Board Bill, Kingswood Water Bill, Pontypridd and Rhondda Joint Water Board Bill, Pontypridd Water Bill, Shirebrook and District Gas Bill, Slough Water Bill.

The Whitland Water and Gas Bill has been withdrawn.

The Provisional Orders applied for under the Private Legislation Procedure (Scotland) Act in respect to Glasgow and Wishaw are to be proceeded with as Private Bills. These have accordingly been presented, read the first time, and ordered for second reading.

Petitions have been presented against the Glasgow Gas Consolidation Bill by (among others) the Baillieston Gas Company and the Busby Gas Company; and against the Wishaw Burgh Extension, &c., Bill, by the Lanark County Council, for themselves and on behalf of the Middle Ward of the county.

The Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill, Mallow Gas Bill, Mallow Urban District Gas Bill, and Tipperary Gas Bill have been referred to a Select Committee, consisting of Mr. Arthur Stanley (Chairman), Mr. Haworth, Mr. Guinness, and Mr. Henry; to commence sitting to-day.

**Gas Purchase Proposal Dropped at Penistone.**—The opposition of the ratepayers has been so emphatically demonstrated, that the Penistone Urban District Council have decided not to proceed further with the proposal to deposit a Bill in Parliament for the purchase of the Penistone, Thurlstone, and Oxspring Gas Company's undertaking.

**Gas Supply of Bradford Out-Districts.**—In answer to Mr. Dobson, who inquired at the last meeting of the Bradford City Council how matters stood with regard to the gas supply of Thornbury and Tyersal, Mr. Wade (the Chairman of the Finance and General Purposes Committee) said his Committee had done their best to get an interview with the Pudsey Gas Company, with a view to purchasing gas in bulk; but the Company would not entertain the proposal for a single moment. Nor could they do anything with the Drighlington Gas Company, who supplied Tong, unless they were prepared to buy them out at an exorbitant price. Negotiations were, therefore, at an end with both Companies; and nothing could be done without going to Parliament for a Bill for compulsory purchase.

**Paris Water Supply.**—A Blue-book lately issued by the Board of Trade contains the following particulars in regard to the water supply of Paris: The water used for domestic purposes (*eau de source*) comes from the three tributaries of the Seine—the Dhuis (east), Vanne (south), and Avre (west); and the supply for industrial and public use (*eau de rivière*) comes from the Rivers Seine, Ourcq (by the canal of that name), and Marne. Prior to 1860, the water supply was a private enterprise. It has since been owned by the City, but worked, as a *régie intéressée*, by a Company on the City's account. Water is sold by meter, and there are two charges—*viz.*, 1s. 3d. per 1000 gallons for drinking water and 7d. for river water; but there is a fixed annual charge, ranging from 4s. 10d. to 16s. for dwellings rented under £32 per annum. The Company collect all charges and receive a percentage.



## LEGAL INTELLIGENCE.

### ACTION AGAINST THE LUDLOW GAS COMPANY.

At the Shropshire Assizes, a few days ago, Mr. Justice Grantham was engaged for some time, with a Special Jury, in hearing a case in which Mr. T. R. Millichamp, a confectioner, residing in King Street, Ludlow, and his wife claimed damages from the Ludlow Gas Company for injuries alleged to have been caused by their negligence.

Mr. C. F. Vachell, K.C., and Mr. Milward appeared for the plaintiffs; Mr. Powell, K.C., and Mr. Graham represented defendants.

According to the opening statement on behalf of the plaintiffs, a smell of gas was detected on the premises, and it continued for some time in spite of steps taken by the Company to stop it. The pipes in the street at the place where the smell came into their cellar were only 19 inches underground, and, moreover, had leaked for a considerable time. The smell was stated to be so bad that the plaintiffs had to leave their bedroom windows open. One Sunday morning early in May last year, when Mrs. Millichamp went downstairs, she was overcome by the gas; and her husband, who followed her, was also affected. Assistance was called, and the plaintiffs were removed into the street; the house being full of gas. Both plaintiffs were medically attended for some time, and subsequently went to Barmouth to complete their recovery. When the gas-main was examined, it was found to be fractured in two places. Evidence was given in support of Counsel's statement; one witness saying that the fractured pipe was in a corroded condition when taken up after the accident.

For the defence, Mr. Powell contended that the Gas Company were not liable, as he should be able to prove that the leakage of gas was caused through traction-engines being driven along King Street, on the day before the escape, at a speed exceeding the statutory limit. He called Mr. H. J. Dean, the Company's Manager, who stated that the subsoil in King Street was good for laying gas-mains. The depth was 20 inches, which he considered was sufficient there. He had only had one other leakage, which took place in 1906. In that year King Street was opened, and the gas-mains exposed for laying electric cables. He then tested the main, and again in 1907, with satisfactory results. He was in King Street the night before the accident, and there was no escape of gas then. When the road was taken up after the accident, he found that the two fractures in the main were quite new. He denied that the pipes were corroded away. They were quite fit for use, and he should give them another thirty or forty years' life. In cross-examination by Mr. Vachell, witness said he should estimate that the pipes were thirty years old.

Other witnesses called for the defendants were Mr. B. W. Smith, Engineer and Manager of the Walsall Gas-Works, who stated that he had examined the main in question, and found it 18½ inches from the surface. The subsoil was very good; and there was no discolouration of it such as there would have been had the leakage of gas been of long standing. He regarded the depth as a very good one, and there was nothing improper about it. He should consider both of the fractures in the main were of practically the same date. The pipe was a very sound specimen of a well-cast pipe. Had it not been broken, he should have thought it would last from thirty to fifty years longer. The fractures pointed to a heavy traction-engine having passed over the road. King Street was most unsuitable for heavy traffic. Mr. W. Belton, the Engineer and Secretary of the Shrewsbury Gas Company, said he considered the fractures were quite recent. The pipes were of good quality. He did not agree, as a general principle, that the deeper the pipes were laid the safer they were, as it depended upon the soil. In High Street, Shrewsbury, the gas-mains were laid at a depth of 20 inches; in other places it varied from 24 to 16 inches. Questioned by his Lordship as to the cause of the fracture of the pipe, witness said it might have been done by a stone. Whereupon his Lordship remarked that the stone should not have been there. Witness said this was a matter for the Corporation. A police constable and the Borough Surveyor (Mr. J. A. Spreckley) deposed to having seen a traction-engine pass along King Street; the latter stating that he was impressed with the amount of vibration it caused. All the opening of the streets for the Gas Company was done by the Corporation. Mr. J. W. Montford, Solicitor, the Company's Secretary, said they had no one whose special duty it was to examine the mains; but the Manager walked about the streets for the purpose of detecting escapes of gas.

Counsel having addressed the Jury, his Lordship summed up, and put several points to them. On all these they found for the plaintiffs; and they assessed the damages at £82 18s. 6d. His Lordship said he agreed with the verdict, as the findings were warranted in every way.

### Use of Water-Gas Tar on Roads.

In the King's Bench Division of the High Court of Justice of Ireland, Mr. Justice Wright and a Jury had before them, a short time ago, a claim by a lady cyclist against the Pembroke (Dublin) District Council for £1000, compensation for injuries sustained by her, as she alleged, through their negligence. The plaintiff was riding over a road under their supervision which had recently been treated with water-gas tar, and had not been sanded. It was contended, on behalf of the Council, that the use of water-gas tar was a reasonable method of treating the road, that the work had been properly done, that sanding was unnecessary, that notice-boards were on the road to warn persons of its condition, and that the plaintiff, if she had not been negligent, took the ordinary risks which a cyclist must take in passing over a newly-tarred road. For the plaintiff, however, it was argued that the road was in a dangerous condition, and that the Council had not taken reasonable and proper care in tarring it. The Jury found that the road was dangerous, and awarded the plaintiff £250 damages. Referring to the case in a recent issue, the "Surveyor and Municipal Councillor" said: "The principle of law which underlies this decision is that, though a local authority are not liable for a mere omission to repair a highway, they are nevertheless liable for any injury or damage caused by any act done by them on a highway."

## MISCELLANEOUS NEWS.

### GAS COMPANIES AND THE PORT OF LONDON RATES.

#### Manufacture of Coke.

During the inquiry last Tuesday into the rates proposed by the Port of London Authority—Lord ST. ALDWYN presiding—various claims to special exemption were heard. Among these were the cases of the Commercial Gas Company and the Brentford Gas Company; their suggestion being that, according to the Provisional Order under consideration, the trade of the Medway and Swale would be deprived of the exemption under section 43 of the Port of London Act. They asked that their trade with the Lea in the case of the Commercial Company, and Southall in that of the Brentford Company, which are outside the Port of London, should be exempt.

Mr. FREEMAN, K.C., who appeared for various gas companies, including the South Metropolitan and Commercial, alluded to goods passing through the Port to and from places on the Medway and Swale. He stated that the wording of section 43 of the Act was: "Nothing in this Act shall be construed as imposing any dues." These were the important words in the section. Turning to clause 4 of the Order, it set forth that "subject to the provisions of this Order, and to the exemptions and rebates set out in the schedules to this Order, and to any further or other exemptions or rebates allowed by the Port of London Authority under section 13 of the Port of London Act, 1908, the Authority may demand and take, in respect of all goods imported from parts beyond the seas or coastwise into the Port of London, or exported to parts beyond the seas or coastwise from that port, port rates not exceeding the rates specified in the schedules to this Order." Counsel thought the intention was that the Order should preserve the same exemption as was given in the Act. But it was not so worded; and if it passed as it now was, it would be competent for the Port Authority to charge the full rates on goods sent to, and going from, places on the Medway and Swale, though the clear intention of the Port of London Act was that they were to be exempted. If the Order followed the spirit and not the wording of the Act, it would be a mere matter of drafting.

Mr. J. D. FITZGERALD, K.C., for the Port Authority, said that, as far as he was aware, there never had been any intention of altering the exemption given by section 43 in respect of the Medway and Swale, which was granted in the interests of the persons carrying on business on these rivers which were outside the Port of London.

Mr. FREEMAN said his clients sent thousands of tons of coke to the cement manufacturers on the Medway and Swale.

Mr. FITZGERALD repeated that, so far as he knew, there never was any intention of altering the provision put in in favour of the rivers named.

Mr. FREEMAN suggested that words should be inserted to make the matter quite clear.

Mr. R. J. N. NEVILLE, who appeared for up-river gas companies, outside the limits of the Port of London, urged that they should be treated in exactly the same way as they were being dealt with in section 43. They were outside the limits just as were the Medway and the Swale. They also sent their coke to cement manufacturers.

Mr. FITZGERALD stated that the point had been raised before the General Committee. The Swale and Medway were just at the mouth of the Thames, and it was a nominal user of the port. But the point in regard to the up-river gas companies was different. These places were not within the port; but nevertheless the coal they imported travelled up the whole length of the river. If such an exemption as that asked for were allowed, the whole of the coal trade of London, or the larger portion of it, would be transferred outside the limits so as to get the exemption. Coal destined for the western districts of London would be transferred to the Grand Junction Canal. The matter was considered before the General Committee, and they refused to extend the exemption either to coal or other articles taken up the River Lea, for the reason that all of them had the benefit of the port. On behalf of the Authority, he could not consent to section 43 being altered.

The CHAIRMAN: Section 43 of the Act would have to be preserved.

### Transport of Coal and Residuals.

When the proceedings were resumed on Thursday, further claims for exemption by gas companies were heard.

Mr. FREEMAN, for the South Metropolitan and the Commercial Gas Companies, said he would only have to trouble his Lordship with practically one case, because the circumstances were exactly the same as regarded both the Companies. It was merely a question of the quantity of coal they took and the degree to which they were affected. He thought some of the remarks he had to make would cover the case of the Gaslight and Coke Company also, whom Mr. NEVILLE represented. The actual import of coal by the South Metropolitan Company was 1½ million tons per annum; and of the Commercial Company, 200,000 tons. Therefore it became a very serious question for them if any further charge in addition to the present charges was to be put on a commodity which was essential for carrying on their trade. There were two matters to which he desired earnestly to draw attention, because they were the key to the whole of their position. At the present time the Companies were paying very large sums under existing legislation for things that were practically of no benefit to them whatever. Under the additional rate which was put on in 1908 as a permanency, they paid £1234 a year; they would also have to pay in respect of the additional registration of the vessels £200 a year further, instead of the few shillings which they had to pay at the present time. Then came this Provisional Order, which sought to impose upon them an exceedingly onerous extra duty in respect of works which would not contribute one farthing of benefit to the Gas Companies. The extra money which was to be raised was to be devoted to two objects—improving the docks and improving the channel,



So far as the docks were concerned, his Companies did not use them. Their coal was all landed at their quays on the river, and did not go through the docks at all. As regarded the channel of the river, that was amply deep enough at the present time for every vessel which brought coal to the Gas Companies. They would not derive one half-penny of benefit from any deepening to enable their vessels to come in, because they were of the right size for their works. Besides coal, they were to be charged a considerable amount on residuals. On the figure for residuals, they would be paying a further sum of £930; so that they would be actually paying to the Port Authority about £2360 in respect of works which would confer no benefit whatsoever upon them. If the figures which were suggested by the Port Authority were to be charged upon them, they would be subjected to an extra charge of something like £5000 a year. Was that fair or just? If the ordinary trader had an extra charge put upon him for the material which he had to consume in his district, he could put the additional charge upon the people who took the product from him. The Gas Companies could not do this, because they were subject to a sliding-scale; and if they found it necessary to raise the price of gas by reason of having to pay more for the coal, they would themselves have to bear a considerable share of the extra payment. They could not put it upon their customers. While the trader could shift his place of business elsewhere, this tax would not fall upon him. The Gas Companies, however, could not do this, because they were bound by Statute to put their works on a particular spot. Therefore they were entirely at the mercy of the Dock Authority; and it would be quite competent for them to put a very large price indeed upon their coal, and the Companies could not say a word. By the action of the Gas Companies in introducing gas cooking they had enormously reduced the smoke of London, and had considerably reduced the fogs which so greatly hampered the trade of the Port of London. The South Metropolitan and Commercial Companies could not take their coal by rail, because there were no facilities. He only proposed to call one witness, because what he said as to the South Metropolitan Company would apply also to the Commercial Company.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, examined by Mr. W. L. ROSTRON, said his Company had an area of about 55 square miles. The consumers numbered about 360,000, and some 250,000 were slot-meter consumers. The latter were chiefly members of the working classes; and they used the gas for lighting, cooking, and heating. They comprised the poorest class of residents in South London. His Company imported about 1½ million tons of coal per year. This was all brought coastwise from the North with a very slight exception; and it was dealt with in the river without coming into dock. A small proportion, for one of their oldest works, was dealt with at the Surrey Commercial Dock. With this exception, the whole of it was dealt with at their own premises. They had no facilities for bringing coal by rail. They also exported large quantities of coke, sulphate of ammonia, pitch, creosote, and other residual products, which were the subjects of taxation under this Order. In dealing with the residuals, they did not make use of the docks—only to a small extent at the Surrey Commercial Dock. The proportion of coal would be about 8 per cent., and ammonia and other residuals—apart from coke—would be about the same figure. Coke would be perhaps about 2 or 3 per cent., or even less.

The CHAIRMAN: Can you give me some idea of the total value of the coal you import and the residuals which you export in the course of the year. Is it about £1,100,000?

Witness was understood to say that it varied. Sulphate of ammonia fetched £12 a ton, and pitch 30s. The figures were made up of so many items. The value of the coal they imported was about 8s. 6d. f.o.b. in the Tyne. It would cost them about 11s. 6d. a ton in the Thames at present prices, or those ruling during the last twelve months. They had no railway-borne coal.

In further reply to Mr. ROSTRON, witness said that, apart from the dues, his Company had to pay considerable charges under the Port of London Act. The tonnage dues were doubled in 1904, and they paid an extra amount. They were made permanent under the Port of London Act. There was an extra ½d. a ton on the ships bringing coal to London. They used to pay ½d. a ton on the net tonnage, and they now paid 1d. In 1909, they paid about £1200 a year under the extra duty. The ships that brought their coal to London were of shallow draught; and there was no need for deepening for them. They would also have to pay extra charges under this Order in connection with registration fees on river craft. They owned a large number of barges, and they had to pay on these. Apart from any rise on goods, they paid about £1400 a year towards the upkeep of the port.

Mr. ROSTRON: As regards the charges on your residuals, so far as they are concerned, I understand you do not claim exemption?

Witness: No; we are quite willing to put these in with other goods exported. The only thing is that they should pay a fair rate.

So that if what you ask—the exemption of your coal—is granted, you would still be paying about £2500 a year towards the port, although you get no direct benefit out of it?—That is so.

Witness went on to say it was quite true they had a monopoly in the supply of gas; but they had no other monopoly. They had at the time their original monopoly was given, because it was the only practicable means of lighting. But now they were in keen competition with electricity. So as regards a great deal of the lighting, they had not a monopoly. Where they had a monopoly was the supply of gas by slot meters to the poor man. More than one-third of their gas was supplied to the very poor. In this case he thought they had a monopoly. Then, with regard to the dues, they made no objection to the proposal to increase the dues which were chargeable for the deepening of the river. They derived no advantage from it; but they raised no objection. In their case, they would get nothing whatever by way of increased accommodation for the extra charges proposed. What they got on the river that was necessary for their business they already paid for.

Replying to further questions by Counsel, witness said that, under the sliding-scale, any increase in the cost of production would be divided between the shareholders and the consumers. The loss to the shareholders would be comparatively small; the bulk of it would fall upon the poorest consumers. As regarded the interests of the Company, it was against their policy to raise the price. They had tried very hard

to keep down the price for a great number of years; and he thought he might say that the example of the Company, under the guidance of the late Sir George Livesey, had been a good one.

Answering the CHAIRMAN, witness said that 1d. a ton would involve an extra expenditure to them of £5000 a year.

In cross-examination by Mr. FITZGERALD, for the Port Authority, witness said he had in his mind that the extra rate which was to be levied on the tonnage of ships and the registration fees for barges were not confined to the coal trade, but were universal throughout the port.

Mr. FITZGERALD: The extra charge on the tonnage of ships does not seem to have adversely affected the South Metropolitan Gas Company in any way.

Witness: They have had more money going out; but they have been able to reduce the price of gas notwithstanding.

Your experience takes you back to the time when your Company had to pay 1s. a ton on all the coal they imported into the Port of London?—That is so. Under those circumstances, the basis price for gas was much higher than at present. It was 5s. 6d. per 1000 feet; it is now 3s. 1d.

When the charge was taken off, it enabled your Company to reduce their price and add to the dividend?—It was quite a short time; and that was corrected in 1900, when we went to Parliament. It was done in 1889, and was corrected in 1900.

You had eleven years during which you had a substantial benefit?—In the proportion of five-sixths to the consumers and one-sixth to the shareholders.

Supposing this impost had remained, it would have amounted to something between £50,000 and £60,000 a year?—A shilling a ton, yes. The whole conditions of gas supply have entirely changed in London.

And the shareholder in the Company is much better off than he was?—I think he is not. The stock is not so high. It was 130, and it is now 122.

Mr. NEVILLE, who appeared in support of the objections on behalf of the Gaslight and Coke and the Brentford Gas Companies, stated that the former had an area of about 74 square miles, mostly north of the river, but also south of the river adjoining the South Metropolitan Company. Their chief works were at Beckton. The Brentford Company were at the other end of the port. He did not propose to call any evidence. The chief points had already been given. The principles were the same for all the Gas Companies. He might call attention to the fact that the Gaslight and Coke Company might be taken as about double the size of the South Metropolitan; so that the figures given by Mr. Freeman were, roughly speaking, about double also. The Brentford Company were rather smaller than the Commercial Company. The total trade of the Gaslight and Coke Company inside the port was about two million tons—of course, chiefly coal, which was about 1½ millions. The total trade of the Company was about 165th part of the entire trade of the port; and 333 millions was given as the total trade of the port in 1907. The Brentford Company's trade was very much similar; but this trade had one characteristic which differentiated it from the other—that it was above Kew Bridge. Mr. Fitzgerald had alluded to Kew Bridge tolls. About 100 or 200 yards beyond, there was an extra toll; and this came to £800 a year on the Brentford Company. The other works which the Company had were at Southall, on the Grand Junction Canal. The entrance of the canal to the Thames was a few hundred yards higher up than Kew Bridge; so that the whole of the coal had to pay the extra toll which was put on for the purpose of keeping up the towing path—a path that was never used by the Brentford Company at all. The total tonnage of coal into the port was about 8,800,000 tons. His two Companies imported nearly 2 million tons between them. The estimate of the Port Authority was that coal was to pay £50,000 out of the total which was to come from the river trade. It was about 40 per cent—it had to pay practically 18s. 1d. in the pound of the total value derived from the river traffic. If they dealt with coal alone, the value of the coal was about 1½ per cent. of the total values of the commodities of the port, which were given at 333 millions. It was about 3d. in the pound of the total value. Yet it was asked to pay £50,000, which was 15 per cent. of the amount raised on the whole of these commodities. Coal was to be asked to pay eleven or twelve times as much as it ought to pay if dealt with as other commodities. The trade of the Gaslight and Coke Company worked out at 12s. out of every £100 of the trade of the port. Taking the rates, which he understood were about 50 per cent. of those mentioned in the schedule, the Gaslight and Coke Company alone would have to pay something like £16,000—£14,000 under the rates and £2000 extra for tonnage dues put on in 1905. There was 12s. for every £100 of the total trade of the port. They would have to pay about £4 19s. out of every £100. The case for the exemption of coal had been amply put before his Lordship; and he submitted that the question ought to be dealt with in a stringent manner.

The CHAIRMAN, addressing Mr. Fitzgerald, said he need not trouble him to say anything on the question as to whether there should be any port-rates on coal or not. He was satisfied there must be. The amount of these dues was a very different thing; and on this he would take time as to his decision. It seemed to him the question was a good deal complicated by the rule in the Provisional Order that coastwise traffic was to bear half of what overseas traffic had to bear. Coal was practically only coastwise traffic; and the result was that a maximum rate of 6d. per ton had been suggested in the Provisional Order, although there never could have been any idea, he supposed, that more than one-half this rate would be the maximum rate to charge on the great bulk of the coal that was imported, and probably—no doubt in accordance with what had been said by the Port Authority—not much if anything more than one-half of 3d. The placing of 6d. in the schedule had been, he thought, unnecessarily alarming to the trade. Whether it was possible or right—whether it would be right—in such a case as this of coal, which was purely coastwise traffic, to fix a rate for the article which should apply equally to coastwise and overseas traffic, he did not know. Perhaps the Port Authority would consider that.

Sir Hudson Kearley, the Chairman of the Port Authority, recalled, and examined by Mr. FITZGERALD, stated that, taking the rate of 6d. maximum, it automatically reduced itself to 3d.; and the Authority had repeatedly said they did not propose to raise more than half this.



Mr. FREEMAN: Do you consider that the payment of dues ought in any way to bear any relation to the benefits received? I put it to you that, in return for all the payments they make, the Gas Companies practically derive no benefit from your expenditure?

Witness: I do not agree.

You know that the South Metropolitan Gas Company bring their coal direct in steamers to their wharves. What benefit do they derive from any of the works you are going to carry out?—There is the river for their steamers.

But our coal comes direct to us, and is not on the river. Supposing these steamers go up the river, which is at present perfectly deep enough for them, and do not go into dock at all, what benefit do we derive from it?—Parliament has laid down that there shall be dues for a particular purpose; and it has been adumbrated in Parliament that the levy should be such that the incidence should be very small on any particular trade.

And did not Parliament say that the case of coal, particularly gas coal, was one that ought to be delicately considered?—I do not think the statement which has been put forward by Counsel was the attitude of the Board of Trade at that moment.

But it was the attitude of the Committee.—No, I do not think it was. The Committee decided in bulk that all these were questions for the Port Authority, subject to the schedule coming up for review before it received parliamentary sanction.

Mr. FITZGERALD, summing up the case for the Port Authority, said the question now reduced itself to whether, in view of the competition that undoubtedly existed between sea-borne and railway-borne coal, such a case had been made out that his Lordship would fix the maximum rate at something very much less than it appeared in the schedule. On this, he submitted that all the evidence, including that given by the witnesses who had been called against the proposal of the Port Authority, really established the proposition that sea-borne coal could perfectly well stand a rate of something equivalent to what was paid in other ports. With regard to what the maximum rate ought to be, that was a question for his Lordship; and it was complicated by the fact that there was one charge for overseas coal and another for coastwise. Of course, this was a question of drafting that might be easily met by putting in the original schedule a charge for overseas coal and so much for coastwise, and exempting coastwise coal from the second schedule. With regard to the Gas Companies, he really was unable to see that they had any case for special treatment at all. On the contrary, they were in a truly favourable position. Mr. Carpenter had told them that any increased charge would fall not upon the Company but upon the consumer. He (Counsel) supposed that, whatever the charge was, the consumer was the person who had to pay, and, accordingly, he submitted that, in this case, the Port Authority had acted quite reasonably in taking a maximum of 3d. for coastwise coal. The Board of Trade could call upon the Port Authority to increase their rates; and for this reason, among others, it seemed desirable that there should be a substantial margin between the actual rate and the maximum rate which they put forward.

The CHAIRMAN: I understand that the Port Authority would not object to my suggestion, if I may call it so, that the rate on coal coastwise should be the same as the rate on coal overseas; and although I should not like to decide the matter finally now—because I do not know whether any other article might be in the same position—yet I am certainly disposed to take this course. As to the maximum rate, assuming such a course to be taken, I think the proposal of the Port Authority is too high; and I would recommend to the Board of Trade a considerable reduction. I do not think there should be a large margin between the maximum rate and the rate actually charged in the case of coal, because I think the due ought to be moderate. But the article is so important in the amount it yields to the revenue of the Port Authority in any case, even on the smallest charge, that I shall postpone my decision as to the precise maximum rate until we have gone through the rest of the schedule, and see how that works out.

The inquiry was then adjourned.

### Impure Atmosphere in Electric Lighted Buildings.

In view of the claims put forward by electricians that their system of lighting ensures atmospheric purity in buildings where it is in use, the following paragraph, taken from a recent issue of the "South Wales Argus," will be perused with interest by our readers. It may be mentioned that the hall referred to is lighted entirely by electricity; gas not having been taken into the building: "One much-desired condition in a public concert hall no architect has ever yet been able to secure, and that is an abundant supply of fresh air without the accompaniment of a disturbing draught. The music-loving people who wished to hear Gounod's 'Redemption' at the Central Hall were more numerous than the places in the building; and many who would gladly have found seats, had perforce to stand. Some of these had to make choice between losing the pleasure of the music or being content with standing room under the gallery. A few who arrived a little late were so enthusiastically bent on hearing the oratorio that they determined to endure this discomfort. But the most serious difficulty was that of enduring the heat, and living, without being fatally poisoned, in the terrible air which had to be breathed. The man who can really solve this problem will be a benefactor of the race of those who patronize crowded indoor gatherings. How happy were the Greeks and Romans in living in a climate which enabled them to take nearly all their pleasures in the open air, where deleterious gases had no chance of collecting and doing untold mischief."

The Laindon District Gaslight, Coke, and Water Company's works—so far as the gas portion of the undertaking is concerned—are to be sold by auction, by Messrs. A. & W. Richards (under direction of the High Court), on the 12th prox. This is one of the Companies that has attained somewhat unenviable notoriety in our columns of late; and it will be interesting to note the difference between the Directors' ideas as to the value of the plant and undertaking and that realizable under the hammer.

### GERMAN CONTINENTAL GAS COMPANY.

#### Extended Use of Vertical Retorts.

We are indebted to Herr W. von Oechelhaeuser, the General Manager, for a copy of the report and statement of accounts for the past year which will be submitted to the general meeting of the above Company to be held at Dessau on the 23rd inst.

The report states that the hopes entertained in the preceding year, that there would be a considerable revival in the business of the Company consequent on the general improvement in trade, have not been fulfilled. The first quarter of the working year resulted in an absolute decrease of gas consumption in the German towns served by the Company. But an improvement took place later; and the net result is that the total make of gas for all the works of the Company amounted to 80,797,702 cubic metres (2,853,451,644 cubic feet), which is an increase of 3.22 per cent. on the make of the preceding year. This compares with an increase in 1908 of 3.48 per cent., and in 1907 of 8.77 per cent. The Company are able to pay the same dividend—viz., at the rate of 9 per cent.—as in 1908, though the total profit of 3,381,126 marks (£165,740) is 45,096 marks (£2210) less than in that year. The decrease in profit is attributed mainly to the unfavourable prices obtained for coke, notwithstanding that the prices paid for coal were comparatively high. The mildness of the winter of 1909-10 in Warsaw, which is the largest town served by the Company, was responsible for an abnormally small demand for coke there, with the result that the stocks had to be disposed of at low prices.

The competition of electric metallic filament lamps was not felt so keenly as had been anticipated, though they were energetically pushed on all hands. Considerable economy in gas consumption, however, continued to be effected through the increasing adoption of inverted gas-burners. The report points out that the latest small inverted burners, consuming 30 to 35 litres (1.059 to 1.236 cubic feet) of gas per hour, afford a light of 25 to 30 "candles" [doubtless befmers = 22.7 and 27.3 English candles], and are therefore the cheapest means of lighting a house at the present time, just as the high-power gas-burners are the best lights for public lighting. The consumption of gas for heating and industrial purposes continues to show considerable increase; but the Company are no longer able to draw the sharp line of demarcation which was possible formerly between the consumption of gas for lighting and for other purposes, because a uniform price of gas has been adopted in several places, and a single meter is used, instead of separate ones. Consequently, in this year's report the tabular statement of the distribution of gas consumption for lighting, heating, and power purposes which has appeared in former years has been omitted. The Company's practice, however, will be to give the ordinary domestic supply at a uniform price; but where a large quantity of gas is consumed for industrial and power purposes, and separate services and meters are not required for lighting, a lower price will be quoted to the consumer. The number of prepayment meters continues to increase, and at the close of the year was 24,318, the consumption of gas through which represented 10 per cent. of the total output.

Reference is next made to the supply of gas to balloons and the production at the Dessau works of the Company of a special light gas for this purpose. This balloon gas has hitherto been produced in the ordinary retorts, both vertical and horizontal, from ordinary purified coal gas; but experiments are being pursued for its production in settings of special construction. The new gas, to which reference has already been made in the "JOURNAL" (Vol. CVIII., pp. 185 and 533), has a specific gravity of about 0.23.

The working results with vertical retorts have been further improved, both in respect of the make of gas per ton of coal and of economy in consumption and fuel wages. The Dessau and Potsdam works of the Company have already for some time past worked exclusively with vertical retorts, and in the past autumn the whole of the Rheydt-Oderkirchen district began to be supplied entirely from a new installation of vertical retorts at M. Gladbach. A large new retort-house at the No. 2 Works at Warsaw, for a productive capacity of 3½ million cubic feet per diem, is being equipped with vertical retort-settings, half of which are already in action, and the other half will be brought into operation in the current year. A large bench of vertical settings will also be completed in the No. 1 Works at Warsaw this year. The reconstruction of the works at Frankfort-on-Oder, which is now being undertaken, will involve the adoption of the new settings there. They will also be provided in the course of the next few years at the remaining works of the Company wherever the scale of working is sufficiently large to make the mechanical handling of coal and coke for the vertical settings remunerative. The new Upper Silesian Central Gas-Works is being erected at Bismarckhütte, and will start work in the present year for the supply of ten communities with a total population of 140,000. The distributing system in connection therewith will have a length of about 28 miles. The total length of mains supplied by the Company's works amounts to 1,254,785 metres (about 780 miles). The unaccounted-for gas fell from 6.49 per cent. in 1908 to 5.93 per cent. in the year under review. New contracts have been made for the supply of Rossau, having 13,000 inhabitants, from the Dessau works, and of eight outlying townships from the Potsdam works. The negotiations which have been in progress for a long time for the renewal of the concession for the supply of gas to Erfurt have failed; but an agreement has been made for the purchase of the Company's works by the Corporation at the expiration of the present concession—viz., on the 1st of January, 1911. The payment to be made will amount to about £245,100, which is equal to the full book value of the works. There will be profitable employment for the capital thus released in the extension of the other works of the Company and in the new works already referred to.

The electricity works of the Company at Dessau have undergone complete reorganization, and new plant for alternating current of 500 volts has been erected on a fresh site, for conversion to direct current at a transformer station on the old works. The report concludes by stating that it has been considered expedient to cease with the present issue giving the tabular statement of gas made and dividends paid since the inception of the Company, and the detailed statement of accounts and working results which were formerly given. It has been found that the



publication of these figures led to false conclusions being drawn in newspapers to the prejudice of the Company in its negotiations with the municipal authorities. Consequently, the present report gives only a summary of the profit and loss account of the Company.

# METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of this Company was held at the Offices, Flinders Street, Melbourne, on the 28th of January—Mr. JOHN GRICE, the Chairman, presiding.

The SECRETARY (Mr. John Hinde) having read the advertisement convening the meeting, the report of the Directors and the accounts for the six months ending Dec. 31 were presented. The former set forth that the net profits for the half year, including £4960 brought forward, amounted to £90,740. Of this sum, £24,500 had been transferred to the reserve fund account; £3500 to the meter renewal fund, and £1500 to the gas-stoves, &c., account. A sum of £6670 had been transferred to provide for the conversion of debentures; £9500 had been set aside as provision to part meet extra expenditure on coal during the strike; and the Directors recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,860, leaving £2210 to be carried forward. The working statements in the accounts showed that, under the supervision of the Engineer (Mr. Philip Holmes Hunt), 90,958 tons of coal and 44 tons of cannel had been used in the production of 972,885,000 cubic feet of gas, of which 875,691,000 cubic feet had been sold, and 889,653,000 cubic feet accounted for.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said the improvement in business disclosed in the June half had continued, and the figures for the complete twelve months compared as follows with the year 1908. The total number of meters standing fixed in consumers' premises was as follows:

	Dec. 31, 1909.	Dec. 31, 1908.	Increase.
Ordinary . . . . .	78,329	72,970	5359
Slot . . . . .	15,128	11,756	3372
Total . . . . .	93,457	84,726	8731

This showed an increase for the year of 8731. The rapid progress of the Company was largely owing to the keen manner in which the staff devoted their energies to their work. This was shown by their having in the last three years installed 24,246 additional meters; being an increase of about 35 per cent. The total quantity of gas sold in 1909 was 1694 million cubic feet; in 1908, it was 1563 millions—showing an improvement over 1908 of 8.4 per cent. The receipts from the sales of gas during 1909 were £407,866, and in 1908 £373,970—an increase in receipts of £33,896. Included in this amount were the sales of gas through slot meters, £34,071. These were in 1908 £24,099; the improvement being £9972. These figures proved that all which had been said on previous occasions as to the popularity of this system was fully justified. Having supplied several districts with their present requirements, they were now installing slots in the district of Northcote. Reference was made at the last meeting to the introduction of small cooking-stoves to meet the special requirements of slot consumers. These could be acquired by them at a low price, and on very liberal terms, on the hire-purchase system. On Dec. 31, 2461 slot consumers were using stoves, against 1630 a year ago. Of these, 1818 were supplied on the hire-purchase system, under which, by means of small monthly payments, the stoves become the property of the householders at the end of two years. The total sales of residuals during the twelve months had produced £106,618. The expenditure on coal was some £6216 in excess of the corresponding amount for December, 1908; largely accounted for by an expanding business, necessitating the use of some 5000 tons extra. Repairs at works represented an expenditure of £22,376, against £21,672 for the corresponding half year. Remarks by the Chairman upon this item on previous occasions would have led shareholders to anticipate heavy outgoings in this direction for some time to come, as they were doing, and had in front of them, much and very important alterations and improvements at the works. The balance carried to the net revenue account was £105,706. From this amount the following appropriations have been made: Reserved fund account £24,500, meter renewal fund £3500, gas-stoves, &c., account £1500, to provide for conversion of the Company's debentures to 4 per cent. per annum as from April 1, 1910, £6670, and provision to part meet extra expenditure on coal during the strike £9500. The demands upon the amount at the disposal of the Directors were thus shown to be of an exceptional and special character, and, after meeting current requirements, the sum to be carried forward to next half year was £2750 less than was brought forward from June last. With regard to the reserved fund account, it would be seen that, notwithstanding the amount of £24,500 placed to its credit, this account was only added to by some £895 as the result of the half-year's transactions. Capital expenditure, for which the reserved fund account was now drawn upon, had, owing to extensive additional reticulation, been very heavy—new mains, meters, and services having absorbed £20,280. The latter item included many items and two important works—viz., the cost of reticulating with gas-mains the new district of Elwood, St. Kilda, and providing a very large new trunk main to strengthen the supply in the rapidly growing suburb of Essendon. The comparatively small transfer of £1500 had been made to gas-stoves account. In mentioning this, a little thought should be given to the important work done in the Stove Department, where the net sales totalled £43,677 during the past twelve months, or an increase of £5500. It had been their policy for some time to encourage the sale rather than the renting to consumers of gas-stoves. The number of stoves on hire on Dec. 31 last was 10,440, compared with 11,243 on Dec. 31, 1908—a reduction of 803. No fewer than 5422 stoves had been sold during this period. Deducting the lesser number on hire from those sold showed an increased output for the year of 4619. In 1908, they sold 3389 and rented 814 more stoves than in the previous year. Speaking approximately, therefore, they had the same number of gas-stoves on hire as they had on Dec. 31, 1907, and had sold to consumers 8800 stoves in two years—a magnificent result, on which Mr. Scotland,

the Manager of the Stove Department, and his staff, could well be congratulated. The Company were not only selling large numbers of stoves, but doing their utmost, by means of tuition and in other ways, to secure to those who had them the fullest advantages to be gained by their use. The provision of £6670 to meet the cost of debenture redemption was the outcome of an important transaction which had received the attention of the Directors during the past half year. On April 1, 1910, debentures amounting to £350,000, carrying interest at the rate of 5 per cent., the principal and interest of which were payable in London, had to be provided for. The matter received very careful consideration by the Directors, and it was decided to accept an offer of £98 per cent. net for £333,500 of bonds, bearing 4 per cent. interest. They arranged for the issue of the balance (£16,500) at 4 per cent. at par, to date from April 1 next. The principal and interest were to be payable in Melbourne instead of London. Special reference was made at their last meeting to the necessity for providing additional plant and a new reort-house. The reort-house, it was stated, would probably be at West Melbourne. They were, however, then very cramped as to space for such an addition; and they had, after lengthy negotiations, purchased and arranged for an additional area of about 3½ acres adjoining their works on the west. A sum of £16,500 would have to be provided out of the reserve fund for this transaction. An item of £9500 had been set aside for the extra cost of coal owing to the strike at Newcastle. What this disastrous affair would cost them it was impossible for the present to say. The Directors, the Secretary, and the Engineer had had an anxious time ever since it started; for, in order to make sure of obtaining satisfactory coal, they had to order the major portion of it from England. The Directors had arranged for the greater part of their coal requirements, at a reasonable price, for three years, commencing on April 1 next. Mr. Aaron Danks had been selected by the Directors to fill the vacancy on the Board caused by the death of Mr. Ham. By way of showing the progress gas had made, and was making, on the other side of the world, the Chairman referred to the recent report of the deputation of the Streets Committee of the Corporation of London who visited the Continent. He then moved the adoption of the report and balance-sheet.

The motion having been put and carried, a dividend at the rate of 5s. per share for the half year ending Dec. 31 was declared, and the retiring Directors and Auditor were re-appointed.

The proceedings concluded with the usual votes of thanks to the Directors and Staffs; the Directors, the Secretary, and the Engineer (Mr. P. C. Holmes Hunt) being complimented on the work they had carried out during the strike.

# ILFORD GAS COMPANY'S CO-PARTNERSHIP SCHEME.

In moving the adoption of the report at the half-yearly meeting of the Ilford Gas Company on Monday last week, the Chairman (Mr. W. Ashmole) prefaced his remarks on the working of the Company by a statement in reference to the co-partnership scheme, which, as mentioned at the preceding meeting, had been receiving the careful consideration of the Directors. He expressed his pleasure in stating that the scheme had taken concrete form; and he thought the stockholders would agree with him that it would be most beneficial to all concerned. The fact of making the employees co-partners not only encouraged thrift, but gave them an interest in the Company's welfare, and an incentive to carry out the various tasks allotted to them in a thorough and willing manner, knowing full well that the advantage of good working not only benefited the Company they served, but also the Company in which they were stockholders. By giving their best talents and energy to the general interests of the Company, they helped towards its more economical working. The benefits derived by the Company by the scheme tended, of course, towards the cheapening of gas; so that the proprietors would readily see that the consumers were going to profit by the arrangement. The scheme, to put it briefly, required the signing by each employee for an agreed term (in most cases twelve months) of an agreement making him a co-partner, and entitling him to the benefits of a bonus paid on a sliding-scale varying with the price of gas. Having further explained the scheme, the Chairman said he trusted the confidence of the Board in it would be justified, to the advantage and general benefit of the three parties concerned—the Company, the employees, and the consumers. He then passed on to deal with the working of the Company in the half year, which, according to the accounts, had resulted in a profit of £7889, against £6747 before, showing an increase of £1142; and there was a sum of £9789 available for distribution. The Board had consequently been able to recommend the declaration of a dividend for the half year at the rate of 7 per cent. per annum on the "A" and "C" stocks, and of 5½ per cent. per annum on the "B" stock (less income-tax at 1s. 2d. in the pound); being an increase in each case of ½ per cent. per annum. He concluded by saying he was sure the proprietors would all agree with him that the fact of the Board being in a position to recommend this increase showed the present sound position of the Company, and would tend to further improve the value of the property. The report was adopted, and the dividends recommended were declared.

At the general meeting of Messrs. C. & W. Walker, Limited, to be held in Birmingham on the 23rd inst., the Directors will report that the profits for the year ended the 31st of January last, after charging Directors' fees and depreciation on buildings and plant, amount to £11,889. Adding the balance brought forward, and deducting the interim dividends (£3100), there remains for disposal the sum of £16,497, which the Directors recommend should be appropriated as follows: Dividend at the rate of 5½ per cent. per annum on the preference shares for the six months ending Jan. 31, £1100; dividend at the rate of 10 per cent. per annum (free of income-tax) on the ordinary shares, £2000; to be added to the reserve fund (making it £35,000), £5000; to be carried forward, £8397. Notwithstanding the continued very severe depression, the Directors are pleased to report that the profits have been fully maintained; and they propose to write off the whole of the goodwill (£10,000) from the reserve fund, which will stand at £25,000.



## CITY AND SOUTHWARK CORONER'S ANNUAL REPORT.

## Question of Disused Sewers—Fires Caused by Electricity.

In the course of his annual return for the year 1909 to the Corporation of London, the Coroner for the City and the Borough of Southwark (Dr. F. Joseph Waldo) refers to the fatal gas explosion which occurred on Dec. 30, 1908, in Grange Road, Bermondsey, as fully reported in the "JOURNAL" at the time. The questions put to the Jury, and their answers, which were given in our issue of Feb. 9, 1909 (p. 399), are reproduced. One of these suggested "an official inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future;" and in connection with this subject, Dr. Waldo says he addressed the following letter to the President of the Local Government Board, dated Feb. 20, 1909.

At the conclusion of an inquiry held by me into the death of George Henry Langley—which included an inquiry into the cause of an explosion of coal gas at Bermondsey—I advised the Jury that "with a view of preventing similar untoward occurrences in the future, it would be well to ask for an inquiry as to the prevalence of disused sewers in London, and whether it would not be desirable to fill them up, or, at any rate, to secure a free system of ventilation."

In answer to questions put by me, Sir Alexander Binnie and Professor Vivian B. Lewes (called by the South Metropolitan Gas Company), Mr. J. W. Restler, the Deputy Chief Engineer to the Metropolitan Water Board, and Mr. Angel, the Surveyor to the Borough Council of Bermondsey, all agreed that the leaving of uninspected sewers, like that in the Grange Road, Bermondsey, below the surface of the road, was, to quote Professor Lewes's own words, "one of the most dangerous practices that could ever be allowed in a populous city."

Among the questions put by me to the Jury was the following: "Would you suggest an official inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future?" The unanimous answer of the Jury to this question was "Yes." As a practical outcome of the Jury's rider, I now venture to suggest that a public inquiry into the condition of old disused sewers, or into the means generally of preventing any similar explosion in future, be undertaken by the Local Government Board, with the co-operation of the London County Council, the City Corporation, and the Metropolitan Borough Councils.

Dr. Waldo remarks that the matter is an urgent one; but so far there has been no practical outcome of the Jury's rider. In fact, the majority of the Local Authorities, so it appears, are not in favour of an inquiry.

With regard to his duties under the City of London Fire Inquests Act, Dr. Waldo says: "Of the 140 fires reported, in 114 cases the cause of the fire was determined; and in only 26 fires does the cause still remain unknown. In the case of 13 fires, I have, with the expert assistance of your Electrical Engineer, been able to decide that these fires were due to defective electrical arrangements. In the course of my fire inquiries, many suggestions have been made and adopted by owners and occupiers with a view of the saving of life and property in the future. The past year is remarkable for the small number of serious fires occurring within the boundaries of the City."

## NEWPORT'S UNPROFITABLE ELECTRICITY UNDERTAKING

## Rates to be Increased.

In the "JOURNAL" last week, it was briefly mentioned that the Corporation of Newport (Mon.) had called in Mr. C. P. Sparks to advise them as to whether the electricity undertaking, in respect of which £9000 has been paid out of the rates since it was started, is now being worked to the best advantage, and what, if any, improvements and alterations are desirable; also, as to the desirability of increasing the plant, as indicated in the report of the Borough Electrical Engineer (Mr. H. Collings-Bishop). Mr. Sparks's report has now been received, and the following are its chief features.

After pointing out that no reserve fund has been provided to meet replacement of plant, which may or has become obsolete before the expiration of the loan periods, Mr. Sparks deals briefly with the history of the undertaking, and disapproves of the Committee's policy, adopted in 1902, for general power supply. On the other hand, he says, considering the present position, the 1909 results compare favourably with those of other undertakings of similar size and load-factor, and reflect credit on the Electrical Engineer. He says he cannot indicate any economies in the use of existing equipment. The losses with the alternating system of distribution are high, owing to the large number of small transformers in use; and the only remedy would be their gradual replacement by larger transformers placed in sub-stations supplying groups of consumers.

On the question of the scale of charges for electrical energy, Mr. Sparks makes some drastic recommendations, which mean an all-round increase. He says the present scale of charges is not adequate, and to balance accounts and provide a reserve fund to meet the renewal of plant which requires replacing before the expiration of loan periods the present charges should be raised, or modified to produce additional revenue to the amount of about £2900 on the basis of sales made to March, 1909.

The Electricity and Tramway Committee of the Corporation have considered the report, but have only come to a decision as far as the scale of charges to consumers is concerned. On this point they have not adopted Mr. Sparks's recommendation that discounts should be reduced to 2½ per cent., but have agreed that all accounts should be subject to a discount of 5 per cent. if paid within one month of the date of delivery. They have resolved that the other recommendations, which include an increase of ½d. per unit for lighting and of ¾d. per unit to large power consumers, with respect to the scale of charges, should come into force on the 1st of April.

The report was brought up for consideration at the last meeting of the Town Council, when the Chairman of the Committee, in moving its adoption, submitted a new scale of charges. After some discussion, an amendment containing another scale was adopted; and the report was passed. A proposal that the whole matter of the charges to be made for the supply of electricity should be deferred for twelve months did not find a seconder.

The ratepayers of Newport are quite alive to the serious position of affairs, to judge from a letter from the Secretary of the Ratepayers' Association (Mr. J. P. Elms) which appeared in the "Monmouthshire Evening Post" last Wednesday. Referring to the report of Mr. Sparks, Mr. Elms says: "He advises, among other things, (1) that 1 per cent. of the capital outlay should be set aside annually to provide for the renewal of plant which requires replacing before the expiration of the loan period, &c.; (2) a revised tariff estimated to produce an annual increase of £2905, sufficient to clear the present annual deficit of about £1400, and provide ½ per cent. (one-half of the requirement); (3) that £350 be set aside annually for battery maintenance; (4) that certain plant be superseded, which will bring the suspense account for this item up to about £12,000; and (5) that the overcharge of 12 per cent. on current for the tramways should be amended." Mr. Elms points out that the Electricity Committee have varied the recommendations in respect of the tariff, so that it will only produce an additional £2661 a year, from which will have to be deducted the £350 for battery maintenance; leaving £2311, which will be practically all swallowed up by interest and sinking funds upon the loan of £31,255 applied for by the Council, assuming 22 years for its repayment. Everything, therefore, depends upon increased consumption; but many believe that customers will be lost through the new tariff. Mr. Elms adds that before anything can be set aside for the renewal fund, the deficit of about £1400 per annum must be wiped off, the £12,000 suspense account must be liquidated, and the overcharge on the current for the tramways ought to be set right. After all this, how many years, he asks, are likely to elapse before the renewal fund is started?

Another matter dealt with by Mr. Elms is the assessing of the electricity works at £1983, compared with £6406 for the gas-works; and he reminds the ratepayers that an appeal to Quarter Sessions or the High Court of Justice would compel the immediate removal of this injustice. He also points out that the Local Government Board are of opinion that gas is cheaper than electricity for public lighting, and will not sanction loans for the extension of public lighting by electricity excepting where it is proved that, in consequence of special local circumstances, gas is unmistakably dearer.

## VALUE OF SCIENCE IN THE GAS-STOVE INDUSTRY.

## Record Profits of John Wright and Eagle Range.

The very satisfactory report noticed in the "JOURNAL" last week, which the Directors of the above-named Company presented to the shareholders on Thursday, fully justified the pleasure expressed by the Chairman (Mr. S. Sanders) in moving its adoption. The period covered—the twelve months ended Dec. 31—was a record year in the history of the Company's operations, both in the amount of business done and of profit earned; the latter being £55,052 against £54,455. From this amount, in addition to paying the dividends, the Directors proposed to carry, as last year, £8000 to the reserve; bringing it up to £57,000. Beyond this, the amount of cash in hand and at the bank at the close of the year was £52,603, compared with £44,347 at the corresponding time in 1908. Another satisfactory feature in connection with the undertaking is that the total of the Company's investments exceeds by some £5000 the amount of the entire preference shares. The means by which these excellent results had been achieved formed the key-note of the speech of the Vice-Chairman (Mr. H. James Yates), in seconding the motion. In the first place, the Company had to face severe competition; and this necessitated a thorough reorganization of the business, not only as regards the works, but also on the commercial side. The introduction of a new equipment of machinery and plant on altogether different lines, and the adoption of manufacturing methods entirely fresh in the gas-stove trade, made substantial progress last year; and Mr. Yates pointed to the result of the trading, as shown by the accounts, as an index of the advantage to the Company which these changes had already produced. So radical had the alterations been at the works, that if anyone who had not visited them for two years were to walk round now, he would scarcely be able to recognize them. With regard to the future, he thought he might say that, with their actual equipment and what was in progress, they had no reason to look with other than full confidence upon the prospect of the keenest possible competition. Having referred to the occupancy by the Company, early last year, of the whole of the additional buildings acquired from the Sutherland Meter Company, Mr. Yates went on to say that among a considerable number of new inventions brought out by the Company during the past two years was a development in gas-fires which had completely revolutionized this section of the gas-stove industry, and rendered obsolete the types of fires hitherto in use. This had naturally added to the Company's prestige, and been very valuable to them. One feature which had contributed largely to this and other developments in their gas apparatus, was the great prominence they had given to the scientific side of the business—indeed, it might be said that science had now become its backbone. The new testing-rooms and physical and chemical laboratories [described and illustrated in the "JOURNAL" for the 19th of October last] had been in full operation for the past year; and the research work carried on there had already borne its full share in conducing to the results which the Directors had been able to show. The report was adopted.

The Gas Desulphurization Company, Limited, is now in liquidation, and statutory notices have been issued calling a meeting of the creditors for Monday of next week, while all claims have to be sent in by the end of this month.



## IMPROVEMENTS AT THE DEVONPORT GAS-WORKS.

The Devonport Town Council had under consideration last Thursday a report by the Gas Committee recommending that application should be made to the Local Government Board for sanction to the borrowing of £6000 for works necessary to improve the quality and pressure of the gas. The Committee stated that their recommendations were based on a report by the Gas Engineer (Mr. W. P. Tervet), in which he submitted that it was immediately necessary to provide retort-bench fittings complete, mains, exhausters, washers, and workshops and mess-rooms; and that these works would effect a saving in the cost of production and conduce to an increased output of gas.

Alderman TOZER, the Chairman of the Committee, in moving the adoption of the report, said that during the past year there had been a demand for gas in excess of anything hitherto experienced; and, unfortunately, the Gas Committee had not been able to meet it as it should be met. They could not give either the pressure or the quality necessary to ensure satisfaction. They felt that it was absolutely essential that something should be done, so as to let the consumers have value for their money; and, having fully considered the matter, they were unanimous in recommending the carrying out of the Engineer's proposals. The output of gas for the year ending March, 1902, was 266 million cubic feet, and for the year ending March, 1909, it was 355 millions—an increase of 33 per cent. in seven years. In 1902, Government establishments took 19 per cent. of the total output, but in 1909 only 9 per cent.; so that, though they supplied considerably less gas to the Government, the demand for it in other directions had grown considerably. The Engineer estimated the savings effected by the works proposed would be more than double the cost of the loan. If the Corporation could give a more satisfactory supply of gas, it was undoubtedly their duty to do it. Of course, the Committee had a reserve fund; but until it reached £10,000 they did not think it should be drawn upon for such improvements as those proposed.

Alderman BLACKALL, in seconding the motion, said the work suggested should have been taken in hand years ago. It really ought to have been done before the works came into the possession of the Corporation; it was urgently needed for the economical production of gas.

After some remarks, the report was adopted.

## BURTON-ON-TRENT GAS SUPPLY.

The Monthly Meeting of the Burton Corporation was held last Wednesday. In moving the adoption of the Gas and Electricity Committee's recommendations, Alderman Lowe referred to the fact that the Committee recommend that Mr. J. F. Bell, of Derby, be again appointed Consulting Engineer for another twelve months on the same terms as before, and that he be paid a special fee for carrying out the reorganization of the gas-works.

In connection with the reconstruction of the gas-works, the Gas Committee have entered into the following (among other) contracts for the first section of the scheme: Messrs. Graham, Morton, and Co., of Leeds, for the erection of ten Klönne regenerator retort-settings, £2070; Clayton, Son, and Co., of Leeds, for the construction of retort-bench mountings for ten beds in the new retort-house, £2870; local contractors to build the new retort-house, &c., and to erect the retort-bench, at the total sum of £3738, and a coal-handling plant at the sum of £1295; and W. J. Jenkins and Co., of Retford, to erect the retort-house roof, steel-work, floor girders, cross girders, overhead coal storage hoppers, for ten beds in the new retort-house, coal-breaking plant, coke-conveyor, and stoking machinery for £5647. The first three contracts are duly completed, the fourth is expected back completed in a day or two, and the last contract will be sent to the Contractors as soon as the plans are received from the Engineer. The total amount of the tenders accepted last week was £15,620. As previously stated, the work is to the designs of Mr. Bell; while Mr. A. E. Ruffhead, Assoc. M. Inst. C.E., who superintended the gas-works reconstruction at the Ayres Quay Gas-Works, Sunderland, is helping Mr. R. S. Ramsden, the Assistant Manager, with the supervision of the work at Burton.

## BURSLEM CORPORATION GAS SUPPLY.

### The Past Year's Working.

At the Meeting of the Burslem Town Council on Monday last week, the accounts of the Gas Department for the year ended Dec. 31 were read in draft form. The revenue account showed that the sale of gas (including public lighting) produced £20,185; the other items making a total of £27,639. On the expenditure side, the manufacture of gas cost £13,790; distribution, £2771; and other items made a total of £20,622—leaving a gross profit of £7017. This was carried to the profit and loss account, and there was paid out of it interest on loans £3392, fifth payment to the sinking fund to repay second instalment of Admiralty loan, £1171, transferred to reserve fund (being the amount of principal paid off loans during the period) £1131, on new show-room £230—leaving a net profit of £1093. There was a balance on Dec. 31, 1908, of £14,273, out of which there was transferred to the general fund in relief of the rates £1200, and a contribution of £5000 was made towards the cost of new municipal buildings; leaving £8073. This, together with the net profit for the year of £1093, made £9166. The balance-sheet showed a total capital expenditure of £124,572; stocks on hand, £7540; gas and meter rental, £6718; cash in hands of Treasurer, £905; sinking fund investments, &c., £6470; these sums, with the cash in hand, making the total £146,214. The liabilities were: Sundry loans, £84,361; interest accrued and unpaid on loans to date, £856; sundry tradesmen, £5299; due to Treasurer on current account, £2884; general fund (being balance of amount voted in relief of rates), £600; sinking fund, £6407; reserve fund, £34,638; new retorts reserve fund, £2000—leaving a balance of £9166.

The Gas Committee recommended that the Council should express

their highest appreciation of the manner in which the duties of Gas Engineer and Manager had been discharged by Mr. Edward Jones during the past four years, and the fullest satisfaction with the results obtained and the general conduct of the undertaking; and that a copy of the resolution, under the seal of the Council, should be handed to Mr. Jones.

Mr. Mitchell, the Chairman of the Gas Committee, in presenting their minutes, stated that during the past year the output of gas had been 208·8 million cubic feet, compared with 211 millions in 1908 with three months of Wolstanton. The works had been continued under full strength, and the retorts had been well used. The show-room, which was completed last year, was repaying them. They made a profit of £330, which showed that the step had been in the right direction. Residuals and other things were rather low; but prices were increasing, and he hoped the works would continue to do as well in the future as they had done in the past.

Mr. Wade congratulated the Committee upon the success of their efforts, and said that personally he was glad they had expressed satisfaction at the way in which Mr. Jones had done his work. Only those who had had anything to do with the Committee and their operations before the appointment of Mr. Jones had any real conception of the great change which had taken place. He hoped the excellent work done by the Burslem Town Council would be fully recognized and acknowledged by the new authority when it came into operation.

The minutes were passed.

## THE OUTLOOK FOR GAS COAL.

[From the "Iron and Coal Trades Review," March 11.]

It is the custom to arrange contracts for gas coals for twelve months from July 1, and the negotiations between the collieries and the works are usually entered into during May and June. But this year there are indications that many inquiries will be made at a much earlier period. In fact, there are already several in the market, which tends to show that gas managers are anticipating advanced prices. Moreover, offers of an additional 6d. per ton have already been made for renewals; but at present collieries will not entertain them. The Colliery Owners' Association, which includes most of the numerous large coal producing collieries in South Yorkshire, Lancashire, and Derbyshire, has agreed not to accept orders for delivery up to the end of June next at less than 1s. per ton advance, and not, at present, to quote for contract renewals for twelve months from July 1.

So far as can be learned at the moment, the Association is likely to ask 1s. 6d. per ton advance on gas coals for contract renewals, and a proportionate advance on gas nuts and slacks. Much depends on the advances quoted by Durham collieries, the outputs of which are likely to be affected by the operation of the Mines (Eight Hours) Act in a greater degree than in the case of collieries in the Midlands, many of which had only turned eight hours previous to the passing of the Act. Last year the price reductions accepted by Durham collieries were such as to put the participation in orders by collieries in the Midlands—so far as the London water-side gas companies were concerned—practically out of the question. The terms of the London gas companies' contracts, being usually the first to be negotiated, are taken as a basis for renewals at provincial towns; and if, as is stated, Durham collieries quote advances of 2s. per ton this year, there is a chance of a good tonnage being secured by collieries in the Midlands.

Last year contracts were renewed at reductions of 6d. and 9d. per ton; and some of the large contracts were accepted at prices that could hardly leave a distinct margin of profit. The policy of collieries in taking such low rates for gas coals as compared with house coals is one which is doubly disadvantageous, since, owing to the low prices charged for gas in some large towns, its use for cooking and heating is greatly encouraged. Moreover, at many small works gas-engines are used and power produced more cheaply than by steam; whereas, if the prices of gas coals were not reduced, gas would possibly be dearer, and the demand for house coals would be stimulated. Gas engineers are, as a rule, more successful in combination than colliery owners. The former hold more closely together. At their local Association meetings results and prices are compared; and a manager can readily obtain full information of the results of any coal he wishes to use. In the coal trade, on the other hand, it has been proved that the only time a combination of owners is really successful is on a rising market, when, of course, there is no option for buyers but to accept sellers' terms. In a falling market, there is always a colliery—perhaps not in membership with the Association—ready to make concessions in order to secure a share of the contracts.

**Lewes Gas Company.**—At the half-yearly meeting of this Company last Wednesday, the Directors reported a profit of £2287 on the working in the six months ended Dec. 31. The balance of net revenue was £4816; and they recommended that dividends should be declared for the half year at the rate of 5 per cent. on the original and 3½ per cent. on the additional capital stock, which would amount, after deduction of income-tax, to £1397. The Chairman (Mr. M. S. Blaker), in moving the adoption of the report, said the half-year's working had been a profitable one, the increase in the gas sold being 572,000 cubic feet; while there was an addition of 30 to the consumers. They did not advance by such leaps and bounds in Lewes as was the case in some places; but they made steady progress, and he considered that the past half year was entirely satisfactory. He thought he might say the Company had been fortunate in their officers and staff. They had in Mr. Jones a Manager who devoted himself enthusiastically to the work. He had the interests of the Company very much at heart; and the conduct of the business under his management had been most satisfactory. He thought the heads of the various departments and the employees generally showed a degree of efficiency and interest in the Company's affairs which was a matter of congratulation to the shareholders. The report was adopted.



## LEGAL EXPENSES OF LOCAL AUTHORITIES.

In the "JOURNAL" last week, it was mentioned that a Bill had been introduced to enable local authorities to contribute towards the expenses of legal proceedings and private and other Bills involving questions of common interest. The following are the principal provisions.

Where it appears to any local authority, called in the Bill the "first" authority, that in any proceeding to which another local authority, called the "second" authority, is, or proposes to become, a party, a question of law arises affecting the interests of the first authority or the common interests of local authorities in general, or of the class of local authorities to which the authorities concerned belong, the first may agree with the second to bear such portion of the costs incurred by the latter in prosecuting or defending the proceedings and of any costs recoverable against that authority as may be specified in the agreement.

Where it appears to any authority that, in any proceedings in relation to a Private Bill which either is, or is about to be, promoted or opposed by another local authority, or in relation to a Provisional Order or Provisional Order Bill which either is, or is about to be, applied for or opposed by another local authority, any question arises which affects the interests of the first authority or the common interests of local authorities in general, or of the class of local authorities to which the authorities concerned belong, the first authority may agree with the second authority to contribute towards the expenses of the second authority, in respect of such promotion, application, or opposition, such portion of the expenses as may be specified in the agreement.

The council of a county or of a borough are to have power to combine with any other similar council for the purposes of section 15 of the Local Government Act, 1888, sanctioning opposition to Bills, and of the County Councils (Bills in Parliament) Act, 1903, or of the Borough Funds Acts, 1872 and 1903, and to incur all necessary expenses connected therewith.

Any expenses incurred by a local authority for the purposes named are to be defrayed in the case of a county out of the county fund, and in the case of a borough (other than a Metropolitan borough) out of the borough fund or borough rate; in the case of a Metropolitan borough, out of the general rate; and in the case of any other urban district or of a rural district, out of any rate or fund applicable for defraying expenses incurred in the execution of the Public Health Acts.

In the application of the Act to Scotland, it will be subject to certain specified modifications; and it is not to extend to Ireland. It may be cited as the Local Authorities (Legal Expenses) Act, 1910; and Jan. 1, 1911, is the date provisionally fixed for it to come into operation.

## PROPOSED ADDITIONAL WATER SUPPLY FOR LONDON.

### Important Schemes for Storage Reservoirs.

At the Meeting of the Metropolitan Water Board last Friday, the Works and Stores Committee presented a report on the future water supply of the Metropolis, based on an estimated population of 12 millions in 1941. Taking the estimated consumption of 35 gallons per head per day, the Committee stated that the total volume of water that may be required in the year named will be about 420 million gallons a day. Two schemes had been considered by the Committee as alternative sources of the additional supply—one being the Enbourne Valley scheme, and the other the Staines scheme. The Committee recommended the adoption of the second, or "progressive," scheme, which would be carried out in stages as the demands of an increased population would require.

The complete scheme includes five reservoirs, having a total capacity of about 20,900 million gallons, and sufficient, with the existing works, to ensure during a drought as severe as that of 1898-9 and 1901-2 a supply of 35 gallons per head per day for a population of 12 millions. The new works would necessitate an intake on the River Thames some miles above Staines, and the construction of an aqueduct about 1½ miles long. The first instalment of the works would provide and distribute sufficient water until the year 1924. The first reservoir (to contain 5200 million gallons) would be divided by a central bank into two sections. The second instalment, which should be ready by 1924, and would suffice until 1931, would consist also of a reservoir (to contain 5500 million gallons) divided into two sections, so that either could be worked independently. The third instalment would be finished by 1931, so as to provide adequate water until 1934, and would include a reservoir to contain 3500 million gallons. The fourth and final instalment, to provide water until 1941, would consist of two new reservoirs constructed at some distance from the others. Each would have a capacity of about 3350 million gallons.

The estimated cost of this scheme would be, for the first instalment, £1,983,760; for the second instalment, £1,713,640; for the third instalment, £674,080; for the fourth instalment, £1,902,230—making a total of £6,273,710. On the other hand, the first instalment of the Enbourne scheme, which would provide the water required up to 1925, would cost £3,637,560; the second instalment, to meet the requirements until 1933, £2,150,500; and the third instalment, to meet the requirements until 1941, £2,608,760—total, £8,396,820. The Committee added: "After a full consideration, we have decided to recommend the adoption of the 'progressive' scheme as being more advantageous to the Metropolis. This scheme will, in our opinion, enable the Board not only to meet the demands of a growing population for a pure and sufficient supply of water, but also to avoid any unnecessary expenditure should the growth of population not attain the proportions which have been foreshadowed."

The result of investigations by the Director of Water Examination clearly proved that, provided sufficient storage is applied to the raw water supplies by the Board and all necessary precautions are observed with regard to filtration and distribution, a uniformly safe and wholesome water supply could be secured for the inhabitants of the Board's area. Rough estimates had been made for the Committee in regard to

the cost of works to meet the probable needs of the London area until 1960, and these would involve an additional expenditure in the case of the Enbourne scheme of £9,573,000 and in that of the "progressive" scheme of £7,958,000.

The CHAIRMAN (Mr. E. B. Barnard), in moving the adoption of the report, said he wanted to avoid creating anything in the nature of a scare. The schemes should be looked at in proper proportion. There was not the slightest need for anybody to fear financial danger, though the figures involved were extremely gigantic. Whatever the consequences, however, the Board were obliged to go on supplying the water needed; and they had water enough now to last the population only until the year 1920. The desirability of going to Wales for the London supply was discussed for a long time; but, though a Welsh scheme might have been very well when the Water Companies were in existence, the circumstances had totally changed, as the public money had been invested to a huge extent. The present scheme was intended as a safeguard against times of excessive drought. They were taking only surplus water; they would not alter the flow of the Thames, and their scheme would injure no one. With regard to the relative advantages of the Enbourne and "progressive" schemes, the choice of the latter had been made because under it they would move by degrees; and if they found that the population did not increase as they estimated, or moved elsewhere, the only capital sunk would be that spent on the purchase of sites for the reservoirs, which would be used as they happened to require them. If, on the other hand, the Enbourne scheme were selected, they would be obliged to build a conduit capable of taking any quantity of water that would be ultimately required, and if their customers did not increase, the expenditure would be unremunerative. They were not running any financial risk.

After some remarks, the discussion was adjourned to allow of further consideration of the report.

## ABSTRACTION OF WATER FROM THE THAMES.

### Dispute between the Thames Conservancy and the Water Board.

It was stated by the Chairman of the Thames Conservancy (Lord Desborough), at the meeting of that body on Monday last week, that the negotiations which had been in progress with the Metropolitan Water Board with regard to the terms for taking water from the River Thames had come to an end, as no agreement had been arrived at. The Engineers of both bodies had worked out a very good scheme, which might have settled the question for a reasonable length of time; but, in a letter to the Conservancy, the Board declined to discuss the financial basis. Mr. E. B. Barnard, the Chairman of the Board, said that under the Statute they were bound to pay a certain sum to the Conservancy. Five of the eight Water Companies had bargained with the Conservancy. The Board stepped into the position of these companies, and whatever the bargains were, the Board were responsible for them. They could claim a given amount of water from the Thames; and if they took more, were obliged to pay for it. The Conservancy thought that if the Board took less at one of the five spots where they paid excess money for the larger quantity taken they were not to have credit for the smaller quantity they were entitled to take at the other places. Their advisers said that by engineering work, which would mean certain capital expenditure, the matter could be so adjusted that they could take the full quantity of water they required without paying any excess. They were willing to recommend the Board to make an immediate payment to the Conservancy of £40,000; and afterwards they would go on for a period approaching twenty years before they reached the limit payment of £40,000 a year, which was the full length of their tether. The Board could not think that, as representing London, they were entitled to do any more than that. The Chairman said they would have to go to Parliament, no doubt; but whether they were going there agreed or not agreed he did not think it was any use their meeting at all when the Board declined to discuss the financial basis of the agreement. The supply of water to London from the Thames involved enormous expenditure, and in return for this the Board ought to pay something which was a fair return on the capital. What that fair return was would have to be decided by Parliament. Sir Robert Buckell said he thought it should be known that in the proposed arrangement arrived at by the Engineers of both bodies very substantial advantages were shown to accrue to the Water Board; and if the suggestions arrived at were carried out, it would be to the advantage of everybody concerned. That these suggestions were peremptorily put on one side by the Board saying they would not consider any financial arrangement, was a most unfortunate thing. The whole of the money was spent in the purification and preservation of the river in the Thames Valley, and millions had been spent in this direction. If the Conservancy were to carry on the work, they must have money. The Water Board, who received pure water, should meet the Conservancy in this matter, so that the work would be carried out to the advantage of all.

**Dover Gas Company.**—The half-yearly meeting of this Company was held on Monday last week—Mr. Willsber Mannering in the chair. The Directors reported that, as they anticipated would be the case when they presented their report six months ago, the profits on the past half year's working were sufficient to provide the full statutory dividend, to replace the £121 withdrawn from the accumulated surplus profits to pay the dividend for the previous half year, and leave a further sum of £636 to add to the amount brought forward. They therefore recommended a dividend at the usual rate of 7½ per cent. per annum. The Chairman, in moving the adoption of the report, dealt in detail with the items in the accounts accompanying it, and stated that during the half year nothing of importance had occurred to be brought to the shareholders' notice. The report was adopted. Votes of thanks were accorded to the Chairman, Directors, and staff; and they were acknowledged by Mr. Mannering, Mr. E. C. Fielding (one of the Joint Secretaries), and Mr. Raphael Herring (Resident Engineer). The last two gentlemen spoke highly of the staff and the employees; Mr. Herring stating that the Company had succeeded in making the employees contented, and success had followed.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Eastern District of the Scottish Junior Gas Association, held in Edinburgh to-night, was the last for this session; the only other item in the syllabus being a joint visit with the Western District to the Falkirk Gas-Works. The session has been a very successful one; and the report of the Council shows the Association to be in a prosperous condition. To-day's meeting was carried through without any of the honorary members being present. Excellent papers were read by Mr. A. Morton Fyffe, of Dundee, upon a most successful installation of luteless purifiers which he assisted to erect in the Dundee Corporation Gas-Works; and by Mr. H. E. Doran, Chemist at the Granton Gas-Works, upon the formation of coal. Both papers were of an informative nature, and not suitable for discussion; so that the remarks following them were of a brief nature, and chiefly complimentary. A very happy feature in the report of the Council was the giving of a list of the members who had received promotion during the year. This, when read, was found to be larger than probably anyone expected, and it makes more plain the good work the Junior Association is doing. It was an added pleasure to find the Hon. Secretary and Treasurer—Mr. J. Dickson, of Kelty—in the list.

At a special meeting of the Pollokshaws Town Council on Thursday evening, Provost Macdougall reported that a further conference of local authorities interested in opposing the Glasgow Gas Consolidation Bill had been held in Glasgow on Monday; and the opinion was that the Glasgow Corporation had made no definite proposals which would justify any of the objecting authorities in withdrawing their petition against the Bill. The conference unanimously decided that, unless some reasonable definite proposals were made by the Corporation of Glasgow, the Bill ought to be strongly opposed. The meeting remitted to Provost Macdougall and the Town Clerk to join with other authorities in employing Parliamentary Agents and Counsel.

Complaints as to alleged increases in gas bills having been put forward in Edinburgh with some persistence, an official statement on the matter was communicated to the local Press on Wednesday, in which the views of the Gas Department on the subject are given. The statement opens with the remark that the public cannot have consumed more gas than had been manufactured and sent out from the works. In the months of November, December, and January of 1907-8, the quantity was 767 million cubic feet; in 1908-9, it was 733 millions; and in 1909-10, it was 794 millions. This was 8.22 per cent. over the past winter, but only 3.47 per cent. over the preceding winter, which is something less than 2 per cent. per annum. The most prominent factor controlling the consumption of gas is atmospheric conditions. The difference between a bright and cloudy afternoon affects the output to the extent of 5 per cent., and a really dull day to the extent of 10 per cent. It had been suggested that the gas was distributed at too high a pressure. It was greatly against the economy of any gas under-

taking to maintain a pressure higher than was necessary in the distributory system. There were 400 miles of main pipes, and probably 1000 miles of service-pipes, in and around the district, all of which were subject to leakage; and the leakage increased fourfold with the increase of pressure. The economy of the undertaking, therefore, demanded that no greater pressure than was necessary should prevail at any time. The records of the undertaking showed that the pressure for the different periods was the same this year as in the past year, and for some years previously. Owing, however, to the greater number of dark hours—dark mornings and dark afternoons—the pressures necessary for such periods had been longer maintained; so that while the initial pressure had not been increased, the higher pressures had been maintained for a greater number of hours during the period under review, and where carelessness prevailed in the regulation of the gas-taps, useless consumption might have taken place. Advice is given as to the attention which should be paid to gas-taps, and, in particular, the information is given that in the case of a gas-fire, after it has been warmed up, the tap may be turned down by half, and the fire still give good efficiency. If consumers who had gas-fires would try the experiment for themselves, they would be convinced of the possibility of halving their gas-fire consumption.

The Edinburgh and Leith Gas Commissioners held their annual dinner on Monday evening, in the Caledonian Railway Station Hotel. The guests numbered about 130. Lord Provost Brown presided; and among those present were Councillor Montgomery and Bailie Paxton, the Convener and Sub-Convener respectively of the Gas Committee of the Glasgow Corporation. The toast of "The Corporations of Edinburgh and Leith" was proposed by Bailie Montgomery. Mr. B. Hall Blyth, of Edinburgh, in proposing the toast of "The Gas Commissioners," said he believed there was no finer installation in Great Britain, or anywhere else, than that which had been provided by Mr. Herring for the communities of Edinburgh and Leith. Judge Bryson, in responding, said that the gas consumption had gone up by leaps and bounds, and he believed that on May 15 the consumption for the year would be found to be the largest since the inception of the Gas Commission. They were doing their best at Granton to produce gas at as cheap a rate as possible. The retorts (verticals) which Mr. Herring had leave to construct a year ago were almost ready, and he believed that in the near future they would show a still further reduction in the cost. The dinner was a very successful social function.

It was announced on Tuesday that the Corporation of Glasgow proposed to insert in their Gas Consolidation Bill a clause authorizing them to acquire, by purchase, the undertaking of the Baillieston Gas Company, Limited; the price suggested being £10,000—at the rate of about £1000 per million cubic feet of gas sold annually. In the Town Council on Thursday, Mr. Montgomery, the Convener of the Gas Committee, in reply to questions, said that a Sub-Committee of the Parliamentary Bills Committee had entered into negotiations with the Company for the purchase of their works. The power to enter into negotiation was granted by the Corporation when they passed the Gas Consolidation Provisional Order. They had to negotiate with a great

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number of people, including the Baillieston Gas Company, who were petitioners against the Order; and it was out of these negotiations that the question of purchase emerged. It was proposed to supply gas to Baillieston at the same price as consumers were charged in the city. The present price in Baillieston was 3s. 1½d. per 1000 cubic feet. Mr. Battersby intimated that he would move a resolution disapproving of the negotiations. Lord Provost M'Innes Shaw considered it extraordinary that the Parliamentary Bills Committee should be doing what they had been doing without the Corporation knowing anything about it. He suggested that Mr. Battersby's resolution should have precedence at their next meeting. It was quite reasonable that the Corporation should be consulted. Mr. W. F. Anderson remarked that he was a member of the Parliamentary Bills Committee, and he knew nothing about the matter. It had been dealt with by a Sub-Committee. Mr. Montgomery said that power was given to negotiate, and that the result of the negotiations would come before the Corporation next week. The Gas Committee met next day, and resolved to recommend the Corporation to seek parliamentary powers to purchase the undertaking at Baillieston, at the price of £10,000.

The Watching and Lighting Committee of the Glasgow Corporation have had before them a report by Mr. John Lindsay, Deputy Town Clerk, and Mr. S. B. Langlands, Inspector of Lighting, on the inadequacy of the stair-lighting in the city. The report states that to remedy this further statutory powers are needed. Proposals for such powers have during recent years been under consideration, but nothing definite has yet resulted. In the meantime, the only course open is that of private arrangement with owners. Mr. Langlands reported that on Dec. 31, 1907, there were 371 incandescent gas-lights in stairs; in 1908, there were 1510; in 1909, there were 5680; and on Jan. 15 last there were 6034. His only difficulty has been to get sufficient burners to meet the demand. There are some 65,000 stair lights in the city, so that almost one-tenth of the number are now incandescent gas. In addition, there were on Dec. 31 last 2005 electric incandescent stair-lights in the city. To meet the extra expense, an additional charge is made, which is subject of arrangement. It is recommended that the work of converting the lights in the stairs into incandescent gas or electricity should be extended, and that the necessity for supplying gas-burners with greater expedition be urged upon the Gas Committee.

The Gas Committee of the Dundee Corporation have been considering the subject of the improvement of the lighting of the Downfield, Lochee, and Rosebank districts. A Sub-Committee this week agreed to recommend acceptance of the offer of the Bryan Donkin Company, Limited, to provide high-pressure plant for £485, and district governors for £288.

The price of gas in Bothwell is to be reduced, as from May 1, from 2s. 1½d. to 2s. 6d. per 1000 cubic feet.

The Gas Committee reported to the Carnoustie Town Council on Monday recommending that Mr. J. Wynne be retained as Manager of the gas undertaking at a salary of £200 a year, with free house, coal, and gas; and that he be not permitted to engage in private practice. The Council approved of the appointment.

## CURRENT SALES OF GAS PRODUCTS.

### Sulphate of Ammonia.

LIVERPOOL, March 12.

There has been a very good demand the whole week, and during the last few days a further sharp advance in prices has taken place, all available supplies being eagerly competed for. The requirements have largely been for covering old contracts; but the tone has also been stimulated by new business for both export and home consumption. The closing quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. No further transactions have transpired in the forward position; but it is reported that there are sellers for delivery over the second half of this year, in equal monthly quantities, at a discount of 10s. per ton on spot values, without meeting any response from buyers.

### Nitrate of Soda.

This article is much firmer, and holders have raised their prices to 9s. 7½d. and 9s. 10½d. per cwt. for ordinary and refined qualities respectively, on spot.

LONDON, March 14.

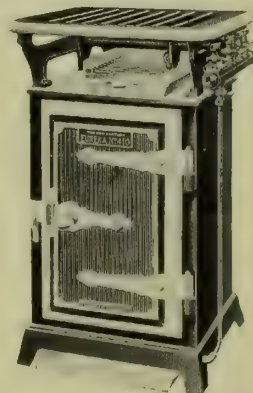
### Tar Products.

The markets for tar products have been steady throughout the past week. Pitch is still firm, with a fair demand, though there is no alteration in price. Creosote remains in about the same position, and makers still look for an improvement at an early date. Benzol, 90 per cent., is very firm both for prompt and forward delivery; while 50-90 per cent. has improved correspondingly. Toluol is also in good demand both for prompt and forward delivery. Solvent naphtha is very firm indeed. There are inquiries for delivery all over the present year; but at present manufacturers do not care to quote so far ahead. There is very little business doing in carbolic acid. Crystals are neglected. Cresylic acid is firm, with an improved tendency. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. ex works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. to 31s. others. Benzol, 90 per cent., casks included, London, 7½d.; North, 7d. to 7½d.; 50-90 per cent., casks included, London and the North, 8d. to 8½d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 2½d. to 1s. 3½d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

### Sulphate of Ammonia.

The market for this article is exceedingly firm, and shipments during the last few days have been very heavy. To-day actual Beckton



WRIGHT'S  
EUREKA

Here is a picture of our  
new Season's Cooker and  
Hot Water Boiler.  
We shall be pleased to  
receive your instructions  
for printing, and quantities  
required.

John Wright & Co

This season -  
The "Eureka"  
is as much as ever  
in advance of all  
competition.

Essex Works - Birmingham



could not be secured under £12 5s. to £12 7s. 6d.; and outside makes upon Beckton terms are £12 to £12 2s. 6d. In Hull, the market is £12 1s. 3d. to £12 2s. 6d.; and in Liverpool makers are asking £12 2s. 6d. to £12 5s. In Leith, £12 5s. to £12 7s. 6d. is quoted; and in Middlesbrough, £12 1s. 3d. to £12 2s. 6d.

### COAL TRADE REPORTS.

#### Northern Coal Trade.

Shipments of coal at the northern ports have been fuller, both in anticipation of the approaching holidays and to increase the stocks in doubt as to future working. In the steam coal trade, best Northumbrian steams are quiet at from 11s. 1½d. to 11s. 4½d. per ton f.o.b.—the output being adequate. Second-class steams are 10s. to 10s. 3d.; and steam smalls are from 5s. 9d. to 6s. 9d. There are still some idle collieries; but the idleness is little felt during the time that the northern navigations are closed. In gas coal, there is a strong demand, though the deliveries on the long contracts are now naturally falling off. Durham gas coals vary in price, according to quality, from 10s. 3d. to 11s. 3d. per ton f.o.b. for the usual classes; while for "Wear" specials, from 11s. 6d. to 11s. 9d. is quoted. Among the contracts that are reported is one for over 200,000 tons of best gas coal for shipment to Hamburg, at a price not yet officially stated, but believed to be slightly below the current quotation. Another, for some 25,000 tons yearly of second-class gas coal for St. Nazaire, is believed to have been placed, at prices that allow about 10s. per ton f.o.b. for the coals. Coke is steady, with good gas coke at about 13s. 9d. per ton f.o.b. in the Tyne.

#### Scotch Coal Trade.

The market is steady, outputs moving away freely. Prices are being well maintained, and are quoted at: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 273,240—a decrease of 16,144 tons upon the preceding week, but an increase of 41,638 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,469,279 tons—an increase of 417,186 tons upon the corresponding period.

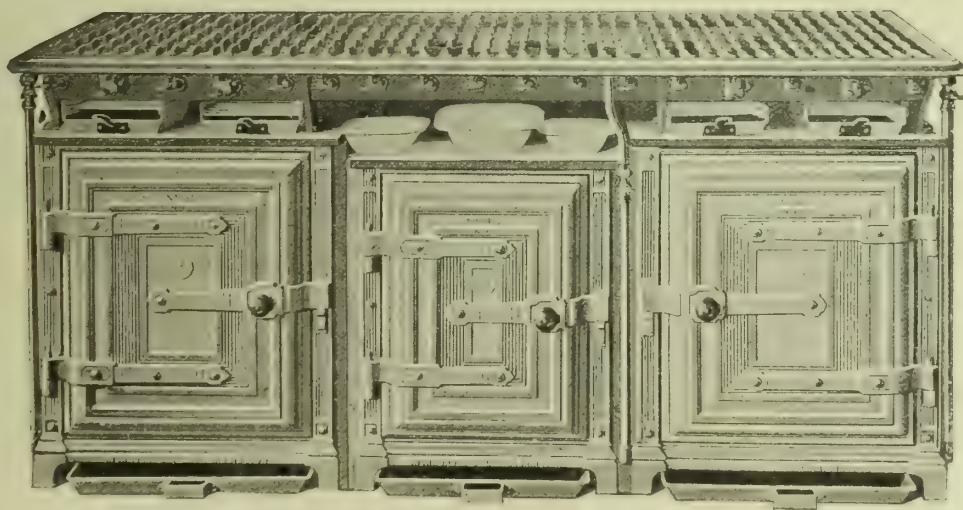
Messrs. Stewarts and Lloyds, Limited, of No. 41, Oswald Street, Glasgow, call attention in a circular to their patent branch connections for main pipes. They remark that gas and water engineers have long felt the want of an effective branch connection which could be attached to a main-pipe with a minimum of labour and the simplest appliances. This combination, it is claimed, has been successfully attained by means of two patents, illustrated abstracts of which appeared in the "JOURNAL" some weeks ago (*ante*, pp. 48, 184).

#### Richmond Gas-Stove and Meter Company, Limited.

The annual meeting of the Richmond Gas Stove and Meter Company, Limited, was held at the offices, Warrington, last Thursday—Mr. T. Derryhouse (Chairman) presiding. In moving the adoption of the report and balance-sheet (*ante*, p. 684), he said he was sure the shareholders must be gratified with the results. Business, particularly in the metal trades, had been, and was at the present time, in a bad way; but the large influx of orders the Company had experienced in a limited time had taxed their resources to the utmost to execute them. The Directors had decided to erect a large new fitting-shop alongside the foundry at Grappenhall, and they hoped it would be ready for occupation early next month. Referring to the purchase of the business formerly carried on by Messrs. S. Clark and Co., the Chairman said the Directors believed it could be carried on by the present staff with little extra cost and with profit to the Company; and though they had had the business only about five months, the results so far verified this belief. The Chairman passed on to deal with financial matters, and concluded by saying he considered the balance-sheet submitted was a very good one, and showed that the Company was in a very strong condition. The Vice-Chairman and Managing-Director (Mr. Horace M. Thornton), in seconding the motion, said he thought the balance-sheet was the best the Directors had ever placed before the shareholders. Every year the Company were getting greater demands upon the scientific side of their business. He was glad to feel that this was becoming very much more a part of their policy; and to-day they had undoubtedly one of the best laboratories any gas-stove works could possess, and it was staffed in such a way as to produce the appliances gas companies asked for. The output of heating-stoves had increased nearly 100 per cent. in the present season. The loyalty of the staff was a great factor in the success of the Company's business. The report was adopted; and a dividend of 10 per cent., less 5 per cent. already paid, was declared.

**Lichfield Gas Company.**—The annual general meeting of this Company was held last Tuesday. Alderman G. Haynes presided, in the absence of the Chairman (Alderman H. M. Morgan), and gave a lucid account of the Company's operations in the past year. He stated that there had been a considerable increase in the revenue from the sale of gas, that coal had cost 7d. per ton less than in 1908, and that the unaccounted for gas had still been kept at a low figure. He mentioned that the Company would be extending their operations during the ensuing summer by laying 3½ miles of mains towards the adjoining district of the Brownhills Gas Company, with the ultimate object of continuing to Shenstone. He moved the adoption of the report, and the motion was carried unanimously. The Chairman proposed a vote of thanks to the Manager (Mr. F. Key), of the success of whose work he spoke in terms of praise. Mr. Key, in returning thanks for himself and the staff, said there had only been three managers in 73 years. This spoke for itself; and he believed that, for a small Company, the staff of employees they now had would be hard to beat for good service.

## Richmond's "HOLBORN" Cooker.



For SEASIDE and other large HOTELS.

The third edition of our Special Catalogue giving fullest particulars of Large Gas Apparatus is at your service.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.



### Winding-Up of the Kitson Empire Lighting Company, Limited.

A petition presented by Messrs. William Still and Sons, Limited, for the winding-up of the above Company came before Mr. Justice Neville last Tuesday. Mr. Maughan, for the petitioners, said he understood there had been a meeting of creditors to consider the position of affairs, and his clients had been asked to consent to the petition standing over for a month, as there was some hope that a scheme of arrangement would be come to. He did not oppose the adjournment. His Lordship directed the petition to stand over for the period named.

### Metropolitan Water Board and Farming Agreements.

In the Westminster County Court a few days ago, his Honour Judge Woodfall had before him the case of the *Metropolitan Water Board v. Arlidge*. It was a claim by the Board against William Arlidge, an owner of property in the New River, West Middlesex, Grand Junction, and other areas of the Board's jurisdiction, for about £14 arrears of water-rate. The claim was composed partly of rates owing before the Board's Act came into force, and partly of those which had become due since. Defendant had entered into a farming agreement with the Board; and the question was whether it related to the whole of the arrears, or only to those which had arisen subsequent to the Board's Act coming into operation. Mr. Given (instructed by Mr. George Kebbell) examined Mr. Arlidge as to the agreement entered into on Feb. 9, 1908; and Mr. A. B. Shaw, who appeared for the Board, having been heard, Judge Woodfall decided in favour of Mr. Arlidge, with costs.

**Prospective Increase of Capital by the Sevenoaks Water Company.**—At the recent half-yearly meeting of the Sevenoaks Water Company, at which dividends at the rates of 10 and 7 per cent. per annum were declared on the two classes of ordinary shares, the Chairman (Mr. Sydney Thompson) stated that the carrying out of extensions had caused the expenditure of more capital than had been raised by the issue of shares and debentures; and consequently the Directors would have to offer some more for subscription, so as to be able to pay for any further improvements that might be necessary.

**Bristol Water Company.**—At the recent annual general meeting of this Company, the Directors reported that the revenue from water-rates for the past year was £153,285; being a decrease of £1206 compared with the year 1908. This was stated by the Directors to have been caused by the falling off in the demand for water for trade and building purposes; the domestic consumption having been satisfactory. The sum available for distribution was £71,728, out of which interim dividends at the rates of £8 and £5 12s. per cent. per annum had been paid; and the Directors recommended the payment of final dividends at these rates, which would leave £4310 to be carried forward. The report was adopted.

**Waltham Abbey and Cheshunt Gas Company.**—At the recent half-yearly meeting of this Company, the Directors reported a surplus of £3143 available for distribution; and they recommended a dividend on the "A" shares at the rate of 8½ per cent. per annum, and on the "B," "C," and "D" shares at the rate of 6½ per cent. per annum (less income-tax). The Chairman (Mr. Alfred Kitt), in moving the adoption of the report, stated that the quantity of gas sold in the six months showed a satisfactory increase, mainly on account of the additional number of prepayment consumers. The report was adopted. At the close of the business, a special meeting was held at which sanction was given to the promotion of the Standard Burner Bill.

**Underground Stream in Holborn.**—An underground stream of water has been discovered in Holborn; and Messrs. A. W. Gamage, Limited, have just had an artesian well bored, giving an independent water supply to their premises. During the boring operations, the strata penetrated included concrete, blue, brown, and mottled clay, hard grey, green, red, and light blue sands, rock, sandy clay and pebbles, and chalk and flints. The total depth bored was 450 feet; 304 feet being through chalk and flints, the beds of which contained a large supply of water. The work was carried out by Messrs. Alfred Williams and Co., of Bow. The water is pumped direct in one operation to the storage-tanks on the roof of the building.

**Village Water Supplies in Cumberland.**—At last Wednesday's meeting of the Wigton Rural District Council, an advance was made in the arrangements for providing several villages with much-needed supplies of pure water. Six tenders were received in connection with the Hayton supply, which is to be derived from the Aspatria, Silloth, and District Joint Water Board's main; and the tender of Messrs. W. J. Minto and Co., of Wigton, was accepted. An agreement between Lord Leconfield and the Council was signed and sealed, for securing on a 21 years' lease a supply of water from a spring at the foot of Carrock Fell for the village of Haltcliffe. The parish of Boltons has approved of a scheme for supplying from the Water Board's main the villages of Brough Hill, Bolton Lowhouses, and Bolton Newhouses; the length of the main being 3½ miles.

**Reduced Demand for Water at St. Helens.**—At the monthly meeting of the Water Committee of the St. Helens Corporation last Wednesday, the Borough Treasurer (Mr. Brown) submitted the annual estimate. He said last year it suggested that there would be a surplus of £588; but this had not been realized, and instead they had to report a deficit of £82. The whole case was explained by the falling off in the demand for water for manufacturing purposes. The supply by meter to manufactories had brought in £12,050, against £14,000 estimated; so that there was close upon £2000 less water sold to manufactories. One manufacturer was taking less water to the amount of upwards of £1000 than formerly. The estimate showed a deficiency for next year of £817; but there was no need for alarm, because, even if the income of the Water Department was low, they would certainly not exhaust their reserve fund.

# HOT WATER

EVERY ONE  
REQUIRES  
HOT  
WATER  
WITHOUT  
THE  
COAL  
FIRE.

## FOR HOT BATHS

at any moment—day or night—without previous preparation.

## MAUGHAN GEYSERS

will provide a Hot Bath in a few minutes at a cost of ¾d. for Gas.

## GENERAL HOUSE SUPPLY

can be obtained both conveniently and economically with

## THE "GACYLOTE" CYLINDER OR THE "HOLBORN" CIRCULATOR

which can be attached to existing Pipes.

*May we send you our suggestions for supplying these to your Consumers on lines  
successfully adopted by other Gas Undertakings?*

## THE PARKINSON STOVE CO., Ltd.

(Incorporating Maughan's Patent Geyser Co.),

STOUR STREET, SPRING HILL,  
BIRMINGHAM.

and

129, HIGH HOLBORN,  
LONDON.



**End of the Coal Strike at Sydney.**—Writing on Saturday, Messrs. W. Coward and Co. informed us that they had just received a cable from the Australian Gaslight Company of Sydney, in the following terms: "Strike has terminated. Work will be resumed next week."

**Gas Exhibition at Bridgwater.**—An exhibition of a novel and interesting character was held in the Town Hall, Bridgwater, last week. It was promoted by the Gas Committee, in conjunction with a local firm of house furnishers; and it was opened on Monday afternoon by the Chairman (Mr. R. Y. Foley) with a witty and interesting speech, delivered in the presence of a numerous audience. The gas-cookers shown were those of Messrs. Fletcher, Russell, and Co., Limited; and the other exhibits included almost every article required in the use of gas, including flash-light apparatus and distance lighters. At night the hall was brilliantly illuminated, and afforded striking evidence of the capabilities of gas. In the afternoons and evenings, Mrs. A. M. Collins gave cookery lectures and demonstrations. The gas arrangements were carried out by the Company's Manager, Mr. J. H. Cornish.

**Riot at a Gas-Workers' Meeting.**—The Paris Correspondent of the "Daily Telegraph" says: "Curious scenes were enacted at a great meeting of the gas-workers at the Labour Exchange, which ended in the throwing of benches and chairs and a general riot. There was a split recently in the Trade Union formed by the gas employees, on the occasion of the strike of the stokers and firemen. A dissenting Union was formed, and its adherents called a meeting, to which the members of the old National Syndicate flocked in crowds. The result was a battle-royal between the two camps. At the first sign of blows, the lights were put out in the hall and the doors flung open, but none of those present cared to evacuate the place. Instead they punched and pulled each other in the dark, and flung about all sorts of objects until the place was in a regular pandemonium. Matches were struck and candles lit by the combatants to distinguish their adversaries; and the riot lasted a full quarter-of-an-hour. At last the lights were again turned on, and then a large number of those present had a lamentable appearance. Their faces were bruised and bleeding, and the meeting, of course, could not be held. But before separating the most militant of the majority stood together and voted a resolution, which was simply to the following effect: 'Vive le Syndicat National.' They then went away to wash the blood from their faces."

The Morton Gas Syndicate, Limited, has been registered with a capital of £10,000, in £1 shares, to enter into an agreement with Mr. G. L. Morton, and carry on the business of gas engineers, manufacturers of gas plants for power, gas-turbines, general engineers, &c.

At the meeting of the Cookstown Urban District Council on Monday last week, a communication was read from the Directors of the Cookstown Gas Company agreeing to a reduction in the price of gas for the public lamps from 5s. 10d. to 5s. per 1000 cubic feet, to date from the 30th of June next.

Over four times the amount of 5 per cent. ordinary stock recently offered for sale by tender by the Directors of the East Hull Gas Company, at a minimum price of £105 per cent., was applied for; and tenders of present holders of stock received only a partial allotment at £106 per cent.—prices ranging up to £107.

The Wellington Tube Works, Limited, of Great Bridge, near Tipton, have issued a net price list in a form that should prove useful—helping tube buyers to overcome the present somewhat intricate discounts system. The double-fold card gives an approximate net list of wrought-iron tubes from  $\frac{1}{8}$  inch to 6 inches diameter at discounts of 35 to 90 per cent. off the standard tube trade list.

In view of the present serious position of affairs in the coal trade, attention may be called to a small pamphlet, entitled "The Conflict in South Wales," which has been published by the "Colliery Guardian" Company, Limited, of Fumival Street, Holborn, E.C. It is a reprint of the first of a series of special articles in that paper, authoritatively written, dealing with important coal trade questions affecting the public generally; and it will be followed by others. The price is 1d.

At the Sussex Winter Assizes last week, Mr. A. R. Pyne and his wife and son recovered damages to the amount of £151—being £126 for Mr. Pyne, £20 for his wife, and £5 for the son—from the Bens Gas Company, for personal injuries sustained by Mrs. Pyne and her infant and loss and damage suffered by himself, owing to the explosion of one of the Company's petrol gas-lighting machines. The plaintiffs' contention was that the apparatus did not come up to the guarantee, and that it had not been fixed and installed so as to be safe in use.

Ever on the alert to increase the business over which he has control, Mr. William Arnott, the Manager of the South African Lighting Association at Port Elizabeth, has installed plant for working up his ammoniacal liquor, and he is now putting on the market anhydrous ammonia used for cold storage and freezing purposes, liquor ammonia, and a new product—"Sala" cloudy ammonia—which is claimed to be stronger and cheaper than that which is imported. These articles are being prominently advertised in the local papers, one of which says the new venture by the Company, in the creation of another industry, is just what is required in Port Elizabeth; and the hope is expressed that it may be well supported by the public.

Messrs. R. & A. Main, Limited, have sent us one of their latest illustrated price lists, containing full particulars of their various types of cookers, all of which possess features that commend them to notice. They are of high-grade and intermediate qualities, and of sizes to suit all requirements. The cast-iron cased porcelain enamelled cookers of the firm are well known, and they maintain their popularity. The slot and packed slot cookers have been specially designed for use with pre-payment meters; and the "Kent" and portable cookers are suitable for small houses or where space is limited. Plans of the hot-plates are given to show the positions of the boiling-burners and grills. The firm have had many years' practical experience in the production of cookers; and those shown in the list under notice are the outcome of it.



"VOLCANIC" (Powder).

"VOLCUM" (Paste).

*Andrew Stephenson,*

Tel. Address:  
"VOLCANISM, LONDON."

182, Palmerston House,  
Old Broad Street,  
LONDON, E.C.

LEST YE FORGET.



"South of England Natural Gas shares are being assiduously 'pushed' from Leeds," says the "Financial News." The writer of the paragraph adds: "Surely the canny Yorkshireman knows better than to buy them."

Messrs. Joseph Taylor and Co., of Bolton, have received orders for solid-plate lead saturators, designed either for hand fishing or for steam sulphate ejectors, for the Bromley and Crays Gas Company and the Widnes Corporation. Exactly similar orders (but for hand fishing only) have been received from the Wigan Corporation and the Exeter Gas Company.

We have received from the Davis Gas-Stove Company, Limited, an advance copy of their new "summer booklet," containing a selection of their gas-cooking apparatus, including the "New Davis" green enamelled steel cooker, modern single-cased and packed "slot" cookers, grillers, and boiling-stoves. The special features of the different stoves, which are effectively illustrated, are summarized; and a page is devoted to the articles required to clean them. The pamphlet, which is printed in colours (one being green), is quite up to the high standard aimed at in the Company's publications in past seasons.

The Electricity Committee of the Manchester Corporation have presented to the Finance Committee a supplementary estimate for £7000 for renewals in connection with the recent explosion at the Victoria Arcade in the city.

Messrs. William Coward and Co., Limited, of Finsbury Pavement, E.C., have received instructions to forward a complete gas plant for the little town of Waipawa, in New Zealand. We are glad to observe that the New Dominion is keeping pace with the rest of our distant sister branches of the Empire.

It may be remembered that about this time last year a Smoke Abatement Exhibition was held in Sheffield, in connection with which there were conferences on the subject. The exhibition was opened by Sir Oliver Lodge, the Principal of the Birmingham University, whose address on "Science and Smoke" was noticed in our columns at the time it was delivered. Several papers were read at the conference (one being by Dr. R. Lessing, on "The Calorimetric Control of the Supply and Consumption of Fuel," an abstract of which was given in the "JOURNAL" for April 13 last); and these have now been printed in pamphlet form, in wrapper, and published at the price of 6d., by the Sheffield Federated Health Association.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situation Vacant.

DRAUGHTSMAN. West's Gas Improvement Company, Manchester.

### Situations Wanted.

ENGINEER'S ASSISTANT. No. 5203.  
MANAGER, SUPERINTENDENT, &c. No. 5204.  
SUPERINTENDENT OF DISTRIBUTION, &c. No. 5206.  
WORKS MANAGER OR ASSISTANT (GAS APPLIANCE WORKS). No. 5207.

### Gas Works for Disposal.

LAINDON GAS WORKS. By Auction. April 12.

### Capital or Amalgamation Wanted. No. 5205.

### Business for Disposal.

ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY.

### Plant, &c. (Second Hand), for Sale.

AIR GAS PLANT. Carrington and Co., Mile End, E.

### Plant, &c. (Second Hand), Wanted.

PURIFIER, &c. Sanderson, Edinburgh.

### Meetings.

BRITISH GASLIGHT COMPANY. London Offices, March 23, Twelve o'clock.  
OTTOMAN GAS COMPANY. Offices, March 22, One o'clock.

### Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. April 5.  
HORNSEY GAS COMPANY. March 22.  
LOWESTOFT WATER AND GAS COMPANY. April 5.  
SEVENOAKS WATER COMPANY. April 2.  
SOUTH AFRICAN LIGHTING ASSOCIATION. No. 5199.  
WORTHING GAS COMPANY. April 5.

### TENDERS FOR

#### Coal (Also Freight and Insurance).

INVERNESS GAS COMMISSIONERS. Tenders by March 19.  
MARPLE GAS DEPARTMENT. Tenders by March 23.

#### Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 18.

#### Conveyor.

PETERBOROUGH GAS COMPANY. Tenders by April 8.

#### Exhauster.

ASHBURTON GAS DEPARTMENT. Tenders by April 12

#### Fire-Clay Goods.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

### Gasholder, &c.

ASHBURTON GAS DEPARTMENT. Tenders by April 12.

### Gas-Fitter's Work.

H.M. OFFICE OF WORKS. Tenders by March 24.

### Lime.

INVERNESS GAS COMMISSIONERS. Tenders by March 19.  
MARPLE GAS DEPARTMENT. Tenders by March 23.

### Mantles.

BURTON-ON-TRENT GAS DEPARTMENT.

### Oil for Gas Manufacture.

BARROW-IN-FURNESS CORPORATION. Tenders by March 23.

### Pipes.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

### Retort-Bench, &c.

CLITHEROE GAS DEPARTMENT. Tenders by March 26.

### Scrubber, &c.

ASHBURTON GAS DEPARTMENT. Tenders by April 12.

### Tar and Liquor.

MARPLE GAS DEPARTMENT. Tenders by March 23.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 718.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Oct. 14	5	Alliance & Dublin Ord.	86-88	..	5 13 8	£	Stk.	Nov. 11	8	Imperial Continental	176-178	+1	4 9 11
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	4,940,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	92-94	..	3 14 6
310,000	Stk.	Oct. 28	6 1/2	Bombay, Ltd.	6-6 1/2	..	5 4 0	1,235,000	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	220-222	..	4 18 4
200,000	5	..	6 1/2	Do. New, £4 paid.	48-44	..	5 6 8	195,242	Stk.	Feb. 25	10	Liverpool United A.	222-224	..	4 9 3
40,000	5	..	15	Bourne- ) 10 p.c. .	29-30*	..	5 0 0	561,000	Stk.	..	7	Do. B.	163 1/2-165 1/2	..	4 4 7
50,000	1 1/2	Feb. 25	7	mouth Gas ) B 7 p.c. .	162-163*	..	4 3 7	718,100	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
311,810	1 1/2	..	6	and Water ) Conf. 6 p.c.	15-15 1/2*	..	3 17 5	50,000	5	Nov. 26	6	Malta & Mediterranean.	42-5	..	6 0 0
75,000	10	..	12 1/2	Brentford Consolidated	250-253*	..	4 18 10	380,000	Stk.	Oct. 1	5	Met. of ) 5 p.c. Deb.	99-102	..	4 18 0
300,000	"	..	9 1/2	Do. New	187-189*	..	5 0 6	250,000	100	..	4 1/2	Melbourne ) 4 1/2 p.c. Deb.	100-102	..	4 8 3
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3 1/2	Monte Video, Ltd.	123-133	..	5 5 8
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	1,775,892	Stk.	Feb. 25	4 1/2	Newcastle & G'tesh'd Con	104-105*	..	4 3 4
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218-221	..	4 19 7	529,435	Stk.	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	91-93	..	3 15 3
246,320	"	..	10 1/2	Do. A Ord. Stk.	154-157	..	5 1 1	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	123-133*	..	5 5 8
460,000	2 1/2	Oct. 14	10 1/2	British . . . . .	44 1/2-45 1/2	..	4 13 6	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	139-141	+1	5 13 6
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	116-118*	..	5 1 2	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68 1/2	..	6 5 6
165,700	"	..	4 1/2	Do. B 3 1/2 p.c.	87-89*	..	5 1 2	31,800	53	Feb. 25	13	Portsea Island A.	134-136*	..	5 1 0
82,278	"	..	5 1/2	Do. C 5 p.c.	103-105*	..	5 4 9	60,000	50	..	12	Do. B.	126-128*	..	5 1 7
55,000	"	Dec. 29	3 1/2	Do. 3 1/2 p.c. Deb.	87-89	..	3 18 8	100,000	50	..	10	Do. C.	119-121*	..	4 19 2
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14 1/2-15 1/2	..	4 11 10	114,800	50	..	10	Do. D and E.	100-102*	..	4 18 0
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	Oct. 28	7	Primitiva Ord.	78-78 1/2	..	4 8 11
100,000	1 1/2	..	—	Cape Town & Dis., Ltd.	4-5	..	—	796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	58-58 1/2	..	4 8 11
100,000	1 1/2	..	—	Do. 4 1/2 p.c. Pref.	6-7	+ 1/2	—	488,903	100	Dec. 1	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48 1/2-49 1/2	..	6 1 3	1,000,000	10	Oct. 14	8	River Plate Ord.	172-181	..	4 7 8
100,000	Stk.	Dec. 29	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	86-88	+ 3	5 2 3	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	105-108*	..	4 12 7	250,000	10	Sep. 29	9 1/2	San Paulo, Ltd.	153-163	- 1/2	5 10 9
1,513,280	Stk.	Feb. 25	5 1/2	Commercial 4 p.c. Stk.	105-108*	..	4 16 4	64,500	10	..	6	Do. 6 p.c. Pref.	112-123	..	4 18 0
560,000	"	..	5	Do. 3 1/2 p.c. do.	103-105*	..	4 15 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50-51	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	97-99	+1	5 1 0	209,981	"	..	10	Do. B	233-235	..	4 5 1
200,000	"	..	7	Do. 7 p.c. Pref.	138-140	+1	5 0 0	523,500	"	..	10	Do. C	233-235	..	4 5 1
491,270	Stk.	..	4	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	South African.	124-124	..	7 16 11
55,000	"	..	4	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5 1/2	South Met., 4 p.c. Ord.	120-122	..	4 9 7
145,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	98-100	..	5 0 0	1,895,445	"	Jan. 13	5	Do. 3 p.c. Deb.	82-84	..	3 11 4
486,092	10	Jan. 27	12	European, Ltd.	24 1/2-24 1/2	..	4 17 0	209,820	Stk.	Aug. 26	6	South Shields Con. Stk.	161-162	..	4 18 9
354,060	10	..	12	Do. £7 10s. paid.	18 1/2-19	..	4 14 9	605,000	Stk.	Feb. 25	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122*	..	4 12 1/2
15,141,545	Stk.	Feb. 10	4 1/2	Gas ) 4 p.c. Ord.	103 1/2-104 1/2	- 1/2	4 9 3	60,000	"	..	5	Do. 5 p.c. Pref.	119-121*	..	4 2 8
2,600,000	"	..	3 1/2	light ) 3 1/2 p.c. max.	88-90	..	3 17 9	102,358	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
3,791,715	"	..	4	and ) 4 p.c. Con. Pref.	103-105	..	3 16 2	507,010	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
4,191,975	"	Dec. 29	3	Coke ) 5 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6 1/2	Tottenham ) A 5 p.c.	133-135	..	5 1 9
257,749	Stk.	Sep. 10	5	Hastings & St. L. 3 1/2 p.c.	95-97	..	5 3 1	453,940	"	..	5 1/2	and ) B 3 1/2 p.c.	112-114	..	4 14 4
62,540	"	..	6 1/2	Do. do. 5 p.c.	119-121	..	5 7 5	149,470	"	Dec. 29	4	Edmonton ) 4 p.c. Deb.	98-100	..	4 0 0
70,000	"	Sep. 29	11	Hongkong & China, Ltd.	17 1/2-18	..	6 1/2 3	189,380	10	Dec. 29	8	Tusean, Ltd.	94-94 1/2	..	5 4 2
131,000	Stk.	Sep. 10	7 1/2	Ilford A and C	145-147	..	4 15 3	149,470	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,782	"	..	5 1/2	Do. B	109-111	..	4 19 1	236,476	Stk.	Feb. 25	6 1/2	Tynemouth, 5 p.c. max.	112-114*	..	4 7 1/2
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	..	3	Wands- ) B 3 1/2 p.c.	139-141*	..	4 14 0
								79,416	"	Dec. 29	3	worth ) 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



## APPLICATIONS FOR LETTERS PATENT.

- 4914.—CROMBIE, W. A. E., "Separation of tar and dust from hot gases." Feb. 28.  
 4920.—SHARPE, W. C. & W. C., JUN., "Air gas." Feb. 28.  
 4924.—GABBOTT, E. P., and TIMMIS, A. C., "Measuring the flow of fluids." Feb. 28.  
 4984.—EDGAR, W., "Automatically controlling gas." Feb. 28.  
 4989.—CHALLIS, J., and STEPHENS, K., "Incandescent burners." Feb. 28.  
 4990.—CHALLIS, J., and STEPHENS, K., "Gas-inlet regulator." Feb. 28.  
 5016.—ALTMAN, J., and the WHOLESALE FITTINGS COMPANY, LTD., "Gas-lamps." Feb. 28.  
 5033.—BENNET, J. H., "Dry meters." Feb. 28.

- 5062.—BROWETT, F., "Union for pipes." March 1.  
 5151.—BLAND, C. W., "Inverted lamps." March 1.  
 5179.—GREEN, G. W., and GIBBONS, W. P., "Charging and discharging gas-retorts." March 2.  
 5237.—ELLIOTT, L. A., "Gas-ovens attachment." March 2.  
 5251.—SPERRY, G., "Cocks for fluids." March 2.  
 5262.—SOCIÉTÉ FRANÇAISE DE CHALEUR ET LUMIÈRE, "Manufacture of mantles." March 2.  
 5263.—LEWIS, W. W., "Acetylene generators." March 2.  
 5293.—POWELL, J. & R. H., "Petrol-air gas generators." March 2.  
 5371.—GLOVER, T., "Incandescent burner." March 3.  
 5384.—HANWELL, H. W., "Anti-vibrators." March 3.  
 5406.—WITHERS, A. W., "Gas-scrubbers." March 4.  
 5418.—ROBERTSON, J., "Gas-fires." March 4.  
 5469.—ROBIN, J. I., "Gas-burners." March 4.

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For GAS PURIFICATION.

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Resists 4500° Fahr. Best for GAS-WORKS.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.  
 We guarantee promptness, with efficiency for Repairs.  
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Sheeting.  
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HIGH PRESSURE LIGHTING SPECIALIST.

BLenheim Works, LONDON, W.

Telegrams:

Telephone:

"GASOSO LONDON."

14 HAMMERSMITH.

## LUX'S GAS PURIFYING MASS.

See Advertisement on p. 701.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

## D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

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CHANCE and HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.  
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

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 REPAIRS RECEIVE PROMPT ATTENTION.  
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## SPENT OXIDE PURCHASED IN ANY DISTRICT.

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## SPENCER'S PATENT HURDLE GRIDS.

## THE very best Patent Grids for Holding

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See Illustrated Advertisement, Feb. 1, p. 277.

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JOHN E. WILLIAMS AND CO.,  
 LOWER MOSS LANE,  
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.  
 For all Gas Joints.  
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 For all Ammonia Joints.

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 AND THERMOMETERS.

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Consumers in any form are invited to correspond with CHANCE and HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

## J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

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(NATURAL.)

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PAINT FOR GAS-WORKS.

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SPECIALLY prepared for the Manu-  
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SIMULTANEOUS Discharging-Charger.  
 The one Machine which Discharges and Charges at One Stroke.

See Advertisement, March 8, p. III. of Centre.

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Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.



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Contractors for Complete CARBONIZING  
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MOVEMENTS FOR CLOCKS, PHOTOMETERS AND  
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BROTHERTON AND CO., LTD., Tar Distillers.  
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
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**"FORTO" Incandescent Gas Mantles**  
Combine Brilliancy and Strength. British  
Made. Send for List.  
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DIGGERS AND SUPPLIERS OF THE  
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Best Percentages. For lowest Quotations to any Port,  
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
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Twice as Rich as Bog Ore.  
Gives no back Pressure.  
The Cheapest in the Market.  
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Purification Plant.  
Results Guaranteed. No Working Costs.  
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**DO** you appreciate how much success  
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**HERBERT GREATORP, HACKNEY, MATLOCK.**

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SONS, AND CO., LIMITED,** Dewsbury, who make a  
Speciality of Catering for the Smaller Gas Concerns.  
Prices Reasonable; quality and results, the best. Satis-  
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**PRIVATE Company, with large and**  
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LIGHTING COMPANY, LIMITED.**

IN VOLUNTARY LIQUIDATION.  
**THIS well-known and Established**  
business of Gas Lighting Engineers and Makers  
of Greenall's Positive Measurement Meter, as at  
present carried on at the Albion Works, Otley, is now  
OFFERED AS A GOING CONCERN, with all Plant  
and Machinery, Patterns, Patents and Goodwill.  
The Works were re-arranged Five Years ago, by the  
Company, and are admirably adapted for their purposes,  
consisting of a large, very well-lighted shed, with ex-  
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Iron and Brass Foundries attached, the whole covering  
an area of 3000 sq. yards, and can be obtained at a  
moderate rental.  
Apply to the LIQUIDATOR, Albion Works, OTLEY.

**GAS Engineer's Assistant seeks**  
vacancy. Works or General. Excellent Quali-  
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Chemist and Draughtsman.  
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Excellent References.  
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Apply, stating Experience and Salary required, to  
WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Albion  
Iron-Works, Miles Platting, MANCHESTER.

**WANTED, a Purifier, Second-Hand,**  
about 6 ft. by 4 ft. by 3 ft. with Valves, Con-  
nections, and Lifting Apparatus.  
Address K. SANDERSON, 23, Rutland Street, EDIN-  
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**COUNTY BOROUGH OF BURTON-UPON-TRENT.**  
**TWELVE Months' Supply of Mantles**

Wanted.  
Full Particulars will be given to reliable English  
Makers on written Application being made to the  
undersigned.  
R. S. RAMSDEN,  
Assistant-Manager.  
Gas-Works, Burton-upon-Trent,  
March 16, 1910.

**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
A. LOWCOCK, Limited, SHREWSBURY.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete  
to Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can  
be seen temporarily erected. Re-erected Cheap for  
immediate Sale.  
**FIRTH BLAKELEYS, Thornhill, DEWSBURY.**

**FOR SALE—One 150-Burner Complete**  
Plant made by the National Air Gas Company,  
Limited. Nearly new and in Good Order. Has been  
little used.  
Can be seen, by appointment, at Messrs. CHARRINGTON  
AND COMPANY, Limited, Anchor Brewery, Mile End,  
LONDON, E.

**PETERBOROUGH GAS COMPANY.**  
**THE Directors of the above Company**  
invite TENDERS for a HOT COKE CONVEYOR.  
Tenders, addressed to the Chairman of the Company,  
Gas-Works, Peterborough, and endorsed "Conveyor,"  
to be delivered not later than the 8th of April, 1910.  
The Directors do not bind themselves to accept the  
lowest or any Tender.  
Further Particulars from  
**JOHN BARTON,**  
Secretary.  
Gas-Works, Peterborough,  
March 11, 1910.

**COKE.**  
**THE Directors of the Wandsworth and**  
Putney Gaslight and Coke Company invite  
TENDERS for the Removal of about 8000 Tons of  
Guaranteed "Wandsworth" COKE from their Works  
at Wandsworth, between April 1 and Sept. 30 next.  
The Coke to be removed by Van or by Barge (free  
waterway on River Thames).  
Sealed Tenders, endorsed "Tender for Coke," to be  
delivered not later than March 18.  
The Directors reserve to themselves the right to  
accept any Tender in part or in whole, and do not bind  
themselves to accept the highest or any Tender.  
Any further Information may be obtained from the  
Engineer, Mr. H. O. Carr.

**CHAS. W. BRAINE,**  
Secretary.  
Wandsworth and Putney Gaslight and  
Coke Company, Fairfield Street,  
Wandsworth, S.W., March 5, 1910.

**BOROUGH OF CLITHEROE.**  
(GAS DEPARTMENT.)  
**THE Gas Committee invite Tenders for**  
the Supply and Erection of RETORT BENCH,  
RETORT FITTINGS, and STEEL MAINS at their  
Gas-Works.  
Drawings may be seen, and Copies of Specification  
obtained, on Application to the undersigned.  
Sealed Tenders, endorsed "Tender for Retort-Bench,"  
&c., addressed to the Chairman of the Gas Committee,  
to be delivered at my Office not later than Saturday,  
the 26th day of March, 1910.  
The Gas Committee do not bind themselves to accept  
the lowest or any Tender.

**ROBERT BARRETT,**  
Engineer and Manager.  
Gas-Works, Clitheroe,  
March 7, 1910.

**ROYAL BURGH OF INVERNESS.**  
CONTRACTS FOR COAL, LIME, FREIGHT AND  
INSURANCE.

**THE Inverness Gas Commissioners are**  
prepared to receive OFFERS for the Supply of  
10,000 Tons or thereby of CANNEL and GAS COAL to  
be quoted f.o.b. at Ports on the Firth of Forth, f.o.r. at  
Pit, and f.o.r. at Inverness Goods Station, over a period  
of Six or Twelve Months at the Commissioners' Option,  
and for Freight and Insurance on Coal from Firth of  
Forth Ports to Upper Harbour, Inverness. Also for the  
Supply of 300 Tons or thereby of SHELL LIME to be  
delivered f.o.r. at Inverness Goods Station.  
Further Particulars and Forms of Tender may be ob-  
tained by Applying to the Manager at the Gas-Works.  
Tenders, endorsed and addressed to Kenneth  
MacDonald, Esq., Clerk to the Commissioners, will be  
received up to Saturday, the 19th inst.  
Gas-Works, Inverness,  
March 9, 1910.

**BOROUGH OF BARROW-IN-FURNESS.**  
SUPPLY OF GAS OIL.

**THE Corporation are prepared to re-**  
ceive TENDERS for the Supply of about 750 to  
850 Tons of OIL (Price to be per Ton), suitable for the  
Manufacture of Carburetted Water Gas, delivered free  
at the Gas-Works Siding, in such Quantities and at such  
Times as may be required for a period of One or Two  
Years (at the option of the Corporation) ending the 31st  
of March, 1911 or 1912.  
Sealed Tenders, addressed to the Chairman of the  
Gas and Water Committee, and endorsed "Tender for  
Oil," to be delivered at the Town Clerk's Office not  
later than Twelve o'clock noon on Wednesday, the 23rd  
of March, 1910.  
The lowest or any Tender not necessarily accepted.  
By order,  
**L. HEWLETT,**  
Town Clerk.

Town Hall, Barrow-in-Furness.

**ASHBURTON URBAN DISTRICT COUNCIL.**  
**TENDERS are invited by the above**  
Council for the Provision and Erection of the  
following PLANT at their Gas-Works.  
1—A New Two-Lift GASHOLDER to be erected in  
an existing Masonry Tank after Dismantling  
the present 30 ft. by 12 ft. Single Lift.  
2—A Steel TOWER SCRUBBER.  
3—Gas-Driven EXHAUSTING PLANT.  
4—The requisite 6 inch Connections.  
The Drawings and Specifications may be inspected at  
the Offices of the Council, East Street, Ashburton.  
Sealed Tenders for the whole of the works, endorsed  
"Gas Plant," and addressed to the undersigned, to be  
delivered at the Offices of the Council not later than  
Tuesday, the 12th day of April, 1910.  
The Council do not bind themselves to accept the  
lowest or any Tender, and the Scheme is subject to the  
sanction of the Local Government Board.  
**R. E. TUCKER,**  
Clerk to the Council.  
Ashburton, Devon,  
March 12, 1910.

**GAS-FITTER'S WORK.**  
**THE Commissioners of H.M. Works and**  
Public Buildings are prepared to receive TEN-  
DERS for the Execution of GAS FITTER'S WORK to  
Public Buildings, &c., in the London District, for Three  
Years from the 1st of April, 1910.  
The printed Schedule with Form of Tender may be  
obtained at H.M. Office of Works, &c., Storey's Gate,  
London, S.W., between the hours of Eleven a.m. and  
Five p.m. (except on Saturdays) upon payment of Five  
Shillings. The Sum so paid will be returned to those  
persons who send in Tenders in conformity with the  
Conditions specified below.  
The Commissioners do not bind themselves to accept  
the lowest or any Tender.  
Tenders must be delivered before Eleven a.m. on  
Thursday, the 24th of March, 1910, addressed to the  
Secretary, H.M. Office of Works, &c., Storey's Gate,  
London, S.W., and endorsed "Tender for Gas-Fitter's  
Work."  
H.M. Office of Works, &c.,  
March 11, 1910.



SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**HORNSEY GAS COMPANY.**

NEW ISSUE OF £5000 CONSOLIDATED STOCK,  
£6500 FIVE PER CENT. PREFERENCE STOCK,  
AND  
£3000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 22, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**LOWESTOFT WATER AND GAS COMPANY.**

NEW ISSUE OF 400 ADDITIONAL ORDINARY  
£10 SHARES,  
AND  
£1000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.**

NEW ISSUE OF £32,000 FOUR PER CENT.  
PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
**WORTHING GASLIGHT AND COKE COMPANY.**

NEW ISSUE OF £3473 CONSOLIDATED  
ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

In the High Court of Justice, Chancery Division,  
Mr. Justice Joyce, 1909, L. No. 1586.  
**THE FREEHOLD GAS-WORKS**

OF THE  
**LAINDON AND DISTRICT GASLIGHT, COKE,  
AND WATER COMPANY, LIMITED,**

Situate about 23 miles from London, within a short distance of the Laindon Station on the London, Tilbury, and Southend Railway. The Works comprise: Retort House with Eight Retorts, Vertical Condenser, Cast-Iron Scrubber, Tar-Tank and Pump, Two Purifiers, with Lifting and Traversing Apparatus, Gasholder, 400-Light Station Meter, together with the Mains, Services, Meters, and Tools, the whole to be sold as a Going Concern and with Possession on completion of the purchase.

**MR. WILLIAM RICHARDS**, of the Firm of **MESSRS. A. & W. RICHARDS** (the person appointed by the said Judge), will SELL THE ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, April 12th, at One o'clock, precisely in One Lot.

The Works may be viewed, and Conditions of Sale obtained, of J. MONTAGUE HASLIP, Esq., Solicitor, 6, Martin's Lane, CANNON STREET, E.C.; of HARRY BARKER, Esq., Chartered Accountant, 6, OLD JEWRY, E.C., and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

**OTTOMAN GAS COMPANY, LIMITED.**

**NOTICE is Hereby Given**, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, the 22nd day of March, 1910, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect Directors and Auditors in place of those retiring; and to Transact the General Business of the Company. THE TRANSFER BOOKS WILL BE CLOSED from the 15th day of March until after the Meeting.

By order of the Board,  
THOMAS GUYATT,  
Secretary.

9, Queen Street Place,  
Cannon Street, London, E.C.,  
Feb. 22, 1910.

**MARPLE URBAN DISTRICT COUNCIL.**  
(GAS DEPARTMENT.)

COAL, CANNEL, AND LIME.

**THE Gas Committee** of the above Council invite TENDERS for the Supply of GAS COALS, CANNEL, and BEST HAND-PICKED BUXTON LIME, as required at their Gas-Works, Marple Bridge, during the Year ending March 31, 1911.

TAR AND LIQUOR.

Tenders are also invited for the Purchase of Surplus TAR and AMMONIACAL LIQUOR produced at the Gas-Works during the Year ending March 31, 1911. The Tar and Ammoniacal Liquor will be required to be taken direct from the Works by the Purchaser.

Forms of Tender (for Coals and Cannel only) and Conditions upon which Tenders only will be received, may be obtained on Application to Mr. Jas. K. Law, Gas-Manager, Marple Bridge, near Stockport.

Tenders, endorsed "Coals," "Lime," &c., as the case may be, and addressed to the Chairman of the Gas Committee, to be delivered at the Council Offices, Marple, by Four o'clock p.m. on Wednesday, March 23, 1910.

CHARLES F. JOHNSON,  
Clerk to the Council.

Public Offices, Marple,  
Cheshire, March 8, 1910.

**FOR SALE—50 Ordinary Shares in the SOUTH AFRICAN LIGHTING ASSOCIATION**, Particulars on Application. Will accept £12 10s. each. Address No. 5199, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**SEVENOAKS WATER-WORKS COMPANY.**

**NOTICE is Hereby Given**, that the Sevenoaks Water-Works Company, in pursuance of their Provisional Order of 1908, as confirmed by Act of Parliament, being desirous of increasing their Capital, have resolved to issue Three Hundred 4 PER CENT. PREFERENCE SHARES OF TEN POUNDS each.

Tenders are hereby invited from the Public for the same at not less than par value.

The present issue of Capital is made to provide for the Extension of Mains and other works, and also for the Repayment of Sums over-expended on Capital Account.

The Company are paying the Maximum Dividend on their Stock and Ordinary Share Capital.

Tenders are to be addressed to the Company at their Offices, Oak Lane, Sevenoaks, on or before Saturday, the 2nd day of April, 1910, and endorsed "Tender for Shares."

The Shares are Payable as under—viz.:

£2 on Application,  
£3 on Allotment,

and the Balance on the 1st day of July, 1910.

Where no Allotment is made, the Deposit will be returned in full.

Forms of Tender on Application at the Company's Offices.

By order of the Board,

ALFRED GRAINGER,  
Secretary.

Offices: Oak Lane, Sevenoaks,  
March 9, 1910.

**BRITISH GASLIGHT COMPANY, LIMITED.**

**NOTICE is Hereby Given**, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 23rd inst., at Twelve o'clock precisely, to transact the usual Business; and to declare a Dividend for the Half Year ended the 31st of December last.

**NOTICE is HEREBY ALSO GIVEN**, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 12th inst. and RE-OPENED on the 24th inst.

By order of the Court of Directors,

A. W. BROOKES,  
Secretary.

Chief Office: No. 11, George Yard,  
Lombard Street, London, E.C.  
March 4, 1910.

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**REPORTS OF DISTRICT  
GAS ASSOCIATIONS FOR 1909.**

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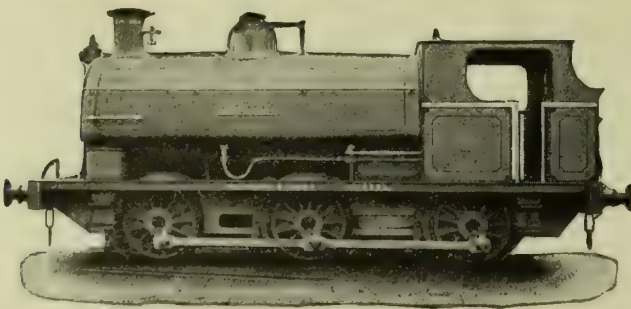
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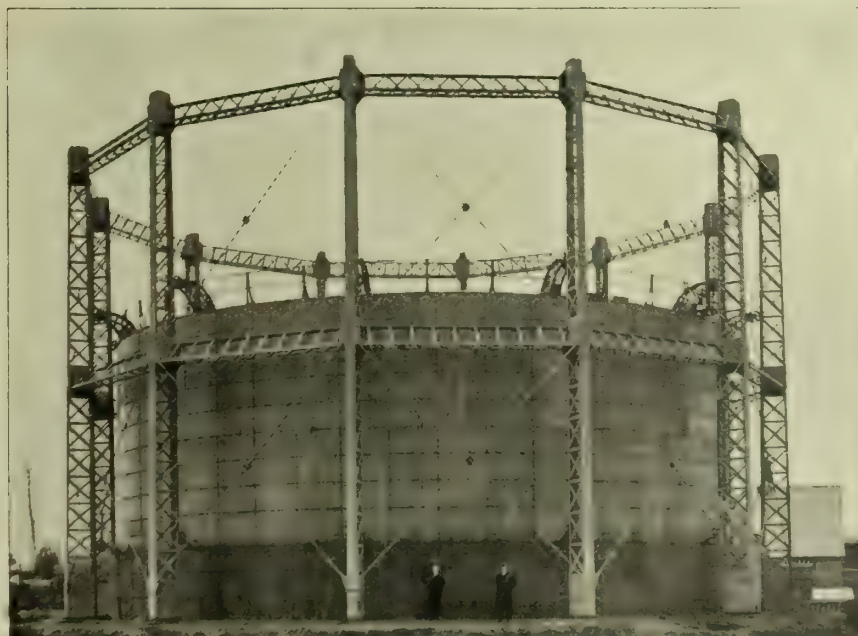
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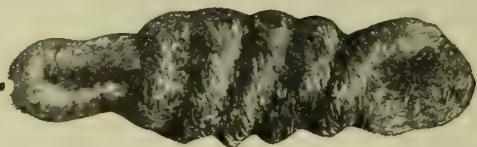
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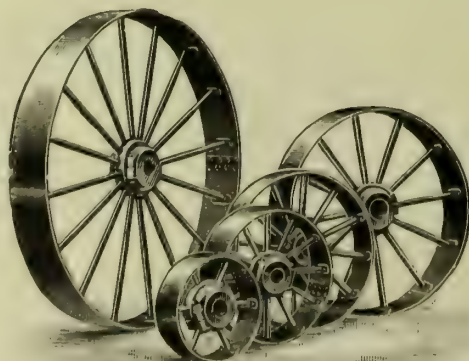
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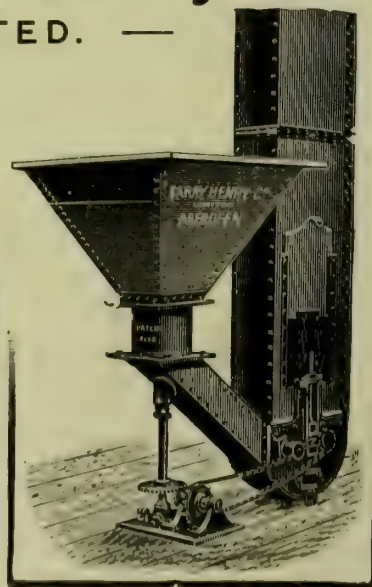
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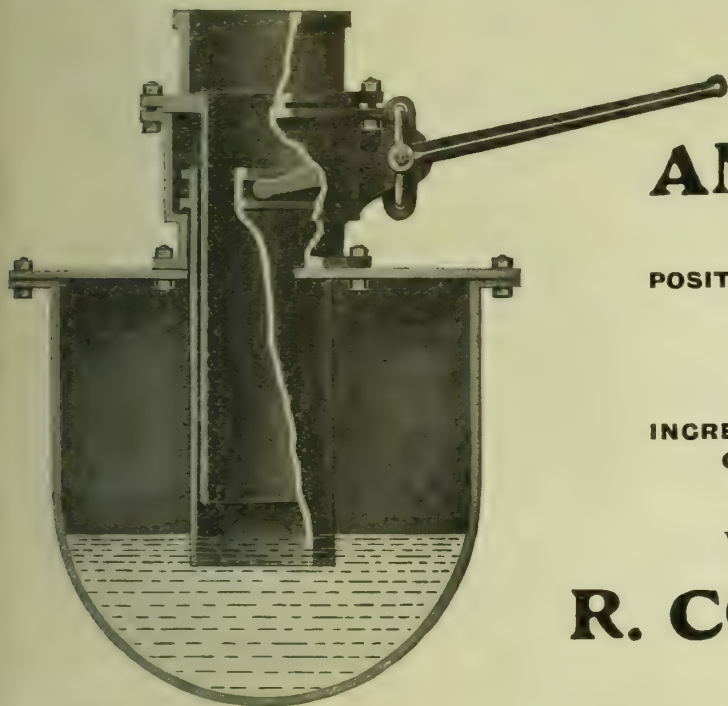
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# SULPHATE OF AMMONIA PLANT

Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

### ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity.
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

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**LONDON, E.C.**

Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Telegrams: "RAGOUT LONDON." Telephone: 273 CENTRAL.



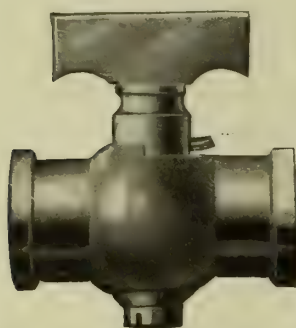


FIG. 1. The Old Style with the Old Trouble.  
Note the Pin A.

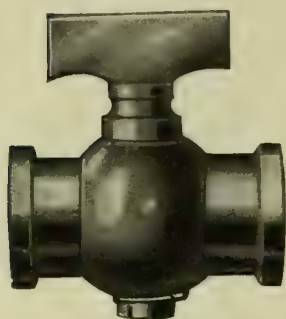


FIG. 2. Evered's Patent "Safety Stop." No Pin.  
No trouble.



FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

## EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

## EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

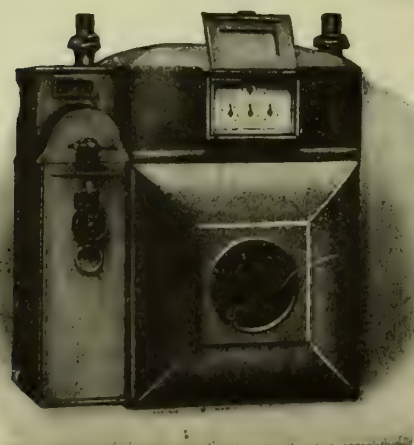
**EVERED & CO., LTD.,**  
27 to 35, DRURY LANE,  
LONDON, W.C.

Surrey Works, SMETHWICK.



# R. LAIDLAW & SON (EDINBURGH), LTD.

## GAS METER MAKERS.

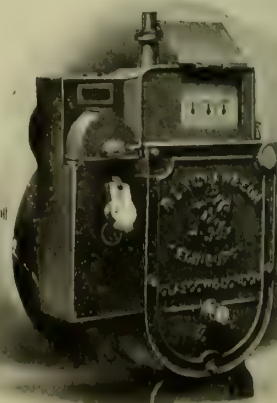


**Prepayment  
Dry Meters in  
Tinplate Cases.**

Thousands of our  
Meters in use by the  
largest Gas Companies  
and Corporations and  
giving

**COMPLETE  
SATISFACTION.**

**Prepayment  
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*DRAWINGS AND FULL PARTICULARS ON APPLICATION,*

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**6, Little Bush Lane, LONDON, E.C.**



# Welsbach

## LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	1 ft. 8 ins.
2-light	2 ft. 4 ins.
3-light	2 ft. 4 ins.
4-light	2 ft. 7 ins.

Width over all.

1-light	1 ft. 1 in.
2-light	1 ft. 5 ins.
3-light	1 ft. 5 ins.
4-light	1 ft. 8 ins.

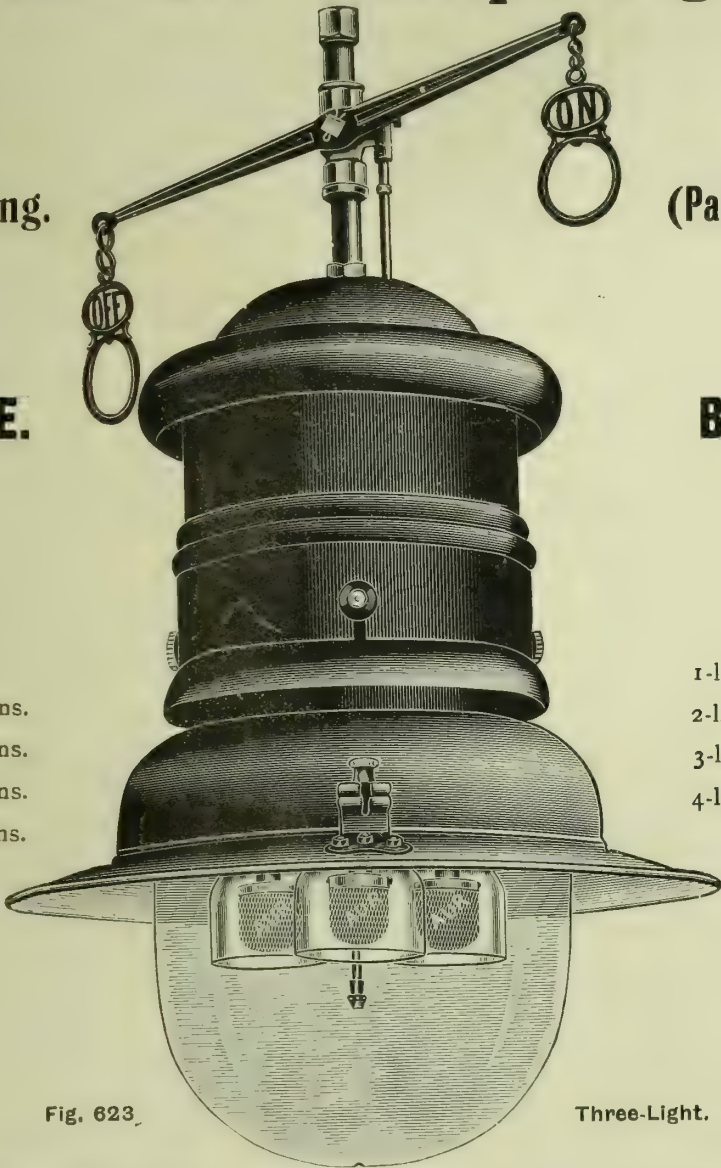


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

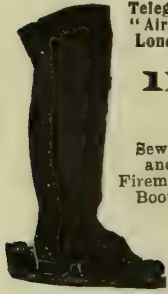
Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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Welsbach House, 344-354, Gray's Inn Road, London, W.C.  
Telegrams and Cables: "WELSBACH LONDON."  
Telephone 2410 NORTH.





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Boots.



Gas Bags for repairing Mains.  
All Seams Stitched and Taped.

### Patentees of the DENMAR BAG,

Impervious to Main Liquor and Climatic Influences.

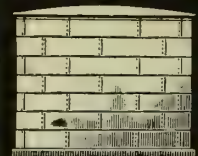


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OR WATER TANK.



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VARIOUS  
TYPES.



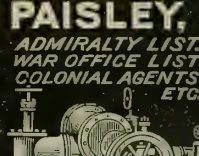
GAS  
AND  
WATER  
VALVES.



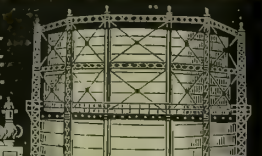
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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

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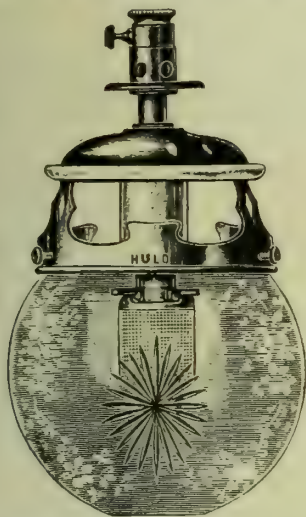
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Light.

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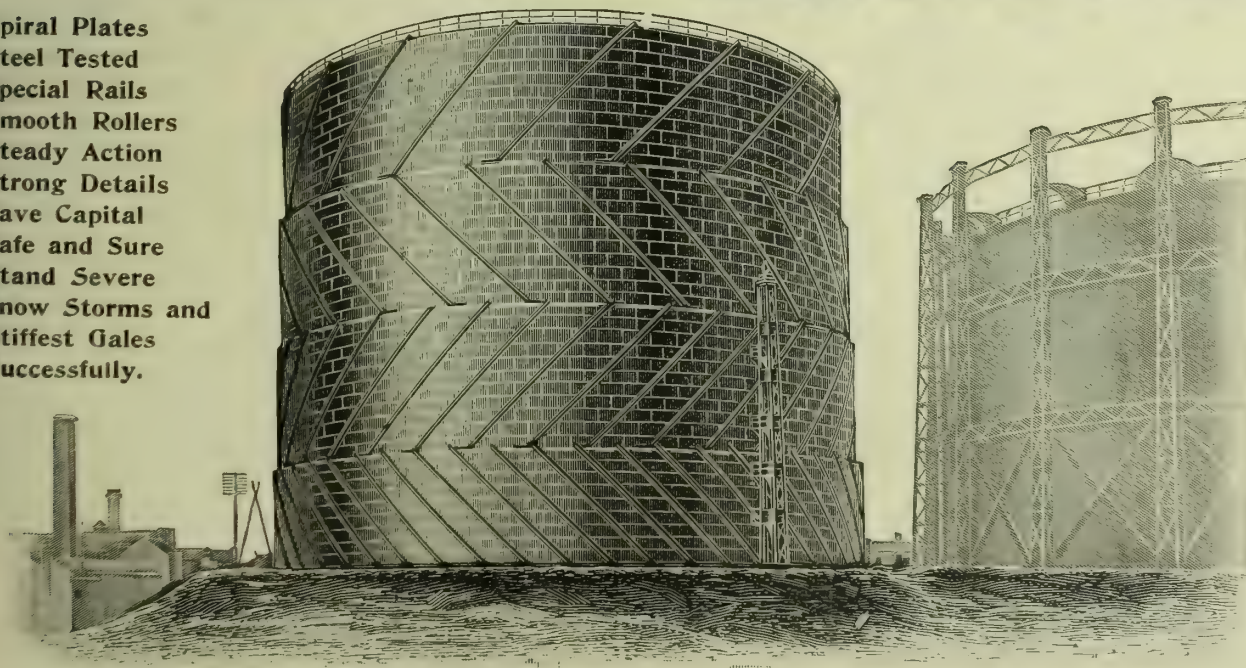
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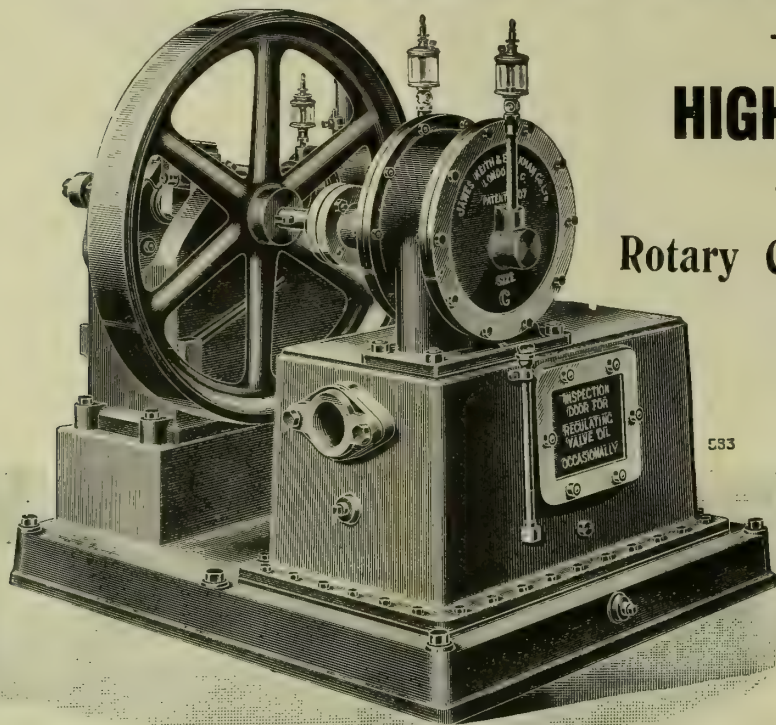
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# THE JOURNAL OF GAS LIGHTING

## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2445.]

LONDON, MARCH 22, 1910.

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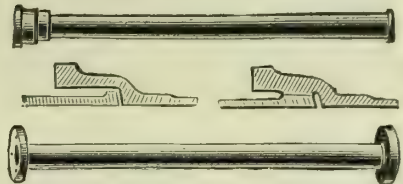
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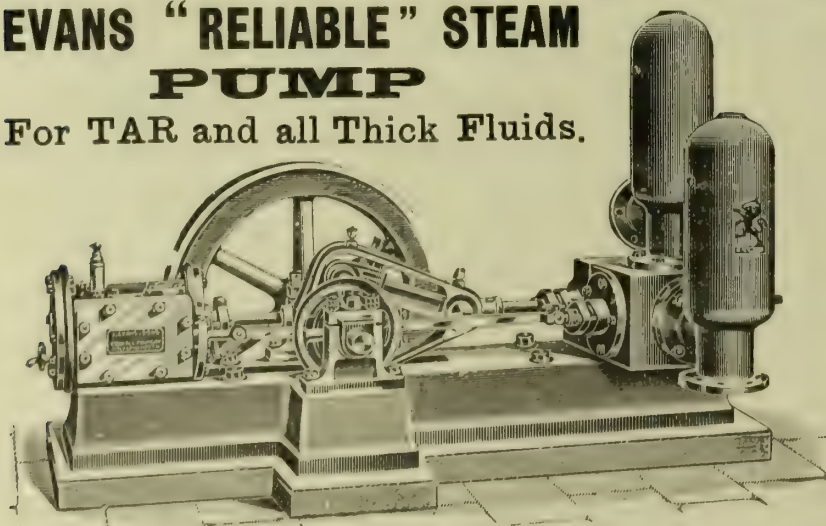
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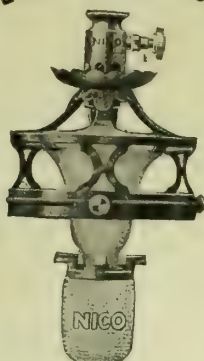
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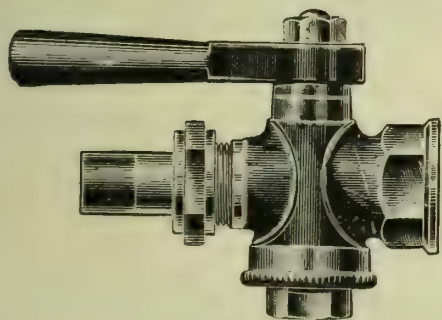
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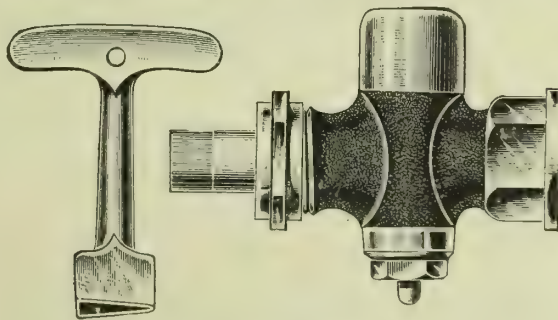
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Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.



All interested are invited to write for further information as to the Hill Mantle, particularly the Hill Four Star "C" and Inverted Mantle No. 753, to:

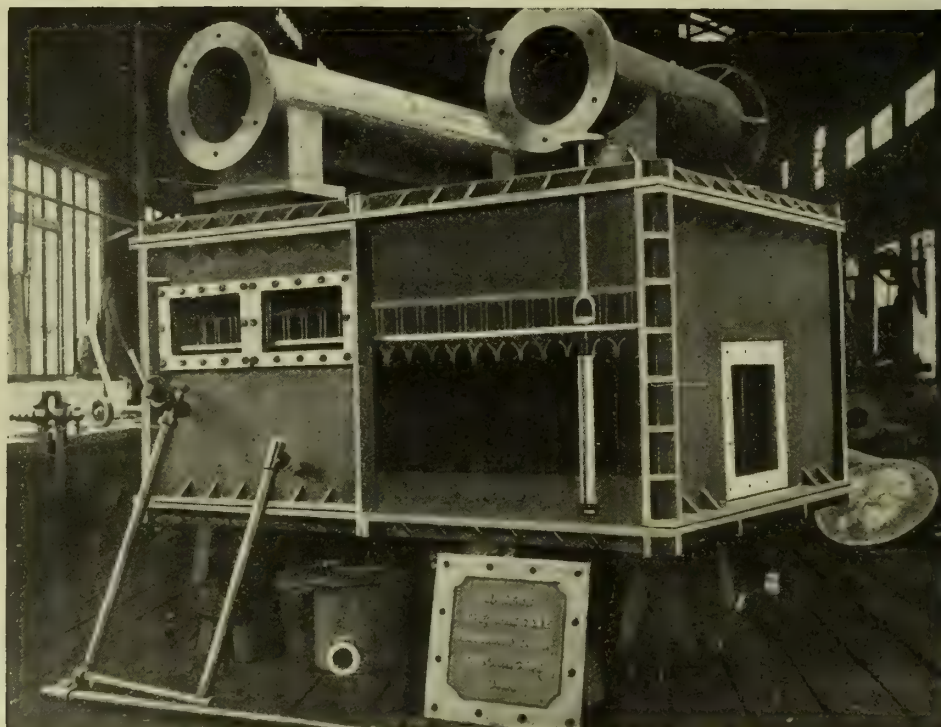
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# "VOELKER" LOOM WOVEN MANTLES.



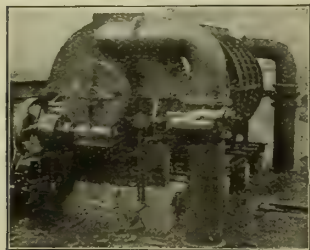
These Mantles are of great strength and durability, owing to the fact that the Ramie Thread is woven on a loom, and not knitted on a knitting machine as other mantles are; hence there are no series of acute angles in the fabric against which another thread is cutting, this being responsible for most of the breakage to which mantles are subject.

We have the greatest confidence in and strongly recommend this series of mantles; they are very strong, very durable, and give an excellent light. These mantles are specially suitable for Street Lighting and Maintenance Work, and we shall be pleased to send you samples, free of charge, knowing that if you once try them, you will be more than satisfied that we have not exaggerated their good qualities.

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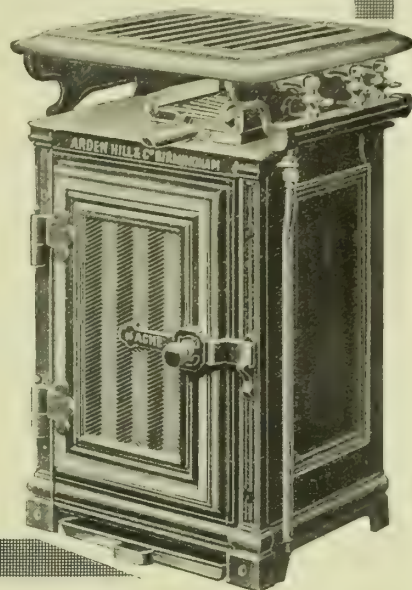
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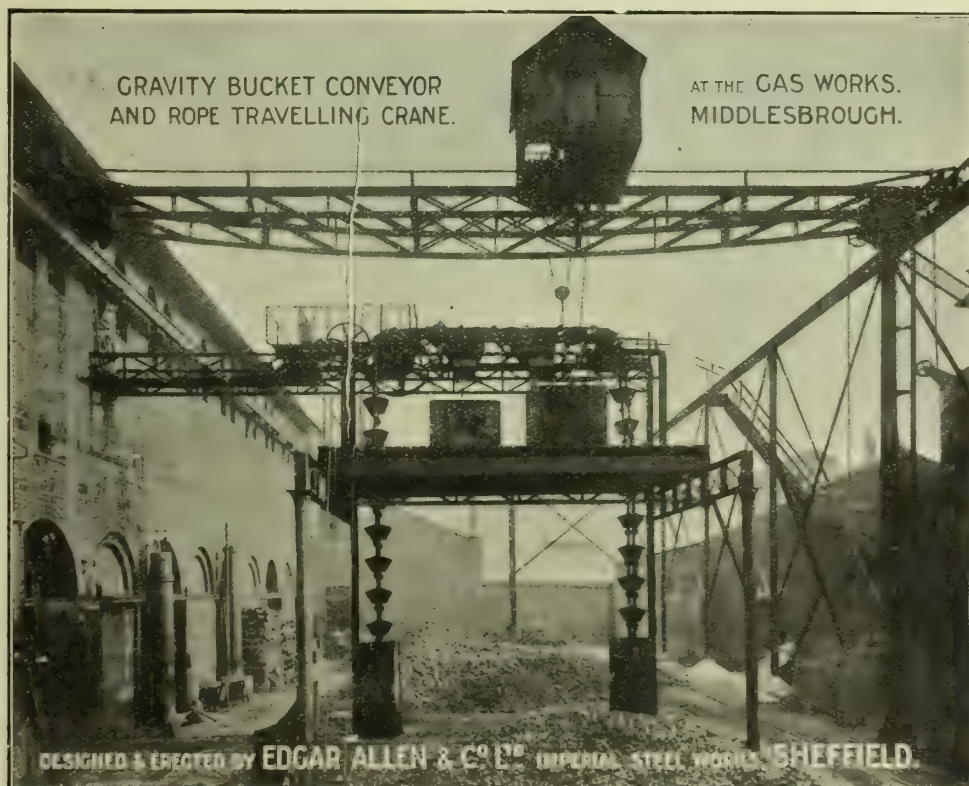
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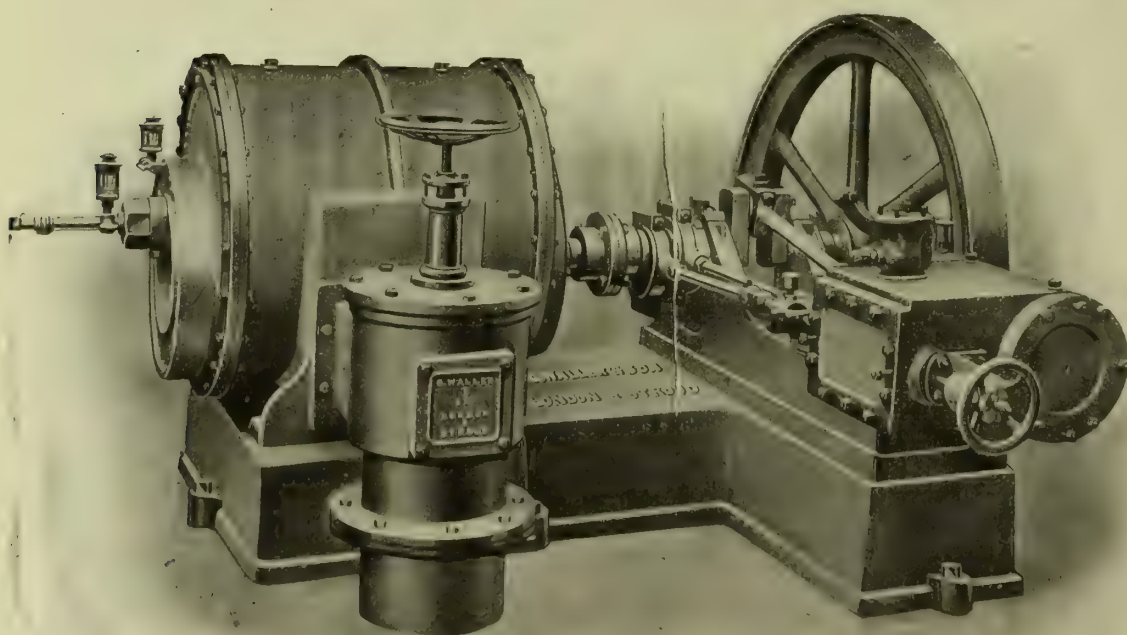
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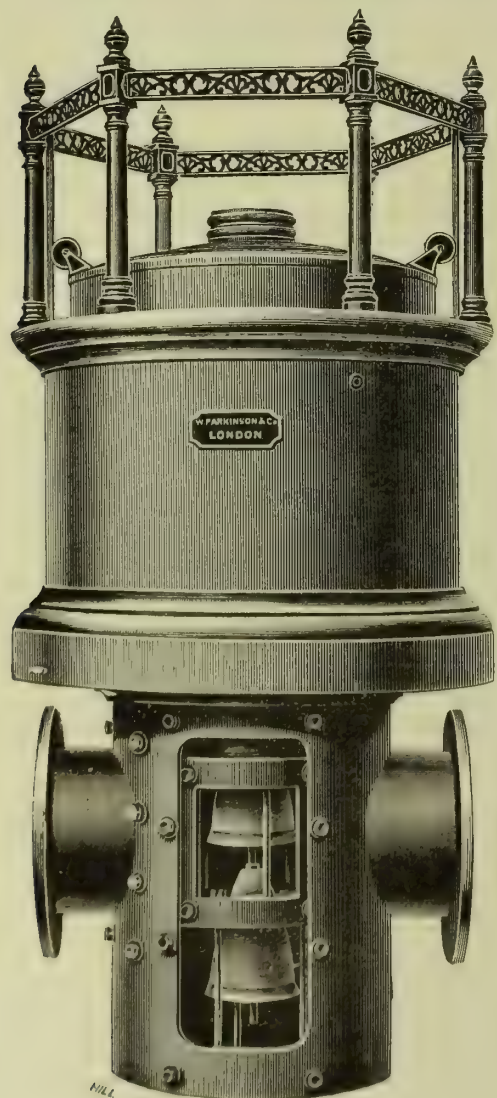
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EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2445.—TUESDAY, MARCH 22, 1910.

## EDITORIAL NOTES—GAS, &c.

### Water Gas and Capital Redemption in Parliament.

COMMITTEE work on Gas Bills in the first session of the new Parliament commenced last week; and there are two or three points in connection therewith to which special attention may be drawn. It is apparent that, with the growth of precedent in the more modern features of gas legislation, local authorities who desire to squeeze something out of the gas companies operating in their areas have, where the concerns have been circumspectly managed, considerable difficulty in finding good and just grounds on which to oppose and to prefer their claims. And it is only by the outside aid of those who glean from session to session hints from all sources, that sufficient demands, can be formulated to make any sort of a case for presentation to a Parliamentary Committee. Local authorities, especially those who are electricity suppliers, appear glad enough, whether or not requests are reasonable, to take advantage of aid of this kind; and this causes the question to frequently cross the mind as to whether ignorance rather than local interests and justice is not at the root of much of the hostility and demand. Take the hotchpotch of requirements presented by the Brighton Corporation and the neighbouring authorities in connection with the Brighton and Hove Gas Company's Bill, in which the proposals were of a character (and so endorsed by the Commons Committee who considered them) designed to inure to the future material benefit of consumers and Company alike—more so to the former than to the latter. The authorities objected to everything—to the new standard burner, to the proposal as to the redemption fund for wiping out ineffective capital, and to the adoption of the special purposes fund; and they unsuccessfully asked for a calorific power test, the restriction of the use of carburetted water gas, and a lowering of the standard price by 3d. The standard burner and the special purposes fund are in consonance with the model clauses and abundant precedent; the redemption fund within limits is an act of wisdom; the demand submitted for a calorific power test, the Corporation could not sustain while the illuminating power test continued; the lowering of the standard price by 3d. was deemed unreasonable, and 1d. was taken off; and the restriction of the use of carburetted water gas was shown by Dr. Haldane to be now less necessary than he at one time thought it to be, and, if such a restriction were imposed, it should be by general legislation and not enforced in the case of individual concerns.

This last matter is of particular interest; and it may be taken that, after Dr. Haldane's evidence, no local authority will again venture to try to uphold the demand made by the Brighton opposition. So long as gas undertakings will voluntarily exercise restraint, as they are now doing, in the matter of the proportion of water gas introduced into the general supply, so long (it may, we think, safely be said) Parliament will not impose any restriction on its use. It is about twelve years now since the Home Office appointed a Committee, of which Dr. Haldane was a member, to inquire into the use of gas containing a large percentage of carbon monoxide; and twelve years after it transpires that, in making their recommendations, the Committee were influenced by the notion that gas undertakings here might follow the example of certain American gas undertakings, and distribute carburetted water gas *per se*. The fear of the Committee in those days, in the light of the explanation now given, was somewhat of a slight upon the discretion of the administrators of gas undertakings; but Dr. Haldane does not hesitate to say now (and we give him full credit for the recognition) that the managements of gas undertakings have themselves in the passing years shown wisdom in this matter, and have largely removed the requirement for restrictive legislation, though he thinks that some credit

may be taken for the moral effect of the report of the Home Office Committee. Another matter that he pointed out was that the conditions of the use of gas have in the meantime changed, in that a comparatively small amount of gas is required in (and so a comparatively small amount could, through a tap being accidentally left open, escape into) a room now with the incandescent burner, compared with a dozen years ago when the flat-flame burner was still very commonly used. In addition, the proportion of gas consumed in the day time (when escapes would be readily detected) has been advancing by leaps and bounds. Dr. Haldane was before the Committee last week, at the instance of the opposition, on a Speaker's order; and he completely failed the opponents. In view of the part he took in the report of 1899, it was believed by them that his evidence would be valuable in the matter of the demand for a restriction on the supply of carburetted water gas. After his testimony, the opposition quietly shifted the matter to one side; and later the Committee expressed their view that the subject was not one for them to deal with, but, if dealt with at all, it should be by way of general and not private legislation. The Brighton authorities unwittingly did the gas industry good by their action in this regard.

The question of the provision of a capital redemption fund within prescribed limits was before the Commons Committee in the case of the Brighton Bill and before the Lords Committee in the case of the Bishop's Stortford Bill. There may be many companies with ineffective capital hanging to them, owing to exceptional circumstances, such as the closing down of old works, and the removal to new sites; and it is a good thing for the consumers to get capital of the kind wiped out, instead of allowing it to continue, and so require money year by year for dividend. Sir J. Rankin's Committee who sat in the session of 1899 recommended that efforts should be made by any company having obsolete and unproductive capital to redeem such capital by a sinking fund or otherwise. The Gaslight and Coke Company had a clause put into their Act in 1903, by which provision is made for the extinguishing, by annual appropriations, of a million pounds of unproductive capital. The Brighton Company have some £57,000 of such capital, owing to the closing-down of their old manufacturing stations and the concentration of the plant at Portslade. In the Bishop's Stortford case, the amalgamation of a number of small companies will inevitably result in the closing-down of works; and there will be an amount of capital that will become ineffective. In this case, a line is drawn at capital equivalent to £400 per million cubic feet at which the fund will not further operate. The same thing—though a different figure—was proposed in the Brighton case; but here the Committee preferred to alter the arrangement to the fixed amount of the estimated obsolete capital (£57,000), with the condition attached that the power was not to be taken as a precedent, but merely as an allowance under exceptional circumstances.

There was argument on the part of the opposition that the consumers should not be called upon to provide this fund, but that the obligation should rest upon the shareholders. For industrial undertakings, subject to competition, the dividends of gas companies cannot be said to be extravagant. If the ineffective capital is maintained, consumers have to supply the money with which to pay dividends. By furnishing instead the money with which to liquidate that capital, the consumers are relieving themselves of a perpetual charge, and, under the sliding-scale, will reap the bulk of the benefit that accrues in economy. Mr. William Newbigging fails to see any analogy between what the patrons of a municipal gas undertaking do and what the consumers of gas in a sliding-scale company are asked to do, because he says the former are virtually the owners of the undertaking. Are they? Let us see what are regarded by the local governors—take Manchester as an example—as the gas consumers' obligations, because by comparison one brings into relief



the unfairness that rests upon the municipal gas consumer over and beyond anything that the consumer under a company allowed to redeem to a limited extent unproductive capital has to do. The charges upon the two are alike up to a point. Then present consumers under a local authority are perpetually providing money for the redemption of capital and the payment of interest, and beyond, in all but a few isolated cases, they have to contribute money to hand over to the relief of the rates of a large number of local inhabitants who are not gas consumers, and who have not put their hands into their pockets for the provision of a single penny of capital, as has the gas company shareholder. The company gas consumer asked to extinguish a certain proportion of ineffective capital is in a preferable position. The comparison could be carried further—to the municipally owned electricity undertakings in competition with a gas company. We agree with Mr. Balfour Browne that the clause in the Brighton Bill is "new and important," and it is justified, not only by the report of Sir James "Rankin's Committee, but by common-sense." It is, in fine, an economic proceeding.

### Temperatures Theoretical and Practical.

HIGHLY instructive, though dealing with elementary principles, was the lecture delivered by Dr. Harold G. Colman, to the London and Southern District Junior Association, on Friday night, on "The Development of High Temperatures "by Gaseous Combustion." Both in matter and in the illustrative demonstration, the lecture was particularly appropriate for what is to all intents and purposes one of the educational bodies for the juniors of the gas industry. The lecture, of course, was largely theoretical; but for next session the members are promised the complementary part which will treat of two of the practical applications of gaseous heating—the heating of retort-settings, and the heating of incandescent mantles. The only criticism of the lecture that there is to be made does not relate to commonly accepted matter and facts, but to style. We cannot, however we look at Dr. Colman's submission, see why it was "much "more convenient" for this lecture to use the metrical system unit of heat than the British thermal unit. The only convenience that can be imagined was in the saving of the time that would have been expended in conversion from one to the other in the preparation of the lecture. In an Association the bulk of the members of which are learners in the technical affairs of the industry, it would have simplified matters (true, not for the lecturer, but for the members' appreciation) to have had figures in terms of their native measure rather than in those of the metrical system. The calorie is all right for the laboratory, as it is in harmony with the apparatus, but for the practical man the British thermal unit is preferable for more than one reason. The point need not be laboured; but the argument advanced in the article entitled "Official Calorimetry of Gas" in the "JOURNAL" for Nov. 9 last (p. 378) will apply. This is the only criticism.

But that apart, the members of the Association, from the clear locution of Dr. Colman, which reduces the (to some) abstruse to perfect transparency, know more than they did before regarding the theory of high temperature development by gaseous combustion; and with the additional knowledge, they must already better appreciate the practical applications, and will do so still more when they have again been privileged to hear Dr. Colman. There is no more interesting field for diversified research and study than this one of heat. The chemical actions and interactions that proceed in combustion, the ideal conditions to the attainment of the highest possible temperatures, and cognate matters, lead into all sorts of instructive and interesting byways of the subject that are contributory to the theoretical side. Then between temperatures that are theoretically possible and temperatures that are obtained in practice, there is a considerable difference from which the student and the inventor is ever trying to make recovery to place to the credit of utility. This is where the practical man comes in; and he is the better able to usefully work in this field if he is the master of the knowledge framed succinctly but strikingly by Dr. Colman in his first lecture. There are heat losses that cannot possibly be avoided; but the history of invention shows us some remarkable materialized ideas in different lines that have yielded heat efficiencies far transcending anything that had previously been accomplished. In the gas industry we depend now for our very

existence almost entirely upon the temperature efficiencies that can be obtained by the appliances produced for utilizing gas. Such appliances are vital to our future; and the greater the improvement that can be realized in their effective performance, the better. Good as they are now, there is plenty of room for producing still greater temperature efficiencies; and such lectures as that of Dr. Colman will pave the way to effort by men who have possibly not hitherto given much thought to the matter. Juniors require lectures that are not only instructive, but inspiring; and this is one.

### To the Memory of a Worker.

EVER feeling that in the life of Mr. William Young there was never any sufficient recognition by the gas industry of the work that was rendered by him to it through his scientific research and the productions through his pen of a naturally powerful and highly-cultured brain, we are glad to learn that the first steps have been taken to create a suitable memorial. The Committee of the North British Association of Gas Managers, who have had the matter in hand, have evolved a plan by which the work of this learned friend of the industry will be kept green in memory, and serve as a stimulus hereafter to those who will occupy technical positions in the industry, but will not have been contemporaries of Mr. Young, and so will not have had the advantage of being brought into direct contact with his fine nature, and of imbibing direct from the great intellectual fount which was kept running to the very end. It is fitting that the North British Association should take up this matter, and that the duty of prosecuting and administering the memorizing scheme should be vested in that body. Mr. Young was a distinguished member of the Association, contributed largely to the proceedings, and his work (over which hovered the one ambition to aid in the world's economic progress) was conducted almost exclusively in the territory from which the members of the Association are drawn. Though there is this especial geographical interest, the fruits of Mr. Young's work, and the honour attaching to his name, know no bounds. The Memorial Committee have determined upon the establishment of a lectureship; and such lectureships cannot be founded without money. We appeal, therefore, not only to the gas administrations, engineers, and managers in Scotland, but to their industrial and professional compeers throughout the British Isles, to let the necessary fund be accumulated without delay, and not be made up in that tardy manner that has become almost a characteristic of, and reproach to, the gas industry. For a biennial lecture, the capital sum required is not large. It is considered that £600 will suffice; a larger sum would, of course, give the administrators of the fund more freedom, as naturally they will only have the proceeds of the invested fund with which to deal. The lectures will treat of the chemistry, manufacture, distribution, and application of gas; so that the primary object of the establishment of the fund will be accompanied by a secondary and very practical one. In its useful scope, the form the memorial is to take is in pure consonance with the life, spirit, and activities of the man whose memory it is desired to honour. From near and far, we hope that the Hon. Secretary and Treasurer to the fund—Mr. Alex. Bell, of Peebles—will receive generous and quick response to his appeal for contributions; so generous and quick, in fact, that the memory of the establishment of the fund will be one of its pleasant associations. Further information appears in another part of this issue.

### The Farmer and the Fertilizer.

WITH a word of congratulation to the Sheffield Gas Company upon the results of last half-year's trading—which produced, with gas at an average price of 1s. 3<sup>0</sup>/<sub>4</sub>d., an increase of 6.35 per cent. in consumption, and enabled the Directors to show that the last reduction in price had been recouped in profit—there is one point in the remarks of the Chairman (Mr. Wilson Mappin), at the meeting of the shareholders a few days since, to which special attention may be called. In this statistical age, so many figures come before one that it is not always that the full relative significance of certain of them is observed. Mr. Mappin brings to the surface an instance; and it must be confessed that what he has introduced to notice is somewhat surprising. It is that of an estimated production of 348,000 tons of sulphate of ammonia in the United Kingdom in 1909, no less than 264,000 tons were exported. These figures were



known before; but the result of subtraction had not been completely appreciated. Taking the smaller figure from the larger, it is seen that the difference is 84,000 tons, which shows that only about 24 per cent. of the total estimated home production is used by our own farmers, while 76 per cent. is exported. It is no doubt a good thing to have a substantial export trade, and to maintain it. But the comparative figures do not look at all well for home use; and there must be a much larger field here for sulphate of ammonia absorption. The trouble, however, is to get hold of the field.

The Sulphate of Ammonia Committee have not by any means been lax in prosecuting educational work among farmers; and their propaganda efforts are being enlarged. And not only so, but they are endeavouring (according to Mr. Hanbury Thomas, Managing-Director of the Sheffield Company, and a member of the Committee) to persuade the Board of Agriculture to encourage the experimental use of sulphate of ammonia by the agricultural colleges working in conjunction with the Board. It is a mysterious thing that in this country the gas industry should always be so loth to spend money on matters pertaining to its common interests; it is also strange that the Government of the country does so little to encourage and assist home industries in developing trade and commerce. And it is somewhat humiliating that we should so often be directed to go abroad for copies worth imitating in the matter of rational conduct in regard to industrial and educational questions. In this matter of sulphate of ammonia, we have Mr. Mappin telling us that in Germany the Government lends assistance in this direction to manufacturers, with the result that whereas in 1896 the quantity of sulphate of ammonia used by the German farmers was 80,000 tons, nearly four times the quantity—284,000 tons—was consumed in 1908. That is to say, fourteen years ago Germany was consuming nearly as much sulphate of ammonia as is used in the British Isles in 1910; and that country's home consumption in 1908 equalled rather more than 82 per cent. of our total production in 1909. Japan is fully alive to the value of sulphate of ammonia as a fertilizer, as is seen by the rapid increase in their imports during the last eight or nine years. The work to which there has to be steadfast attention is that of educating the farmer, while there must not be a decline of perseverance respecting the export trade, for which there is keen competition. In the former matter, Chairmen of Gas Companies might do much good, and certainly no harm, in making a point of calling attention to the subject of the utility of sulphate of ammonia as a fertilizer at the reported meetings of shareholders, in the manner that Mr. Mappin has done. With production increasing, there must be advertising on all suitable occasions, in addition to educational work; and meetings of gas companies are such occasions.

### Income-Tax Allowance for Depreciation.

Our readers may remember that an appeal on behalf of the Whitchurch and District (Hants) Gas Company, Limited, for an allowance in respect of depreciation for decreased value of plant and machinery by reason of wear and tear was heard by the District Commissioners sitting at Whitchurch on the 12th of November last. An assessment had been made allowing for depreciation; and this had been subsequently amended by withdrawing the allowance. Mr. W. A. Schultz appeared on behalf of the Company, and argued the case on the question of principle; and, in view of the importance attaching to their decision, the Commissioners decided to adjourn the consideration of the question. It was further argued by Mr. Schultz last week; and a report will be found elsewhere. It will be seen therefrom that the Commissioners decided that depreciation should be allowed to the extent of 3 per cent. on the value of the plant and machinery as written down—being on the same basis as last year. It may be pointed out, in connection with this decision, that the claim for compensation must be made when the income-tax return is sent in.

### Investment of Renewal Funds.

Though specially applicable to the Worthing Gas Company, the judgment given last week by Mr. Justice Swinfen Eady, as reported elsewhere, in an action brought against them by a shareholder to obtain a declaration as to the investment of the renewal fund formed under their Act of 1907, is of interest to

other companies. The Company had, in three succeeding half years, set aside certain amounts to form the fund; and by so doing had complied with the Act. But, instead of investing the money, they had used it for extensions; considering this was preferable, in the condition of their capital account, to borrowing money or issuing further capital for the purpose, paying high interest upon it, and investing their fund at a low return. Mr. William Cash, one of the Directors, clearly explained the position to his Lordship, who quite appreciated witness's points and the good intentions of the Board in the course they took. But there were the express words of the Act. He thought the plaintiff was justified in bringing the action; and he made the declaration asked for, but worded it so that the invested fund can be drawn upon when wanted for the purposes contemplated in the section sanctioning its formation.

### London Port Dues and Coal.

It will be remembered that, in the editorial reference to this matter last week, it was stated that, on the representation of the London and other gas companies, and interests concerned in coal in other ways, Lord St. Aldwyn (who has been inquiring, on behalf of the Board of Trade, into the schedule of rates provisionally proposed by the Port of London Authority) had concluded that 6d. per ton maximum was too high. He also laid down the principle that, in respect of such a necessary as coal, the maximum rate and the actual should have a fairly close correspondence. The Port of London Authority has apparently taken the hint of his Lordship; and, as will be seen from a report in another part of this issue, they have come to terms with the objectors—the Gas Companies reserving the right to raise the matter again should the Board of Trade make any ultimate alteration in the rates to their prejudice. It is understood that the maximum for coastwise and oversea coal that will appear in Lord St. Aldwyn's report will be 2d. per ton; and coke will be treated *pari passu* with coal. That is more reasonable.

### The Burden of Compensation.

The scope of workmen's compensation has so continually been widened, that employers may possibly by this time have attained a frame of mind which will enable them to regard with fortitude the latest decision of the House of Lords, upholding judgments of the Courts below, though only by a majority of three to two. The question to be decided was an eminently straightforward one—namely, whether a man, suffering from an aneurism in so advanced a state of disease that it might have burst at any time, who was tightening a nut with a spanner when the strain (quite a usual one in the ordinary course of his work) ruptured the aneurism and so led to his death, died from an accident, so as to entitle his representatives to compensation under the Act of 1906. The Lord Chancellor, in agreeing that he did so die, remarked that an accident had been defined by the House of Lords as “an unlooked-for mishap or an untoward event which is not expected or designed.” Next, the accident must be one “arising out of” the employment. There must be some relation of cause and effect between the employment and the accident, as well as between the accident and the injury. He thought some of the difficulties in applying the Act were due to this. It, however, seemed to him sufficient if it appeared that the employment was one of the contributing causes without which the accident which actually occurred would not have happened, and if the accident was one of the contributing causes without which the injury that actually followed would not have followed. The breaking of the aneurism was certainly an “untoward event.” It was not designed; and it was unexpected, in the sense that a man who knew the nature of the work would not have expected it. The crucial point was whether the accident was one “arising out of” the employment; and, on this head, he was of opinion that an accident “arose out of” the employment when the required exertion producing the accident was too great for the man undertaking the work, whatever the degree of exertion or the condition of health. It should here be noted, however, that the Lord Chancellor was careful, in connection with his judgment, to point out that it did not mean that everyone whose disease killed him while he was at work would be entitled to compensation. In each case the arbitrator ought to consider whether death came from the disease alone or from the disease and employment taken together. He confessed that in the present instance, if he had



been the arbitrator, he might have come to a different conclusion on the facts; but as it was, he was, of course, bound by the finding, if there was evidence to support it. Lord Shaw, who dissented, thought it was impossible to attribute the man's death to injury by accident; and if it were so attributed, it would involve a liability which was not imposed either by the language or in the intention of the Statute. His concluding words show—what has often been pointed out before—how liable are Acts of this character to “cut both ways.” He said that, if such a case were regarded as an accident, “a new peril will have been introduced into the lives of many workers who, notwithstanding debility and chronic disease, are most anxious and willing to devote their remaining powers to earning an independent livelihood. Should such persons be held to carry with them into employment the serious additional liability alluded to, employment may become for such persons (often the most needy and deserving of the population) more difficult to obtain.”

### The Explosion at the Geneva Gas-Works.

The additional particulars which, by the courtesy of M. Des Gouttes, the Gas Engineer to the Municipality of Geneva, we are able to give to-day in regard to the lamentable explosion which occurred in the gas-works of the city on the 23rd of August last, furnish probably all the information we are now likely to get as to the cause of the accident. There are two features of special interest in connection with the account which appears elsewhere—viz., the discovery of what may be called the primary cause of the explosion, and the plan and sections sent by M. Des Gouttes of the building in which it occurred and the portion of the plant concerned in it. The circumstances which led to the catastrophe may be explained in a few words. A portion of a new 32-inch main had been laid under the station-meter house, and a governor of similar dimensions was fixed in connection with it; the new main being joined near its two ends (both plugged) to an existing 20-inch main. The new governor was put under test at the close of the week preceding the accident; and everything was satisfactory. The following Monday the plug was removed from the town end of the main, and when this was done the presence of gas was detected by the two men engaged on the work. But it appears they were told by the foreman that it was only the gas left in the pipes after the tests the previous week. “What occurred after this,” to quote the words of our account, “nobody knows for certain, because all the witnesses of the accident, and probably those who caused it, are dead.” Its effects, however, are only too apparent from the views we now give and those which have already appeared in the “JOURNAL.”

### Its Cause and its Lesson.

We now come to the cause of the accident, which was discovered when the wreckage produced by the explosion had been cleared away. The valve on a connection between the new main and the old one (which was in use) was found fully open, though it was supposed to have been left safely closed on the conclusion of the tests. How it came to be open nobody knows, and never will know. This is certain: A key was necessary to move it, and 62 turns were required to bring it into the condition in which it was found. It can only be surmised that one of the two workmen must have gone to the valve, and, under the impression that he was gradually closing it, released it from its condition of security, and with every turn of the key enabled it to liberate a greater quantity of gas to form with the atmosphere an explosive mixture potent for mischief. It is needless to speculate as to how this mixture became ignited; the speculation should be rather as to how its production could be brought about by the action of a possibly absent-minded workman. Surely there must have been some indication, by means of arrows, of the direction in which the lever operating the valve should be turned for opening or closing it. If so, then the act must have been performed in a condition of mental aberration similar to that which prompts a railway signalman to pull a wrong switch and send a train to its destruction. In the case of the great explosion near Tottenham Court Road thirty years ago, which caused the deaths of two men, though the verdict of the Jury at the inquest was that the accident was due to a defect in the valve at the junction of two mains, the Coroner questioned whether the evidence went so far as to justify it; for he pointed out that the valve might have been opened by misadventure. In the absence of evidence of wilful-

ness or ill-feeling—for there does not appear to have been any labour trouble on the works at the time—this must be the conclusion in the present case. But if such feeling did exist, or even if there was any negligence on the part of those whose duty it was to keep a watchful eye over the workmen, a heavy penalty has been paid for it. While this terrible disaster naturally evokes the sympathy of all gas engineers and managers with the Geneva Municipality, their chief gas official, and all who have suffered, personally or pecuniarily, in consequence of it, it at the same time serves to impress upon them more forcibly the necessity for the exercise of the utmost vigilance to prevent the occurrence of an accident even remotely similar in the works which are under their own supervision.

### Trading in Coalite.

The British Coalite Company have not many carbonizing centres yet; and those that they have are not of any great magnitude, having regard to the fact that the Company aspire to become universal fuel providers. The plant at the Hythe Gas-Works is probably the smallest one; but apparently the Company cannot dispose of the whole of the coalite produced in the large area close at home, including Folkestone. They have opened a store at Canterbury, to which local orders have to be addressed, while it is requested that all other inquiries be sent to the Coalite Company at the Hythe Gas-Works. In advertising this fresh effort to secure extended business for coalite, the British Coalite Company quote “14s. for ten large sacks,” with “6d. discount for cash on delivery;” and it is added “this quantity is equal *in bulk* to one ton of coal.” That is a disingenuous way of putting the matter to the general public. The public usually recognizes a sack of coal as containing 2 cwt.; and as ten large sacks are quoted here, and is stated to be equal “in bulk” to a ton of coal, the public may be easily misled into thinking that a ton of fuel is to be obtained for 14s. There is no guarantee as to what these ten large sacks contain; nor whether one sack may be depended upon to be equal to another. But this we do know, that 1 ton of coalite occupies as much space as 2 tons of coal; so that we arrive at the fact that a ton of coalite costs at the present time 28s., less 1s. discount for cash on delivery. This is rather a steep price for fuel from which gas and other combustible material has been removed; and which, according to an article in the “Chemical Trade Journal” a few months ago, results in coalite being (so it is said) useless for ordinary kitchen ranges, as there is no flame to pass round the oven. A further effect of this is that food is asserted to become tough through the longer time required in baking. From the domestic point of view, an additional drawback is that 1 ton of coalite requires for storage the same space as 2 tons of coal, which limits by one-half the fuel a householder can stock prior to winter.

### The Serious Work of the Juniors.

Again this week, a considerable portion of our space is occupied with the chronicling of the doings of the Junior Gas Associations. In fact, during the winter months generally these organizations have become a prolific source of “copy” for the pages of the “JOURNAL”—too prolific at times, it must be confessed, to be altogether convenient. But inconvenience, when it has arisen, has been borne with, in the belief that the Junior Associations are doing a good work, in which it is to the interest of the industry at large that they should be in every way encouraged. This remark, of course, applies to the movement in the abstract. Taking the meetings individually, it is found that many of the papers and discussions are quite in the front rank; and the profession as a whole is a gainer by their publication. It is, however, principally the benefit in the first instance to the members themselves that we have in mind in penning this note. The frequency of the meetings of the different Associations in the winter months calls for a substantial sacrifice of leisure time on the part of some of the members, and of working time on the part of many others. Their leisure is cheerfully devoted to the cause by those of whom it is demanded; and it is a gratifying, as well as highly significant, feature of the movement that, where necessary, leave of absence is so freely granted by their chiefs during working hours, to enable assistants to attend the meetings and visits to works—a fact which is appreciated the more, when it is remembered that the absence of an assistant may possibly mean that his chief has to remain at the works when otherwise he would be off duty. Occasionally, some managers—possibly through not



having time to carefully study the published reports in the "JOURNAL" of the meetings of the juniors—may have felt inclined to ask themselves whether it was worth while to afford so many facilities to their assistants to attend the meetings. That is to say, whether the members were likely thereby to become more efficient servants to the undertakings they serve. If there are any still desiring to be assured on this point, we would suggest a visit to a meeting or works inspection of one of the organizations. It would then be seen that the members take their Association work really seriously. Whether it be at the reading of a paper or a visit to a works, one cannot but be impressed by the wide desire displayed to obtain information. On a recent occasion, an assistant from Croydon stated that when he was leaving for a meeting, Mr. J. W. Helps said to him: "Mind you learn something." These words sum up the situation perfectly. The Junior Association forms an excellent medium for acquiring useful knowledge; and the members are bent on taking the fullest possible advantage of it. This expression of opinion, to take a particular instance, will, we feel sure, be fully acquiesced in by the number of seniors of the profession who were present on Friday night last when Dr. Harold G. Colman delivered the first of two lectures to the members of the London and Southern District Junior Gas Association—as well as by the many engineers who have at different times kindly invited the members to inspect their works. So long as the Junior Associations continue on present lines, they will not lack the support of those who are in a position to assist them.

### More Strike Fears in South Wales.

After a further period of uncertainty, the news was received yesterday morning of the failure of the Coal Conciliation Board for South Wales to arrive at a satisfactory arrangement with regard to the matters that have now been so long outstanding between masters and men. Negotiations between the representatives of the parties have been broken off; and the country is faced with the danger of a stoppage of production in this important coalfield on the termination of the agreement at the end of this month. The state of affairs thus set forth is one that has been met with before—and at the last moment wiser counsels have prevailed. This reflection will probably induce most people to confidently look forward to a similarly happy issue out of the present trouble. But it is impossible to overlook the fact that this continual straining at the bond of "conciliation" is a risky operation, which may be indulged in once too often. The owners, it seems, are adopting a determined attitude, the basis of which is that they must have relief for the increased cost of coal production imposed upon the industry by the operation of the Mines Eight-Hours Act—that measure of which everyone is by this time heartily sick. According to the Labour Correspondent of the "Financial Times," the owners put this increased cost down at no less than 1s. 7d. per ton—a figure which goes far to justify the opinions expressed, long before the measure became law, by many of those well qualified to judge. Of course, there are a number of questions at issue; but these it is unnecessary to go more closely into now, as they all bear more or less directly on the increased cost of getting coal under the new conditions. The situation briefly is that no arrangements have been made for any further meeting of the Conciliation Board, but that the owners have expressed their willingness to meet the workmen's representatives, if the latter have any further proposals to make.

Experiments have recently been made at the Bureau of Standards at Washington to determine the proper source of light to combine with the mercury arc to produce the best imitation of average daylight; and the results were embodied in a paper by Mr. H. E. Ives in the number of the Bulletin for November last. According to an abstract in "Nature," the ordinary lights, the Welsbach mantle, the carbon, the tungsten, and the tantalum filament glow lamps are nearly complementary in colour to the mercury lamp, and have, therefore, only to be combined with the latter in suitable proportions to produce satisfactory imitations of daylight. The best proportions are 1-candle power of mercury light to 0.57 of Welsbach light, 0.54 of tungsten, or 0.50 of carbon glow light. The watts per candle power required are 0.8 for the tungsten and 1.4 for the carbon filament combinations respectively. Though the Welsbach mantle cannot be compared in this way, the author finds from the cost of running that the Welsbach-mercury combination compares closely with the tungsten-mercury one in efficiency.

## OBITUARY.

### SIR FREDERICK THORPE MAPPIN, BART.

WE regret to record the death last Saturday, at his residence, Thornbury, Sheffield, within about two months of completing his eighty-ninth year, of Sir Frederick Thorpe Mappin, whose name is well known to our readers from the position he so long held as Chairman of the Sheffield United Gas Company. He had been in failing health for some time; but a few weeks ago a slight operation was found to be necessary for throat trouble, and to this he succumbed.

Sir Frederick Mappin was the eldest son of the late Mr. Joseph Mappin, a well-known manufacturer of cutlery in his day; and at the early age of fourteen he left school in order to assist in his father's business. Six years later the death of his parent threw upon him—a young man of twenty—the entire responsibility for the management of the concern. He subsequently took his younger brothers into partnership; but in 1859 he left the business to become senior partner in the still existing firm of Messrs. Thomas Turton and Sons, steel manufacturers, of the Sheaf Works, Sheffield. He entered the Town Council in 1854; and was elected Master Cutler the following year. He filled the office of Mayor in 1877-8, and shortly afterwards his municipal career closed. At the General Election in 1880, he was chosen, with Mr. F. J. S. Foljambe, to represent the borough of East Retford. After the Redistribution Act, in 1885, he stood for the Hallamshire Division, and represented this constituency until his retirement from public life in 1905. In 1886, a baronetcy was conferred upon him—an honour which was on all sides considered to be well deserved as a fitting recognition of the important part he had taken in political affairs, and especially in the municipal and commercial life of his native town.

His connection with the Sheffield Gas Company was of long standing. He must have had a keen recollection—there are but few left who possess it—of the troubles arising from the Flintoff-Croll agitation in 1854, when "twenty thousand Sheffield men" publicly expressed their determination to put an end to what was stigmatized as the gas "monopoly," or "know the reason why." The competition between the Sheffield Consumers' and the Sheffield United Gas Companies ended, as in many other cases of the kind, in the amalgamation of the two bodies. The result was that Sheffield was burdened with an additional £50,000 of dividend-bearing gas capital, and the consumers had to pay 4s. per 1000 cubic feet for their gas, instead of 3s. as promised by the promoters of the new Company. The joint concern then entered smoother waters, and after about eight years—viz., in 1862—Sir Frederick (then Mr.) Mappin was elected a Director, and gave the Company the benefit of his wide business experience. In 1873, he was elected Chairman, in succession to Mr. Lockwood, and occupied this position without interruption, with honour to himself and prosperity to the Company, till his retirement, on account of failing health, on Aug. 31, 1908, when he was followed by his second son, Mr. Wilson Mappin. He, however, retained his seat on the Board, and continued to take an interest in the affairs of the Company with the progress of which his life had been so closely identified. He had had the gratification of seeing the price of gas so reduced—in spite of so-called "monopoly"—as to become conspicuous among the lowest in the United Kingdom; and it was by a sad coincidence the last half-yearly meeting of the Company, at which full dividends were declared, and the severance by death of his connection with it, should have taken place within one week, and call for notice in the same issue of the "JOURNAL," to the columns of which the deceased had often expressed himself indebted for information on the current affairs of the gas industry.

Sympathetic references were made at the Police Court on Saturday, and at various places of worship next day, to Sir Frederick's death, and high tributes were paid to his noble character. Preaching at St. Silas Church, the Bishop of Sheffield told the congregation that if they looked through Sir Frederick's work they found that he was "not content with materialism or imperialism or any other 'ism'; but everything philanthropic or educational or religious that affected the upward welfare of the body, mind, or spirit of the people of Sheffield had his generous and sympathetic support."

The deceased baronet married in 1846, and on Sept. 25, 1906, the sixtieth anniversary of the wedding was celebrated very quietly at Thornbury. Lady Mappin died about two years ago. He leaves three sons—Mr. Frank Mappin and Mr. Wilson Mappin, who are associated in the management of the Sheaf Works; and Mr. Samuel Mappin, who devotes himself to agriculture. The first-named gentleman succeeds to the baronetcy. The interment takes place to-morrow (Wednesday) in Eccleshall Churchyard.

Mr. H. JAMES YATES (Messrs. John Wright and Co.) has been elected a Member of the Institution of Mechanical Engineers.

Mr. WALTER C. SCOTT, Gas Manager at Bonnybridge, has been appointed Manager of the Markinch Gas Company, and takes up duty there on the 1st of May.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 835.)

LAST week on the Stock Exchange achieved some distinction. A long nineteen-day account was concluded; and all are agreed that it was about the heaviest known. As yet, no casualties are reported. However, the onerous burden of the settlement could not extinguish the ardour of the speculative markets, and business there was at high pressure. The opening on Monday was cheerful mostly, though Consols were weak. Railways were active and full of rise; the Foreign Market was firm; and the fashionable speculatives went well. On Tuesday, the general characteristics were much the same; but Americans were uneasy on strike alarms. Wednesday was perhaps even better pretty well all round, except in Americans, and business was quite active. A change came on Thursday; and the rise was stopped by the inevitable move to realize which follows upon a sharp advance. But gilt-edged were better, and Consols had a small rise in spite of dearer money. American, too, cheered up a bit. The selling to secure profits continued on Friday, and prices shrank up to a period; but later in the day there was a sharp rally in all the popular speculative lines. This movement continued on Saturday; while Consols were firm and unchanged, and Railways stronger. In the Money Market, there was a good demand for short loans, and rates profited accordingly. Discount terms were irregular. On Thursday, the Bank rate was raised to 4 per cent., from the 3 per cent. rate fixed five weeks previously. Business in the Gas Market was scarcely as abundant as in the preceding week, owing in some measure to a lull in the activity of the Argentine Companies, which was not fully compensated by an increase in the activity of the Continental undertakings. Several quotations advanced, and the tendency generally was favourable. Additional evidence of the popularity of gas investments may be found in recent sales at the Mart. In Gaslight and Coke issues, the ordinary was well dealt in every day; but prices were rather easier. The opening figures were 104½; and these were not exceeded during the rest of the week, while on Friday one bargain was marked at 103. In the secured issues, the maximum changed hands at 88½, the preference at 104 and 105, and the debenture at from 80 special to 82. South Metropolitan was quiet and very steady—all transactions being within the limits of 121 and 122, as the week before. The debenture marked 82 and 82½—a fall of 1. Nothing at all was done in Commercial; there being apparently no stock in the market. Among the Suburban and Provincial group, Alliance and Dublin was done at 87½, Bournemouth "B" at 16½, Brentford old at from 251 to 252½, Brighton original at 214 *ex div.*, Ilford "A" at 147 *cum div.*, and on the local Exchange Liverpool "B" at 164½. The Continental companies were active and strong. Imperial was marked at from 176½ to 178½ (a rise of 1), ditto debenture also rose 1, Union made from 97½ to 98½, European fully-paid from 24½ to 24¾, and ditto part-paid 18¾. Among the undertakings of the remoter world, Bombay part-paid changed hands at 4½, Monte Video at 13 and 13½, Primitiva at 7½ and 7½½, ditto preference at from 5½ to 5½, ditto debenture at 99½, River Plate at 17½, and San Paulo at 16.

## ELECTRICITY SUPPLY MEMORANDA.

**An Official Explanation of Rules and Regulations—Unremunerative Free-Wiring Scheme—A Contracting Firm's Assisted-Wiring Project—A Queer Deadlock.**

THE great safety of electricity supply—a safety recognized only in electrical literature, and not privately by its authors—calls, as our readers are aware, for rules and regulations by the hundred. But, except under the Factory and Workshops Acts, there does not appear to be any supervising authority to see that the rules and regulations are obeyed. The Institution of Electrical Engineers, the Fire Offices, the Board of Trade, and the Home Office have all framed regulations for the protection of the public and property; but electricity itself, human indifference, and competitive finesse override them all. Under the circumstances, the making of the regulations has its serious and its humorous sides. It will be remembered that in 1908, the Home Office, in pursuance of the powers conferred by the Factory Acts, composed certain regulations for the generation, transformation, distribution, and use of electrical energy in premises under the Factory Acts. The regulations incensed the electrical industry from top to bottom; and the Home Office thereupon appointed a Commissioner (Mr. James Swinburne) to inquire into the objections, with the result that there was some revision. Even then there was not happiness. It transpires that few people, after all that has been done, understand the regulations; and the Home Office has been inundated with inquiries for explanations. So great has the trouble been, that the Chief Electrical Inspector of Factories (Mr. G. Scott Ram) was instructed to prepare a memorandum explaining the effect of the regulations, and the exemptions allowed; and he has faithfully performed his task. Thirty-two regulations have required fifty-three closely printed octavo pages to explain them. This may not be the end; for in a prefatory note, the reader is asked to understand "that the Secretary of State has no power to give an authoritative interpretation of the

regulations—that is for a Court of Law—and the memorandum is, of course, subject to revision as experience accumulates or fresh discoveries are made." Already there is a call from electricians for an explanation of the explanations. This being so, and as we have not space for a complete review of the memorandum, gas engineers and managers of gas engineering shops who have electrical installations on their works should obtain a copy (it only costs a few pence), and mentally exercise themselves in trying to find a happy issue out of the explanatory labyrinth.

If not altogether successful in this, we promise them they will find instruction on many points in the production. Under section 79 of the Factory and Workshop Act, 1901, the generation, transformation, distribution, and use of electricity have, in factories and workshops, been certified as dangerous; but, until this memorandum has been studied, electricians themselves have to confess that they do not know how dangerous electricity really is. Let us take an illustration or two. Transformers are common things where low-voltage metallic filament lamps are employed. We read:

Auto-transformers are very frequently used to reduce the supply voltage for use with metallic filament lamps. Thus, the supply to any premises may be at 250 volts. This is taken to an auto-transformer, from which a circuit is taken having, for example, only 50 volts between the conductors; and this is used throughout the installation. The question is whether this 50-volt installation may be regarded as under the exemption. In this class of transformer, the lower pressure circuit does not form a separate system. It is quite possible that the 50-volt circuit may be at 250 volts above earth; and therefore just as dangerous as regards shock as if there were no transformer.

Of course, if the 250-volt supply system has one conductor permanently connected to earth, it is possible so to arrange the 50-volt circuit that the maximum pressure above earth shall not exceed 50-volts. Again, if we want an illustration of the refined care and precautions necessary in wiring, we have it here:

Where metallic tubing or casing is used, it must be efficiently earthed. In an installation where the wires are protected throughout by substantial metallic tubing, the earthing can be simplified by making the separate lengths of tubing electrically continuous; so that actual connection with earth at one or two points only may be sufficient. But if so, the joints between the lengths of tubing must be mechanically strong—e.g., screwed together—as otherwise electrical continuity may after a time be destroyed. The mere sliding of the end of one tube into a socket of another is not sufficient. In whatever manner the joints are made, it is essential that the surface of contact should be of clean metal, free from any paint, red lead, enamel, dirt, or other substance which might impair the electrical continuity. Unless joints are sound, efficient earthing can only be accomplished if the separate lengths of tubing are otherwise specially bonded, or if a connection from an earth wire is made to every separate length of tubing—methods which would probably lead to greater expense and trouble. If the continuity of the metal tubing is anywhere interrupted, care must be taken to bond all the tubes electrically across the break. Thus, where wooden distribution cabinets are used, all the metal tubes leading to and from the cabinets must be electrically bonded together. The use of thin metal tubing and imperfect joints has proved a fruitful source of danger from fires; and too much stress cannot be placed upon the necessity for using tubing of adequate thickness with sound joints. In installations covering a large area, where the tubing may be of considerable length, even if it be of adequate thickness to afford sound mechanical protection, it may be of too high a resistance to act as an efficient earth connection, and may have to be supplemented in this respect by an earth cable connected at different points. If parts only of the wiring are in metal tubing, it is equally necessary that every such part shall be properly earthed.

Switches, conductors, motors, portable lamps, and a hundred and one other things are dealt with. And so we go on. Loop-holes for danger are pointed out on every page of the memorandum; and one leaves its perusal fully persuaded that it is a life's work to become master of all the precautions necessary to safeguard life, limb, and property where electricity is concerned. If one could only see, smell, or hear electricity, it would be something towards ensuring protection. Though valuable and a friend in many respects, electricity is a terribly insidious enemy.

Many local authorities have been seriously bitten by free-wiring. But still there seems a perennial fascination about the idea for municipal dabblers in the administration of electricity undertakings; and the accumulation of experience does not appear to act as a deterrent. So the game goes on merrily, until one after another the municipal adventurers fall out of the ranks of the free-wirers with a large load of unremunerative capital at their backs. The District Council of Beckenham once upon a time approved of a free-wiring scheme. It was going to do wonders for the electricity undertaking; and they set to work with a right good will, which was carried to a point of whole-hearted prodigality by the generous feelings entertained for the electricity concern. The result has been disastrous. From a statement prepared by the Clerk to the Council, the expenditure has amounted to 23s. 3d. per free-wired lamp installed; and the Council have no less than £22,613 locked up this way. Rentals last year amounted to only £935, which showed a deficit, after meeting interest and sinking fund charges, of £1708, or (roughly) no less than 17d. per unit sold to the consumers on this system. The private consumer pays 5d. per unit; so that if the rental loss is deducted from 5d., it follows that the free-wirer has only been paying 33d. per unit. It is the old tale in connection with electricity supply. All these departures from commonsense business method do damage to someone—and it is generally the poor ordinary lighting consumer. Something has to be done to alter the



position in which Beckenham finds itself in this matter; and having in view the foregoing figures, one is disposed to agree without reserve with Mr. A. H. Dykes, the retiring Chairman of the Electricity Committee, that unless the free-wired consumer is prepared to guarantee at least the actual amount that he costs the station, the Council are not justified in spending public money in wiring his house.

The electrical industry likes to nurse the fallacy that it is the question of wiring that stands in the way of rapid headway being made in connecting-up new consumers. Hence free-wiring and assisted-wiring schemes. That the contention is a fallacy is evidenced by the fact that free-wiring and such-like schemes have so often been a failure, and have been ineffective in creating a lucrative business for the electrical concerns that have tried them. Assisted wiring has just been exercising the Brighton Town Council. It comes as a shock to learn that anybody who lives at Brighton, and thinks he or she can afford electric lighting, should require any assistance in making an installation. But it was not the Council who were proposing to run any risks in this assisted-wiring business; but a firm of would-be public benefactors, Messrs. Page and Miles. What they were suggesting to the Corporation was that wiring and fittings should be, in the first instance, provided free by the firm; the expense to be recouped by an extra charge of 1d. per unit on the consumers' current (prepayment meters being used); and the additional 1d. per unit handed over by the Corporation to the firm. When the consumption reached an average of 240 units per point installed, the whole installation was to become the property of the consumer. So that, supposing the consumer had twenty 16-candle points, when his meter showed a registration of 4800 units (the additional 1d. by that time having amounted to £20), the installation would become the consumer's property. It seems to us that some of the consumers would have to start fairly young on this job if they desired to realize the enjoyment of ownership in the installation. But stay, it is just possible that, before that happy time arrived, the "property" would stand in need of renewal; and the expectant property owner would have to bear the expense of this. The Electricity Committee were in favour of Messrs. Page and Miles' proposal. The other electrical contractors in the borough were opposed to it; and some people are rude enough to say that the Gas Company were exercising beneath the surface some amount of influence. However that may be, the fact remains that the Council bundled the stupid proposition out by 21 votes to 10. There is no likelihood of the Council attempting to enter upon the work themselves; for has not Brighton been surfeited with the indigestible fruits of municipal trading?

A "Borough Electrical Engineer" is in sad trouble. Peradventure if we explain its nature, one at least of our readers will be able to put a name to the electrical engineer and the undertaking to which he refers, and perhaps be able to place a different complexion on the matter. Our friend has been airing his grievance in the "Electrical Review," and he asks the editor to express his opinion, and other engineers similarly situated theirs. The editor does not comply; and the "Borough Electrical Engineer" leads us to suppose that he does not expect many opinions from other quarters, as he is good enough to say in his concluding paragraph "that there cannot, of course, be many instances of the sort." The grievance is this: The Borough Gas and Electricity Departments are under the control of one Committee. The gas-mains are alleged to be in such a deplorably bad condition that "a large quantity" of gas is allowed to continuously escape. The electrical conduits and box chambers are also apparently in extremely bad case, as they allow the gas to have free access to them. There have been explosions; and there has been a conduit fire. Reports have been frequently made to the Committee, letters have been often written to the Gas Department, the electricity system reeks. But the Gas Department goes on its way sinning, and takes no heed of the complaints. The Electricity Department suggests to the Committee that the Gas Department should lay new mains; the counter proposal is that the former should ventilate their conduits and boxes. The Electricity Department is prepared to do so if the Gas Department is willing to share the cost. But the former says nothing about bearing a proportion of the expense of laying new gas-mains. There is a deadlock, as the Committee will not consent to the Gas Department bearing any share of the cost of ventilating the electrical system. Now what is this "Borough Electrical Engineer" to do? The Board of Trade regulations state that, if gas is found in any of the chambers or conduits, notice shall be immediately given to the gas undertaking. But plaintively asks the correspondent, "What is to be done if, after such notice is given, the gas undertaking pays no attention to it? Is the Board of Trade to be notified?" Can any of our readers make a suggestion that will give this unhappy mortal relief? Perhaps if his Committee find out that he has been in communication with the Press, he will be relieved of all further care and sorrow so far as his present appointment is concerned.

**Glover-West Retorts for Rochdale.**—It will be seen, from a report which appears elsewhere, that the Gas Committee of the Rochdale Corporation have decided to put up an installation of Glover-West vertical retorts in connection with the gas-works extension scheme to be carried out under the supervision of Mr. T. Banbury Ball, the Engineer.

## THE WILLIAM YOUNG MEMORIAL.

WE learn from a circular issued by Mr. Alexander Bell, of Peebles, the Hon. Secretary and Treasurer to the William Young Memorial Committee, that the Committee have carefully considered various proposals in connection with the memorial, and have unanimously agreed that it should take the form of a lectureship. For this purpose a capital sum of £600 is required. The amount will be settled on Trustees under a trust deed defining the purpose for which it has been raised, and thereby securing that the proceeds will be applied to this purpose only. The fund will be known as "The William Young Memorial Lectureship Fund." It will be invested, and the income devoted to providing a biennial lecture, to be delivered at a general meeting of the North British Association of Gas Managers, who initiated the project. It will be known as "The William Young Memorial Lecture," and will deal with the chemistry, the manufacture, the distribution, and the application of gas.

In asking support to this scheme, the Committee point out that, while the primary object is to provide a lasting memorial to Mr. Young, the project has also a practical aspect, which is of great importance to the Association. From the former point of view, the lecture, recurring every second year, will certainly serve to perpetuate the memory of Mr. Young, who, as a distinguished member of the Association, contributed so much to the success of its meetings, and to the advancement of the gas industry, by his frequent papers and communications. Indeed, the Committee consider no better memorial could be devised than this, which in a sense continues the good work which, for a lifetime, Mr. Young did in and for the Association. As regards the practical aspect, the lectures will be delivered by eminent men, and will deal with the latest developments in each department. It will therefore be seen of what great importance these lectures will be to the members, and how much they will enhance the already valuable proceedings of the Association. This especially, in the opinion of the Committee, should secure for the scheme a generous response. Contributions have been promised to the amount of £228 9s.; and it is hoped the rest will be promptly subscribed.

With the view of enlisting the co-operation of those who control the financial department of gas undertakings, such as directors and gas commissioners, in the scheme, a letter addressed specially to them, embodying the foregoing particulars, accompanies the circular; and emphasis is laid therein on the great benefits which will accrue to managers who are members of the Association, and through them to the company or the gas department they serve, by the delivery of these lectures. The Committee therefore express the hope that their appeal may result in some handsome contributions to the fund.

## NOTES FROM WESTMINSTER.

IN a quiet manner, the Upper and the Lower Houses showed last week an interest in Private Bill Legislation, by each having a Select Committee at work, and both with gas measures in the groups allotted to them. The Commons Committee, over which Mr. Arthur Stanley presided, had before them the Brighton Gas Bill in connection with which quite a big fight was made. The Committee have still the East Grinstead Gas and Water Bill, the two Mallow gas measures, and the Tipperary Gas Bill to consider; but we doubt whether they will get much further with their work this side of Easter, in view of the fact that they did not sit yesterday and Parliament rises for a brief recess to-morrow. The Lords Committee disposed of three gas measures, as will be seen by the accompanying notes; and in regard to the other three Bills in their list—Southend Water, Thorne and District Water, and Wicklow Gas—opposition has been withdrawn. The Whitland Water and Gas Bill has now been dropped. The Standard Burner Bills have been referred to a Committee over which Lord Joicey will preside; and the Committee will hold their first sitting on Thursday, April 7. Lord Joicey has a large experience in the colliery and commercial world; and what is brought before him and his colleagues will undoubtedly be examined carefully from a practical standpoint. The Glasgow Order, in which, *inter alia*, illuminating power and the standard burner are being dealt with, is now to go forward as a Bill. In connection with Water Bills, it is noticed that instructions are again being given to Committees to inquire whether promoters have made adequate provision in their measures for the supply of water at reasonable rates to the agricultural communities within their areas of supply, and to any person or persons from whom any existing or natural supply is, or may be, withdrawn owing to the works authorized by the Bill, and, if thought proper, to impose the obligations.

**Brighton Gas Bill.** A long line of Counsel, a good body of witnesses, and numerous interested spectators were in the Committee room when the Chairman of the Commons Committee selected to consider, among others, the Brighton and Hove Gas Bill took his seat last Tuesday morning at the hour appointed, and sat there awaiting the tardy arrival of colleagues to form a quorum. After a little delay, two other members put in an appearance; and Mr. Balfour Browne, K.C., at once proceeded to address the Committee, informing them of the objects of the Brighton Bill and of the contents of the petitions



that had been presented by the opponents. The opposition were represented by the Brighton Corporation, the Hove Corporation, certain District Councils, and the East Sussex County Council. Perhaps no one was more surprised than the Gas Company at the character of the demands and case generally that had been concocted by the opposition—some of the matters being anything but pertinent to the measure, and, as a matter of fact, some of them bordered upon, if they did not pass over into, the impertinent. Matters that have been accepted by Parliament, and have been incorporated by the authorities of the two Houses in the model clauses, and in many Bills, were attacked, and new claims were placed on the table. But, after best part of a week's deliberation, what, save in the case of the out-districts in the matter of the differential price, good has all the opposition done? It is true that 1d. (and not 3d. as demanded) has been unfairly cut off the standard price; but what does that amount to? To maintain the shareholders' dividend, the Company will have to work to supply gas 1d. cheaper per 1000 cubic feet; and merely the few hundred pounds that the shareholders would have received on the next reduction (which would have been made as soon as the Directors were in a position to do so), will be denied them. At the same time, the compulsory reduction of 1d. in the price of gas will not be to the benefit of the municipal electricity undertaking. Seeing that the Gas Company were not proposing a reduction of the nominal illuminating power of the gas, but only to adopt the "Metropolitan" No. 2 burner, and seeing also the protection that the consumer has in the sliding-scale, having regard, too, to the huge investment of capital that has been made on the faith of Parliament maintaining the standard price which Parliament itself has allowed, the reduction, though only by 1d.—from 3s. 3d. to 3s. 2d.—of the standard price is quite unjustified. That, however, and the lowering of the extra price in the outer districts from 6d. to 3d., constitute the only two points where the Company were scathed, and then not deeply. The promoters' requests were all (as will be seen by turning back to our review when dealing with the Gas Bills lodged for the session) of ordinary character in modern gas legislation, except in regard to the institution of a capital redemption fund. The case for the Bill was supported by the Chairman of the Company (Mr. A. M. Paddon), Professor Vivian B. Lewes, Mr. E. L. Burton (Secretary), Mr. Joseph Cash (Engineer), Mr. H. E. Jones, and Mr. E. H. Stevenson. Mr. William Newbigging appeared for the out-districts, but chiefly in regard to the differential price. Mr. Isaac Carr and Mr. J. G. Newbigging were present to support the claim to something substantial for the consumers for the damage—fancied by the witnesses, but not felt in the experience of consumers—sustained by the adoption of the new test-burner. Dr. Haldane was also called, on a Speaker's order, to give evidence with reference to the opposition claim for restriction in the use of carburetted water gas, with a somewhat disagreeable result for those who were instrumental in bringing him to the Committee rooms.

**Calorific Power.** There is no doubt that the question of calorific power will be pressed in this and future sessions for all it is worth by those who suggest opposition cases to Gas Bills. But, on the other hand, there is no doubt that Parliament will not impose it while the illuminating power test stands. It was refused by the Lords Committee in the Farnham Bill last week; the Brighton Company's opponents withdrew their claim for a standard and test when they saw they had not a leg to stand upon, so long as the illuminating test remained. And it was clear the Committee were not in sympathy with these attempts to cast undue burdens upon, and to unnecessarily harass, private enterprise. When the opponents are asked to be fair, as they were by Mr. Balfour Browne in this Brighton case, and requested to choose between the illuminating power test and that for calorific power, they prefer to maintain the *status quo* rather than adopt something of which it is palpable they know, and really care, little, though at the same time local authorities who are electricity suppliers prefer to tie the hands of their competitors as tightly as possible, and have no prickings of conscience regarding the nature of the bonds employed. The unfairness of the dual test was shown to the Committee by Counsel and witnesses; and Mr. Joseph Cash at present does not seem to be particularly in love with the test, as, in the event of the interruption of the supply of a good quality of coal, he does not quite know how deficient calorific power is to be readily made up, as can be done in respect of illuminating power. All the technical witnesses, however, were in agreement that a calorific test would come, but only in substitution of, and not in addition to, the illuminating power test. "There is not the least doubt," says Professor Lewes, "when you have it realized how important calorific value is, that the calorific test will come in place of the illuminating power test." But he adds what is tantamount to a warning: "As a gas examiner, and knowing a good deal about the manufacturing processes of the country, I should certainly say it would be indefensible to hamper and strangle any industry by putting upon it too many tests." The opponents of the Bill placed at 3 per cent. the reduction of calorific power per candle reduction of illuminating power; but that can only apply to specific conditions. Why is it that with the 10 to 12 candle gas made in the Dessau verticals in Berlin, a net calorific power is obtained equal to London gas? But after all, the 3 per cent. reduction is the result of a laboratory test, is not great, and has no perceptible or practical significance in the use of gas under ordinary household conditions. In household use, there are not the refinements of the laboratory tests.

#### Suggested Water Gas Restriction.

As already mentioned, the opposition made a little essay to put a limit on the use of carburetted water gas by the Brighton Company; and, at the instance of the opposition, a Speaker's order was issued calling upon Dr. Haldane to give evidence on the subject. It was expected by those who were instrumental in bringing him before the Committee that, in view of his share in the famous Home Office report of 1899, Dr. Haldane would have blessed the proposal of the opponents to forge this particular additional shackle for the Brighton Company. But in the course of his cross-examination, he showed that the discretion of gas authorities and changed conditions have modified the necessity for legislation, and that, if legislation there ever should be, it should be general, and not inflicted spasmodically and in isolated cases. The matter is dealt with at greater length in our editorial columns.

#### Redemption Funds.

Reference is also made in the same editorial article to the question of capital redemption funds under exceptional circumstances. And again we need only say here that despite the Brighton Corporation submitting that the proposal was unprecedented and unjustifiable, the Committee have allowed the Company to create such a fund in order to extinguish £57,000 of capital, representing works discarded on the concentration of the manufacturing plant at Portslade. The House of Lords Committee have also passed a proposal in the Bishop's Stortford Gas Bill, by which such a fund will be permitted for reducing the capital to £400 per million cubic feet of gas sold. Here, again, there will be works that will be abandoned in favour of concentration. There is precedent for a redemption fund in the Gaslight and Coke Company's Act of 1903. The subject is further discussed in the article to which allusion has been made.

#### An Essex Amalgamation.

Work also commenced in the House of Lords Committee rooms on Tuesday morning; and, as a matter of fact, half-an-hour earlier than the time at which the Committee of the Commons assembled. The Lords Committee in which we were interested was the one of which Lord Hylton had been appointed Chairman; and they had had allotted to them a little group mostly comprising gas and water measures. The brief preliminaries having been passed through, Mr. Honoratus Lloyd, K.C., was on his feet, introducing to their Lordships' notice the Bill in which it is proposed that a number of more or less small gas undertakings in Essex are to be merged into one substantial concern. The Bishop's Stortford, the Harlow and Sawbridgeworth, and the Epping Companies are to be amalgamated; in the new concern are to be vested the Ongar, the Newport (Essex), and the Much Hadham Companies; and there is to be absorption by purchase of the Dunmow Company. The substantial concern that it is proposed by the Bill to create by the fusion of these separate and, being separate, less influential undertakings, will have a large district in which to operate; but we fail to see why the Local Government Board should have had any fear that, or rather suggest that it was a matter for consideration whether, in view of the extensive character of the district, the interests of the parishes would suffer through the gas supply being centred in one Company. Their fear is not endorsed by the Local Authorities—only one of whom (the Bishop's Stortford), out of eight or nine, offered any opposition, and that of a negligible character. It was not endorsed by the Committee; and Counsel and the witnesses called—Mr. E. L. Burton, Mr. H. E. Jones, and Mr. E. H. Stevenson—showed that there was every confidence on the part of the promoters in their ability to serve, and not jeopardize, the interests of the inhabitants of an area measuring roughly 21 miles by 15 miles. There is undoubtedly a big expanse of territory represented by these measurements; but there will be no more difficulty dealing with it than with other large areas. Mr. Honoratus Lloyd traced the financial position of the undertakings which it is intended to bring together for the supply of both gas and electricity; and he and the witnesses impressed upon their Lordships the economies that will arise in working and trading generally through one united Company, and in which economies the consumers will be, under the sliding-scale, greater beneficiaries than the shareholders. The features of the scheme as framed in the Bill were set out in our issue for Jan. 4 last (p. 23); one of the proposals being, as in the Brighton Bill, the creation of a capital redemption fund. As, however, the opposition collapsed on a simple agreement to enable the Bishop's Stortford Council to purchase the electricity undertaking at the expiration of 21 years, there is nothing more that calls for reference here, except to congratulate the promoters (who include Mr. H. E. Jones, Mr. Frank H. Jones, and Mr. E. L. Burton) on the success of the project to this point—a success that indicates a safe journey through the remaining parliamentary stages of the measure.

#### Farnham Gas and Tests.

The next Bill considered by the Committee was that of the Farnham Gas Company, in which incorporation, additional gas powers, and electricity supply authorization were sought. It seemed hardly necessary to drag the Company before a Committee with the objects the District Council had in view. The Council asked for a calorific power test, a testing-station on their own premises, and a lower standard price than that the Company were proposing on the adoption of the sliding-scale. It would be interesting to know who put the matter of a calorific power test into the heads of the Farnham District Council. Estimable gentlemen as the district councillors doubtless are, making a



cursory survey of representatives a conviction takes hold of one that before the Bill was introduced, they knew little or nothing about a test for the calorific power of gas, and they know precious little more about it now. We venture to say that, as a matter of fact, they personally do not care a fig about it. Much the same may be said in regard to the testing-station at the Council's offices. So concerned are the Council about illuminating power tests that they have made use of the present testing-station, only a few yards from their offices, merely three times in four years! It is ludicrous to waste the time of a Parliamentary Committee in this way. It was an instance in which there was great poverty of material on which to present any case for opposition. The Company propose to reduce the illuminating power standard from 15 to 14 candles, and to fix the standard price at the present maximum of 3s. 9d. Mr. E. H. Stevenson gave evidence to the effect that the reduction of 1 candle in illuminating power would represent a saving of 3d. per 1000 cubic feet. The Council, however, asked for a reduction of the proposed standard price by 5d., making it 3s. 4d.—the present price of gas. The Committee's decision, placing the standard at 3s. 6d., showed the claim of the Council to be, in their opinion, unreasonable. They rejected the request for a calorific power standard and test, and made no change other than that of standard price in the Bill. In addition to Mr. Stevenson, Mr. F. H. Jones gave evidence for the Company, while Mr. Charles Hunt appeared for the Council on the subject of the standard price.

**Gowerton Regenerate.** There is a little doubt as to the suitability of this side-heading. When once a dog has earned a bad name, it is a difficult thing for the animal to set himself right with humanity again. The Gowerton Company come from the Eaton stock; and Eaton, according to Mr. Wedderburn, K.C., has cleared out. Sir Charles Soames has also beat a more or less dignified retreat; and Counsel and Mr. Stevenson assured the Committee that the Company are now on the high road to an honourable existence, and that there is good scope for them to work in a small way *pro bono publico*. We hope for the best. The information laid before the Committee revealed the old game of the original promoters of the concern, in trying to plunder shareholders by asking fancy prices for plant and so on, getting all they can, and then leaving the concerns wrecked and over-burdened with capital. The Law Courts have produced a goodly tale of receiver appointments of late—due to Eatonsque exploits. The only opposition was from the Swansea Rural District Council, who through Mr. Freeman, K.C., stated that they preferred that the Swansea Gas Company, and not the Gowerton one, should have the right of supplying Penderry and Cockett. For this very purpose, the Swansea Company have a Provisional Order before the Board of Trade at the present time, and decision on this awaits the assertion of the preference of Lord Hylton's Committee. This has now been declared; and the Swansea Company gain the extension. But are there not certain omissions in the Gowerton Bill—such as the auction clauses—in regard to which the authorities of Parliament are generally credited with being particularly lynx-eyed? There are also Bills in which dividends are not specified. Such departure from parliamentary custom in gas measures has, of course, a tendency to raise doubts.

## HEAT INSULATION OF RETORT-SETTINGS.

SOME particulars were given in the "JOURNAL" during 1907 (Vol. XCVII., p. 543) of an insulating material, "Thermalit," which had been used by Herr J. Arnold, the Superintendent of the Gaudenzdorf Gas-Works at Vienna, to hinder the passage of heat from the faces and tops of retort-settings. The material is a preparation of "kieselguhr," of a highly porous character and having a specific gravity of only 0.3. It is fire-proof and may be exposed directly to a dry heat of 2000° Fahr. without suffering depreciation. We have satisfied ourselves that a sample of it which has been submitted is not appreciably affected by dilute acids, alkali, or high temperatures. The material is stated—according to figures of a trial which have been put before us by Corkstone Company, of Arlington Street, Islington, the vendors of it in Great Britain—to insulate a steam pipe 7 inches in diameter so efficiently that there is a drop in temperature from 434° to 423° Fahr., or only 11° in the superheated steam in a length of 62 feet. This corresponds to a total loss of heat of 2.6 per cent. per 100 square feet of surface. The pipe was covered flush with the flanges with 2 in. of "Thermalit." The material is made up in sectional moulds 2 in. thick for any sized pipes, and in slabs and bricks of the standard size of 10 in. by 5 in. and either 2 in. or 2½ in. thick. In addition to its use for superheated steam plant, it has been applied, as already stated, to the insulation of the faces, back walls, and crowns of Austrian retort-settings with apparently satisfactory results, though we are not aware that Herr Arnold of Vienna has yet fulfilled his promise to report the saving in fuel in retort-settings fitted with it. A later use of "Thermalit" is for the insulation of coke-ovens built in the open; the object of the insulation being not merely to conserve the heat of the oven, but also to protect the outer brickwork from the injurious action which occurs when it is exposed at a high temperature to atmospheric cooling influences. The material is made in Austria by the works which manufacture the "corkstone" insulating materials for which the firm already mentioned are likewise agents in this country.

## THE NATIONAL PHYSICAL LABORATORY WORK.

THE Royal Society issued invitations for the customary annual reception, which was held last Friday, at the National Physical Laboratory; and a large number of guests availed themselves of the opportunity of inspecting the new buildings and new equipment of the institution. The coincidence of the function with the annual meeting in London of the Institution of Naval Architects, was a happy arrangement, since those attending that meeting were enabled without difficulty to see the national experimental tank which has been constructed at Bushey and is now being equipped. The provision of this tank is due to the generosity of Mr. A. F. Yarrow, who gave £20,000 for the purpose. A fund sufficient for its maintenance for a period of ten years has been raised by the Institution of Naval Architects, who have the nomination of the Advisory Committee under whose direction the work and the investigations carried out in the tank will be conducted.

Passing from this matter—which was the topic of most of the conversation of visitors at Bushey House on Friday afternoon—to points of more special interest to "JOURNAL" readers, we may say that a great deal of valuable research work appears to be in progress in the Photometry Section, under the supervision of Mr. C. C. Paterson, Assoc.M.Inst.C.E., towards the establishment of sets of electric sub-standards of light. The standards which are now under trial consist of tungsten filament large bulb lamps. Working at about 3.5 watts per candle, comparisons can readily be made between these lamps and the Harcourt 10-candle pentane standard. When the electric lamps come to be burnt at a higher efficiency, the colour begins to approach to that of the metallic filament lamps used by ordinary consumers; and at the present time metallic filament lamps sent to the laboratory for examination are compared with tungsten sub-standards working at two watts per candle. The colour difference in this case is stated not to be serious, though it prevents the certification of the lamps to as high a degree of accuracy as would otherwise be possible. So far, lamps operating at 1.5 watts per candle, which would admit of better comparisons being made, have been found to be subject on life test to small fluctuations (for which there is no satisfactory explanation) in candle power, and hence they are not yet available as sub-standards. This branch of work is of great importance, as suitable standards are urgently needed for testing the performances of metallic filament lamps, and accurate comparisons are difficult, if not out of the question, between these lamps and existing standards, owing to their great differences of colour. The task of establishing satisfactory sub-standards has, however, proved very arduous, and Mr. Paterson is to be congratulated on having already made such good progress. We refer to this point at some length, in view of Professor Fleming's disparaging remarks on this branch of the work of the laboratory reported in another column of to-day's "JOURNAL."

The unit to which all sub-standards are referred is the candle represented by a tenth of the light afforded in normal conditions by the Harcourt 10-candle pentane lamp introduced by the Gas Referees in 1898, and of which the National Physical Laboratory has at least one example certified as correct by that body. The continuity of the standard candle used in gas testing is thus ensured; and its general application in place of the Hefner for the rating of electric lamps can now only be a matter of a few years so far as this country is concerned. While the Harcourt lamp itself will doubtless continue to be used as the working standard in the photometry of a gas-flame, because the light of the two will vary *pari passu* (or nearly so) with changes in atmospheric conditions, obviously electric sub-standards, based on the same candle-unit, are more suitable for testing the light of electric lamps; and their use will extend in the photometer rooms of electricians. An attempt has been made to deduce a formula for converting the humidity values found in the still air of a room by the ordinary Mason's wet and dry bulb hygrometer into the values which the Assmann ventilating hygrometer would give for the humidity of the air of the room. It would hardly seem likely that it would be possible to deduce any simple relation between the readings of the two instruments in varying conditions of temperature and humidity; and it is therefore the more interesting to note that the report of investigations that were carried out during the past year at the National Physical Laboratory speaks hopefully of the deduction of a simple formula for the correction of the ordinary wet and dry hygrometer readings. We hope that these investigations will soon reach a successful issue. Meantime, we may remark that it is perfectly easy to get concordant readings between an ordinary wet-bulb thermometer and the wet-bulb of an Assmann instrument if the former is placed in the draught created by a small fan, such as an electric table-fan, or is waved quickly to and fro in the air. The Assmann hygrometer, as made in Berlin, is at present an extremely costly piece of apparatus, notwithstanding the simplicity of its construction; and those who do not care to buy it may be glad to know that simple wet and dry bulb thermometers, if used in the manner just indicated, will give the same readings. We should prefer readings thus obtained to those deduced from any formula.

The National Physical Laboratory is about to make a series of determinations of the light afforded by the Harcourt 10-candle lamp, when a light petroleum of higher boiling point than pentane is used in it in place of pentane, the use of which is precluded in



really hot climates. We believe it is already known that there is no appreciable alteration in the light yielded by the lamp provided the temperature is sufficiently high to volatilize the petroleum spirit at about the rate at which pentane volatilizes at ordinary temperatures, and provided the petroleum spirit is derived from the same raw material and purified in the same way as pentane. A useful research to which the Photometry Section of the National Physical Laboratory might well devote some time in the interests of technical men is the comparison of the results of different methods of ascertaining the mean spherical and mean hemispherical illuminating power of sources of light. At present, consultants and others who are called upon to make these determinations in the ordinary course of their professional work use various methods, with the consequence that their results are not always fairly comparable. They would be glad to hear that the National Physical Laboratory will shortly undertake an investigation of existing methods with a view to formulating a generally acceptable method, which could be followed by those engaged in making commercial tests. It is investigations of this character that fall properly within the scope of the activities of a National Laboratory; and as we are glad to understand that the Bushey House Institution is now devoting its operations to an increasing extent to work of such a generally useful kind, we throw out the above suggestion in the hope that it will be favourably received by the authorities there.

Some researches, which should be of considerable value, are now in progress in regard to pyrometry, and materials for the construction of thermometers for both high and low temperature work. We note that in the department of metallurgical chemistry, where analyses incidental to the research work of the laboratory

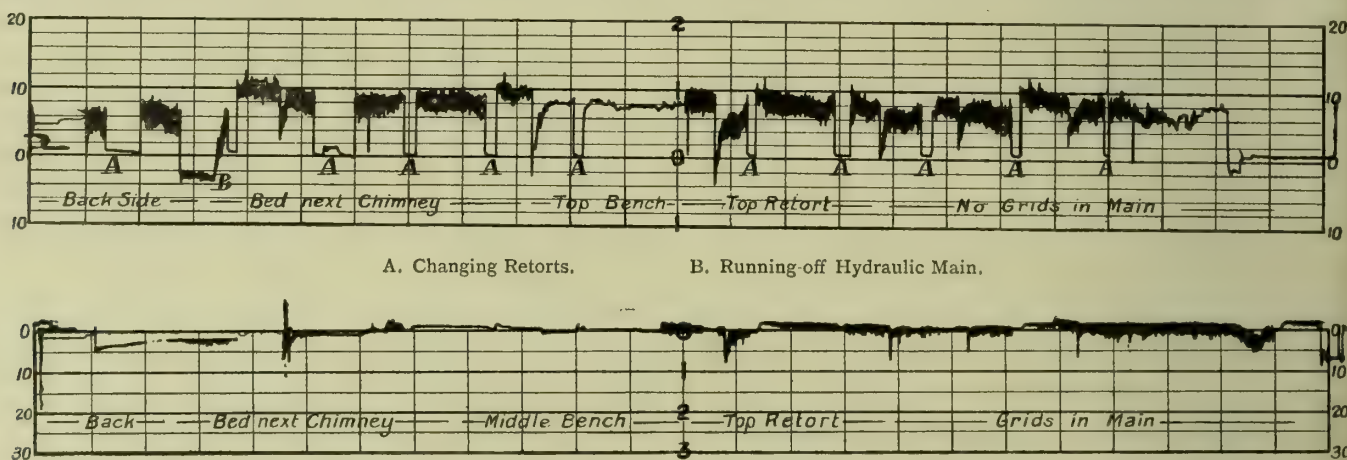
are carried out, it is intended ultimately to replace all gas-heated appliances by electrically-heated ones. This decision appears to have been arrived at without trial of the high-pressure system of using gas for laboratory furnaces, which Mr. A. W. Onslow, of Woolwich Arsenal, described at a recent meeting of the London Section of the Society of the Chemical Industry. We have no doubt that if the authorities of the Bushey House Institution would seek advice from Mr. Onslow, or chemists who have used his high-pressure heating burners in their laboratories, they would soon be convinced that gas, properly applied, is superior to electricity for providing a readily controlled and constant furnace temperature. The Department of Metallurgical Chemistry has incidentally made a number of ordinary analyses, such as of the laboratory supply of coal gas for the information of the Photometry Section, and of the Portland cement used in the new buildings of the laboratory. There were rumours afloat a short time ago that, as a consequence of these tests, considerable friction had arisen as to the quality of some of the cement supplied.

In conclusion, we may say that it gave us much pleasure to observe on Friday last that the National Physical Laboratory is rapidly extending the sphere of its research work, and that while the investigations of which reports have already been published are still few relatively to the magnitude of the institution, there is every reason to believe that they have been conducted with care, and are of sufficient importance to justify the existence of the laboratory and its maintenance at the public expense. The standardizing work, which was taken over by the laboratory at its start, continues to increase in volume and to be carried out with the precision which earned for Kew its good repute in connection therewith.

## MEUNIER'S PATENT HYDRAULIC MAIN FLOATS.

WE have received from Messrs. Robert Dempster and Sons, Limited, of Elland—who, as already announced in the "JOURNAL," have been appointed by the inventor Sole Agents for Meunier's patent hydraulic main floats—the accompanying two charts taken

by Mr. S. R. Ogden, the Engineer of the Blackburn Corporation Gas-Works, which, they remark, clearly show the benefits in level seals to be derived by the use of the apparatus. The diagrams were taken from hydraulic mains on each side of the same arch. One of the hydraulic mains, which gives a very unsteady gauge, was not at the time fitted with Mr. Meunier's arrangement; while the other, giving a very satisfactory gauge, was so fitted.



## Appointments in Buenos Ayres.

Now that the arrangements for the absorption of the River Plate and Buenos Ayres New Gas Companies by the Primitiva Gas and Electric Lighting Company of Buenos Ayres have been completed, we understand that the new Board of the Amalgamated Company have appointed as Joint General Managers Messrs. A. Gabarret and M. Obarrio, and as Joint Engineers Messrs. J. M. Rowbotham and W. Angus—formerly the respective Managers and Engineers of the River Plate and Buenos Ayres New Gas Companies respectively. Mr. Bernard F. Browne, who has been acting as Engineer and Manager of the Primitiva Gas and Electric Light Company for the past three-and-a-half years, in addition to having the management of the chemical works of the Company, will probably be leaving in the near future, owing to his having tendered his resignation last year, which he postponed on account of the amalgamation, on the desire of his Directors that he should carry out the transference involved. The progress of the Primitiva Company has been very marked under Mr. H. E. Jones's chairmanship and Mr. Browne's local administration; the gas sales having increased by 40 per cent. and the profits by 25 per cent. in the last three years, in spite of a reduction of 10 per cent. in the selling price. The leakage has been reduced by 7 per cent., and the profits of the chemical works have considerably more than doubled in the same period.

Mr. A. J. Hope, Gas Engineer, of Nelson, has resigned the office to engage in cotton manufacturing.

Mr. Joseph Smith, J.P., who has just entered upon his forty-third successive year as Chairman of the Romford Gas Company, has been a Director of the undertaking for forty-eight years.

## Testing Water with Calcium Hypochlorite.

Sterilization of the water of the Connecticut River has been investigated at Hartford, to ascertain if an emergency supply can be obtained from that river by treating it with calcium hypochlorite. Except for the fact that the sewage of perhaps 250,000 people is discharged into the river above Hartford, the water is suitable for domestic supply; and experiments were accordingly made by Professor J. A. Newlands, of the Connecticut State Board of Health, and Mr. Harold C. Stevens, of the engineering staff of the Board of Water Supply of New York, to learn if it could be made safe for drinking. According to some particulars in "Engineering Record," the experiments were made by allowing water to flow from the river to a well, and pumping it therefrom through a 16-inch main to a sewer three-quarters of a mile distant. The hypochlorite solution was added to the suction of the pumps, and the character of the treated water was observed by samples taken at four places along the force-main—the last station being at the connection with the sewer. When one part per million of available chlorine was used, the removal of bacteria was always greater than 99.5 per cent.; and the colon bacillus was not detected. With the addition of half as much hypochlorite, a reduction of 99.78 per cent. was detected at the last observing station on a day when the raw water contained 64,000 bacteria per cubic centimetre. Professor Newlands has reported that this treatment, particularly if made with 1.5 parts per million, would yield satisfactory results in emergencies. But he does not believe it should be adopted as a permanent method of purification, unless the water is subsequently filtered, as, in his opinion, great care is necessary, in any such process, in order to eliminate any chances of error in adding the chemical; and the physical appearance of the water is not affected by the hypochlorite employed.



THE EXPLOSION AT THE GENEVA GAS-WORKS.

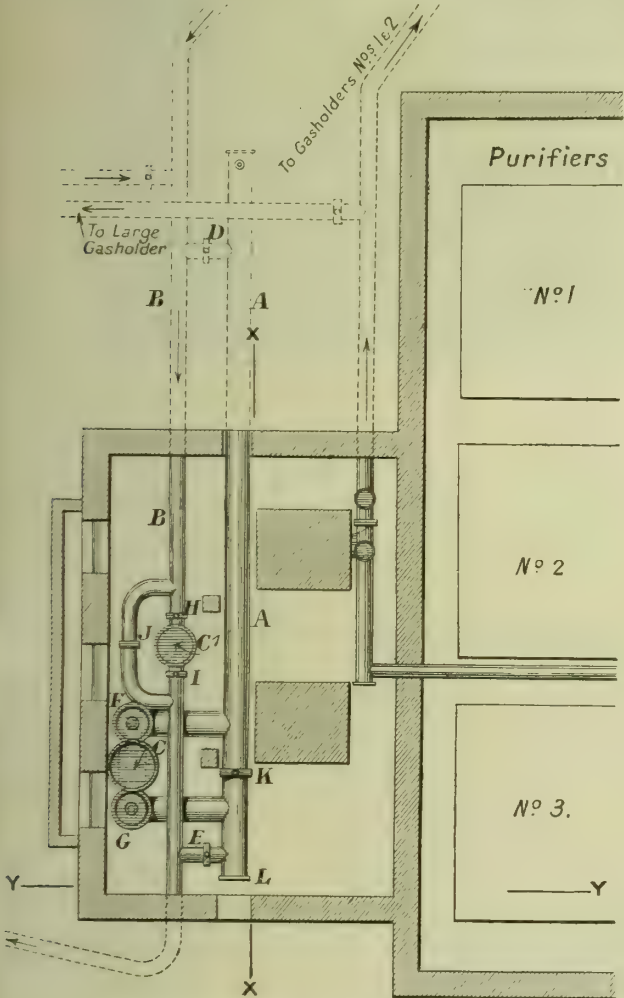
Official Account of the Accident.

It will be in the recollection of most of our readers that on the 23rd of August last year the gas-works of the Municipality of Geneva was the scene of a serious explosion, which unhappily resulted in the loss of thirteen lives, injury to a number of employees, and considerable damage to the works and neighbouring property. We have been able, from time to time, by means of reproductions of photographs and the few particulars available, to give readers an idea of the extent of the catastrophe. We are now in a position, however, through the courtesy of M. Des Gouttes, the Municipal Gas Engineer, to publish what may be regarded as an official account of the accident, and show, by means of a plan and sections, the portion of the works and plant in which

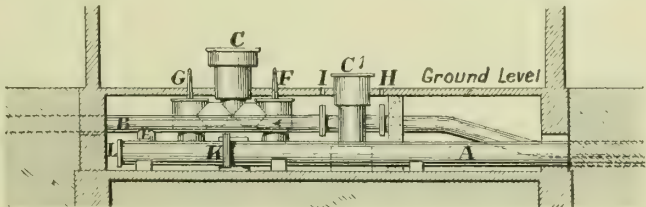
the explosion occurred. For the other illustrations we are indebted to the proprietors of "La Patrie Suisse."

At the outset it must be stated that the accident took place in connection with the laying of a new supply main, and was in no way a consequence of the ordinary operations of the works. The circumstances which gave rise to it are as follows: A 32-inch main had been laid by the side of an old 20-inch pipe in the subsoil of the building containing the station meter and governor. A new 32-inch governor had also been put in. The positions of the two mains, marked A and B, and the two governors C C<sup>1</sup>, are shown on the accompanying plan and sections. The larger pipe had been connected to the smaller one by two valves D E, placed respectively outside the building, before the two governors, and in the subsoil, after them. The new main was closed on the works side, just beyond the valve D, by a plate, in view of the erection at some future time of a fourth holder. On the town side it was provisionally plugged at L with a plate of asbestos, another of sheet iron, and a strong wooden disc; all being pressed firmly against the pipe by means of a screw-jack supported by the ground outside the building, at the end of the trench opened for laying the main. This plug was inside the building, and, as shown by the plan, was within about 2 feet of the foundation wall, which had an opening large enough to allow of it passing through. It was the intention of the gas authorities to extend this main eventually in the direction of the city.

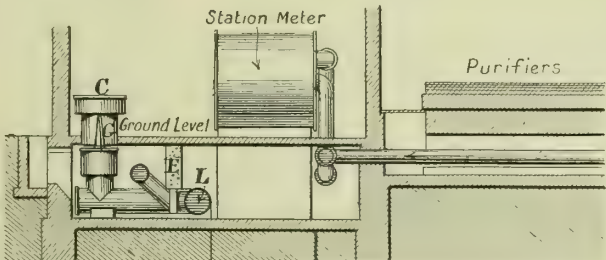
The work of fixing the new governor was finished by the 19th of August; and from that day till the 21st it was put under a series of tests. For this purpose, the two bye-pass valves connecting the old and new mains were opened, as well as those of the new governor F G; and during the tests the gas passed through the governor and the 32-inch main. The old governor C<sup>1</sup> was temporarily thrown out of action by the closing of the inlet and outlet valves H I. The result of these tests was very satisfactory. At their conclusion, on the morning of Saturday, the 21st of August, the two bye-pass valves D E were closed, and the gas once more took its usual course through the 20-inch main. The larger main was at once thrown out of use; and therefore it contained only



Plan of Station-Meter and Purifier House.



Section on the Line XX.



Section on the Line YY.



View Taken at the Time of the Explosion and Subsequently Strengthened.





The Large Gasholder Damaged by the Explosion.

the gas remaining after the tests had been carried out. The by-pass valves J K of the two governors were kept closed during the whole of the tests.

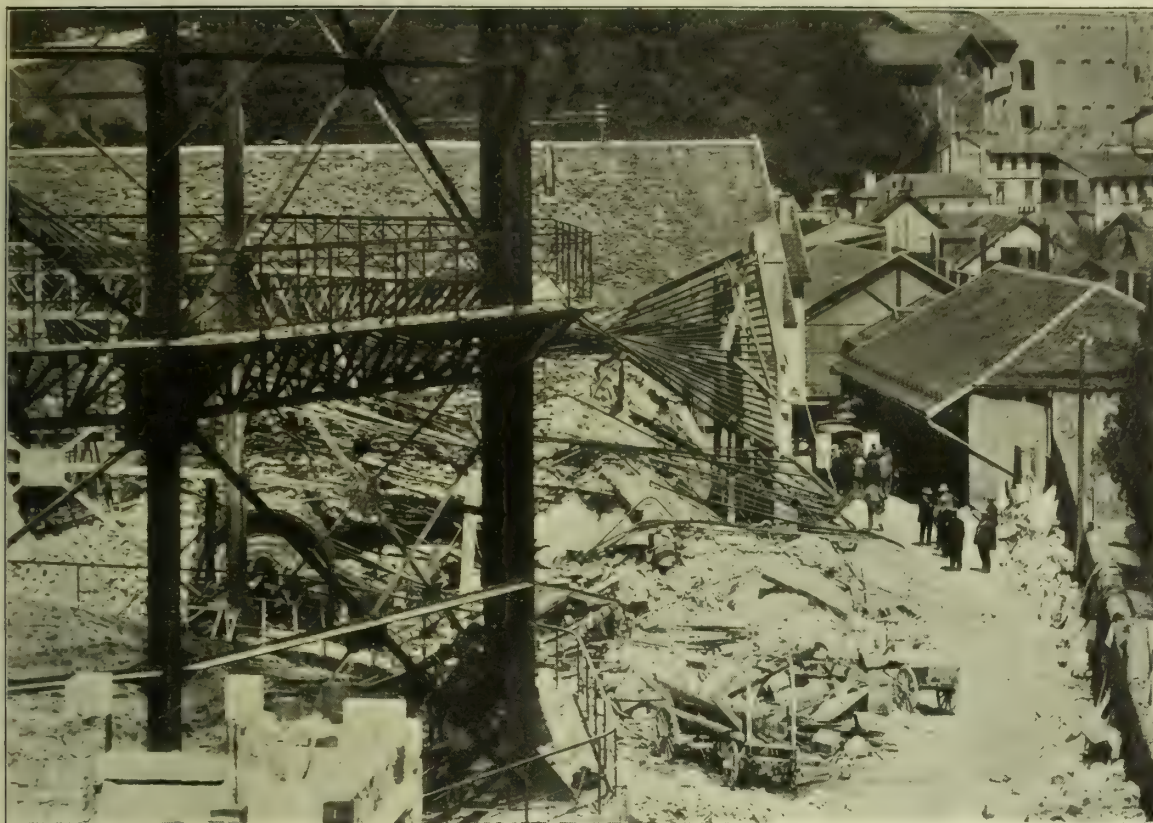
The following Monday, the foreman who, under the direction of the Engineer, had laid the 32-inch main, proceeded, with the sanction of his chief, to remove the temporary plug already referred to. He first took away the screw-jack and the wooden disc, and then, with the assistance of two workmen, removed the iron and asbestos plates. This action left the end of the pipe open, and liberated the gas remaining in it after the tests made at the close of the preceding week. The two men detected the smell of gas; but the foreman remarked that it was only what had been left in the portion of the main between the by-pass and the outlet of the governor. He then went away to the workshop, to which he had been called; and the two workmen remained in the trench gathering up their tools and the pipe-laying plant.

What occurred after this, nobody knows for certain, because all the witnesses of the accident, and probably those who caused it, are dead. This, however, appears to be the most reasonable explanation: The two workmen—or, at all events, one of them—smelling the gas remaining in the pipe, wished to ascertain whether or not the valve on the connection with the 20-inch main, which was then in use, had been properly closed. Possibly the men may have been ordered to do this. Instead, however, of closing the valve, they did just the reverse; for after the accident it was discovered to be wide open. When it was subsequently tested, it was found that 62 turns were required to open it to its fullest extent. It is inconceivable that one of the two workmen should on his own account have manipulated the valve and opened it. Moreover, one of them had, on the previous Saturday, closed this very valve as well as others in its immediate vicinity, in the presence of the Engineer; and therefore he knew perfectly well



The Purifier-House, at the Side of which the Explosion Occurred.





Ruins of the Station-Meter House.

how it should be worked. It is an internal screw valve, and its rod turns without rising. It is not worked by a wheel, and consequently a key is required. It opens to the right, like the water-valves in the city; and when it is desired to ascertain whether or not one is closed, all that is needed is to give it a quarter, half, or even a whole turn. By this very simple operation any one can satisfy himself as to whether he is opening or closing a valve. It is therefore incomprehensible that one of the men employed upon the works should have turned the valve in question to such an extent as to open it fully. Yet it was in this condition, with the result that it allowed to pass into the subsoil of the station-meter house an enormous quantity of gas, which formed with the surrounding atmosphere an explosive mixture.

How was this mixture ignited? This is a question which cannot be answered. Was it by a match, by the cigarette of a smoker, or by a spark from the tool of a mason engaged in putting small blocks of stone beneath the mains? Was it by a burner alight in the laboratory, which is on the first floor of the building, and separated from the rest of it by a partition with a door; or by an electric lamp in use in the basement becoming accidentally broken? The writer of the report inclines to the first hypothesis; and he points out that on the ground floor of the building, in the vicinity of the station meter, there is a board on which there is a notification that smoking is strictly prohibited.

The explosion occurred in the subsoil of the building already referred to, and not only destroyed it entirely, but also did considerable damage to the adjoining purifier-house; and it was followed by a fire. The effect was that stones and bars of iron were projected in all directions, especially in that of the large gas-holder, of about 530,000 cubic feet capacity, which was close by, and which at the time was not quite two-thirds full. The side-sheets of the holder were perforated in several places, and as the escaping gas was ignited by the fire in the neighbouring building, the holder descended rapidly, got out of shape, and left the guide-framing. There was, however, no explosion, though the contrary was erroneously reported at the time.

The consequences of the accident were terrible. As mentioned at the outset, it caused the death of thirteen persons, one being M. Masset, the Manager of the Geneva branch of the *Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz*, of Paris, whose office was contiguous to the laboratory on the works; and among others were the Works Manager (M. Georges Béguet), the foreman, and an engineer who was on a visit, and who was engaged in conversation with a friend in the station-meter house at the time of the explosion. About twenty workmen, either belonging to the works or in the service of contractors engaged there, were more or less seriously injured. The damage done to the works was pretty considerable; but it was partly covered by insurance. Working had to be stopped after the accident; but it was resumed as soon as the most urgent of the repairs could be completed, and this was the evening of the 9th of September. At that date there was neither station meter nor governor available; but these were provided subsequently. With regard to storage, there was only one holder of about 130,000 cubic feet, and another of 166,000 cubic feet capacity, which were available; but, with the help of the carburetted water-gas plant,

M. Des Gouttes was able to furnish sufficient gas to meet a daily consumption which exceeded 1½ millions in December last. The damaged holder could not be brought into use until the 6th ult.; its repair having been difficult owing to the numerous holes and deformations found in it. The damage caused to the property in the neighbourhood of the works was estimated at about £4000. It consisted mainly of broken glass and damaged walls and roofs.

#### Suggested Use of Discs in Prepayment Meters.

There appeared a short time since in one of the Manchester papers a letter by Mr. J. D. Affleck, which contained the suggestion that discs should be used in prepayment meters, instead of pennies, with the idea of removing the temptation to rob. His idea was that shopkeepers should be employed, on a small commission, as agents for these discs, which would be purchased by the consumers as required. The main points of this letter appeared in the "JOURNAL" for the 1st ult. (p. 308); and now Mr. C. Jeffreys, of No. 735, Commercial Road, Limehouse, E., has drawn our attention to the fact that as long ago as January of last year he applied for a patent for a "token or device" to be used as a substitute for coin in prepayment meters. The discs made in accordance with the patent (which has since been sealed) are of what is known in the trade as "gilding metal," which is imported from the Continent, though the discs themselves are made in London. One advantage of using this metal is said to be that no marine store dealer will buy it. The discs are of exactly the right weight and size to pass through the slot and operate the gas-valve; and they are so notched at the edges as to prevent them being mistaken for pennies if placed in the pocket. On one side would be stamped the name of the undertaking to which they belonged; and fraudulent manufacture would be unlikely to occur, seeing that, as we understand, the tokens or tablets cost at least a penny each to produce. Mr. Jeffreys claims that there are many advantages to be derived from the use of the discs. Some of the ultimate benefits he states as follows: No loss of money; no cost of repairs and new padlocks; no cost of prosecutions; no tips to persons giving information as to robberies; and no cost of staff specially employed to catch thieves. The immediate gains foreshadowed include: No waiting for a month for the collection of money from meters—cash down, from all agents; more gas used than now, as people would upon pay day secure their supply of light for the ensuing week; and a more extended use of slot-meters in lock-up shops, &c.

**Coal Output during Last Year.**—A return has been issued from the Home Office containing an advance proof (subject to correction) of the tables relating to the output of coal and other minerals, and the number of persons employed at mines worked under the Coal and Metalliferous Mines Regulation Acts during the past year. The output of coal, which was 261,512,214 tons in 1908, was 263,758,562 tons in 1909; showing an increase of 2,246,348 tons. The number of persons employed was 1,013,998—an increase of 26,185.



## MEETING THE GAS DEMANDS OF BROMLEY AND CRAYS.

Twin Generator Carburetted Water-Gas Plant—High-Pressure Plant and Mains to Supply the Crays District.



Front Elevation of the Old Retort-House before Alteration.



Old Retort-House after Raising the Walls and Roof.

THE absorption of the Crays Gas Company by the Bromley Gas Company, under the powers conferred by Parliament in the session of 1908, had as one of its purposes the production of manufacturing and business economies generally which, under the law of the sliding-scale, will eventually be advantageous alike to the consumers in the whole district and to the shareholders. In respect of manufacture, the fullest economy it was agreed by the Chairman (Mr. Alexander Dickson), the Directors, and the Chief Engineer (Mr. William Woodward) could only be obtained by plant concentration at Bromley, and the closing-down as a manufacturing station of the works of the defunct Crays Gas Company. The Bromley works, although quite capable of dealing with the requirements prior to the amalgamation, naturally needed some additions and alterations with the increased demands from the 15,000 acres added to the district of supply. The question of increasing the productive power of the works thus became a matter of practical politics.

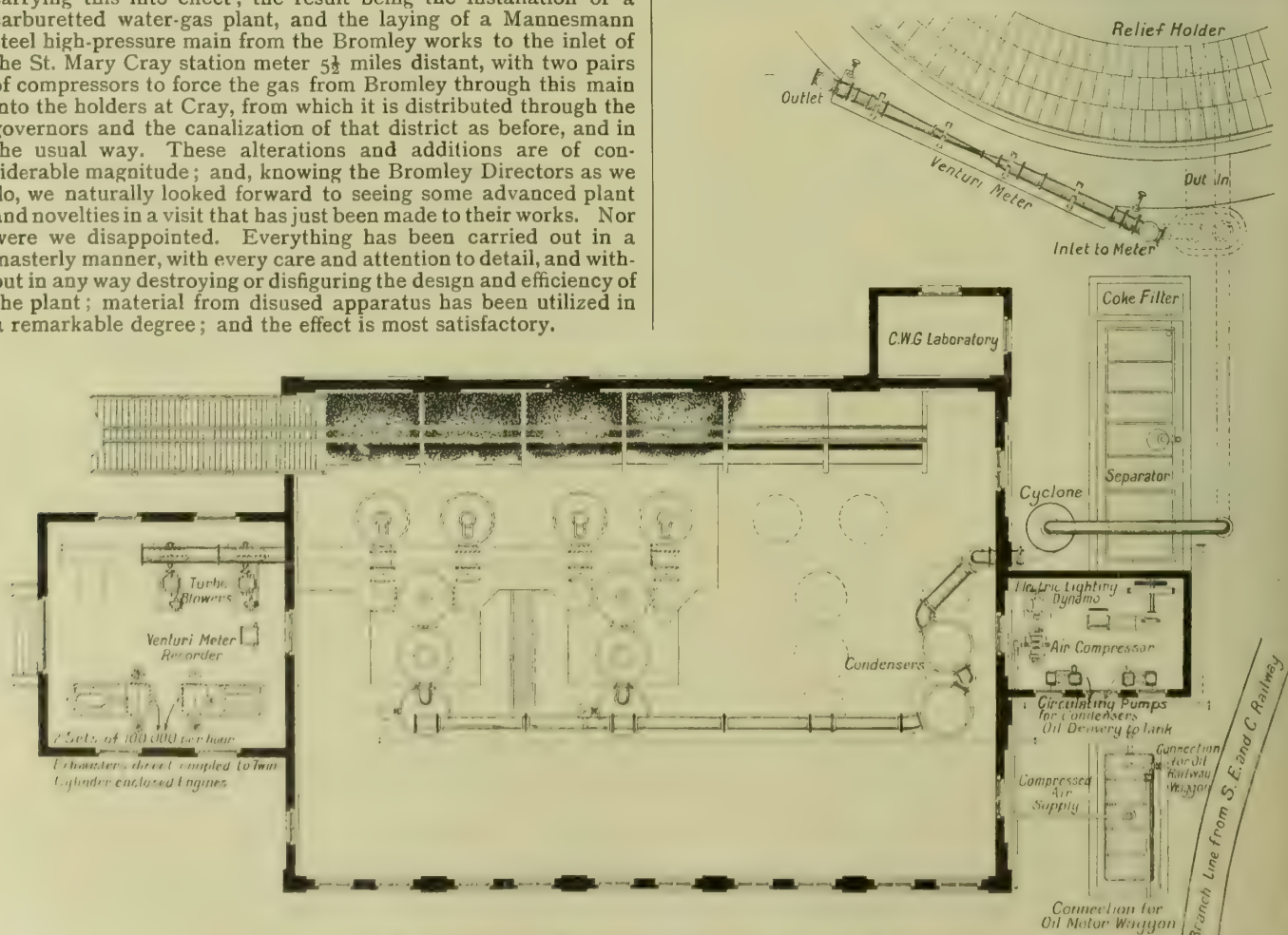
The Directors having, as before stated, determined that the whole of the gas required should be manufactured at Bromley, instructed Mr. Woodward to prepare a scheme and plans for carrying this into effect; the result being the installation of a carburetted water-gas plant, and the laying of a Mannesmann steel high-pressure main from the Bromley works to the inlet of the St. Mary Cray station meter  $5\frac{1}{2}$  miles distant, with two pairs of compressors to force the gas from Bromley through this main into the holders at Cray, from which it is distributed through the governors and the canalization of that district as before, and in the usual way. These alterations and additions are of considerable magnitude; and, knowing the Bromley Directors as we do, we naturally looked forward to seeing some advanced plant and novelties in a visit that has just been made to their works. Nor were we disappointed. Everything has been carried out in a masterly manner, with every care and attention to detail, and without in any way destroying or disfiguring the design and efficiency of the plant; material from disused apparatus has been utilized in a remarkable degree; and the effect is most satisfactory.

## BUILDING CONVERSIONS.

There being on the works an old small coal-gas retort-house not well placed for coal delivery or in close proximity to the coal storage, and consequently little used, and only then when absolutely necessary, it was decided to dismantle this house, lift the roof, and convert the building into a proper home for the carburetted water-gas plant; an adjoining smaller oil-gas retort-house serving admirably, with alteration, for a machinery house—viz., for blowers, and exhausters when necessary. The carburetted water-gas house is 80 ft. long by 60 ft. wide. Before lifting the roof, it was very low; and it has been heightened to 34 feet at the eaves, which means that walls and roof have been raised by 14 feet. The building, formerly very squat and ugly, has, by this heightening, and judicious architectural designing, been now rendered into quite a pretentious structure, having a good exterior elevation, and being light, lofty, airy, and roomy inside—in fact, we should call it an ideal house altogether for the purpose to which it has been put.

## COKE SUPPLY TO THE TWIN WATER-GAS GENERATORS.

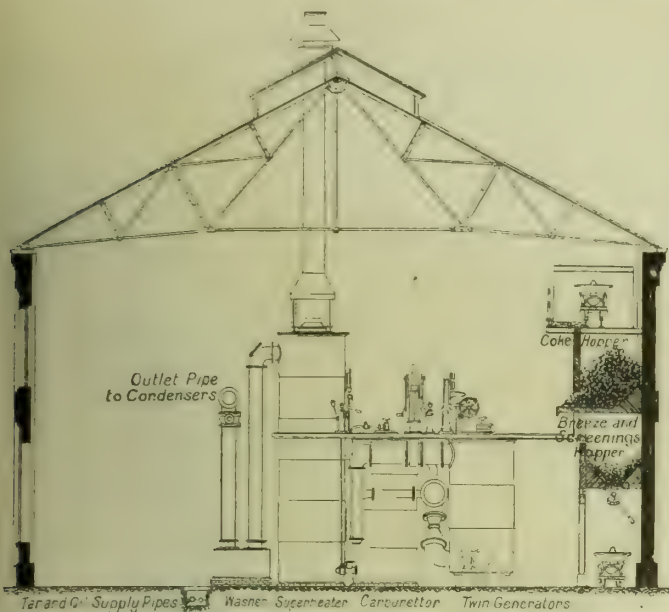
A special system of coke lifting and storing apparatus being in operation at Bromley, Mr. Woodward decided not to erect any



Plan of the Twin-Generator Carburetted Water-Gas Plant.

W. WOODWARD, Engineer.





Cross-Section of the Carburetted Water-Gas House.

independent hoist or elevator for placing the necessary coke on the stage for supplying the water-gas generators; but an elevated gantry has been erected (and this out of disused material), with a large coke-hopper at one end, suitably placed for taking a supply from the special coke-loading machine in the yard. The gantry is constructed with rails, and runs from this point to and over the coke-hoppers inside the generator-house—the coke being conveyed thereon by special tip-waggons to the generator-house coke-hoppers. The gantry is formed of H-section steel standards (formerly buckstays to the old retort-beds). These are surrounded at the bottom by old 16-inch cast-iron pipes erected socket-down in concrete blocks; the pipes being then filled with concrete grout to the standards, and covered with small cast-iron caps at the top. These pipes make a splendid fender for the protection of the steel standards, shielding them from oxidation and damage from the surrounding coke, &c.; and they are of really very good appearance. The standards are properly braced together with channel steel, &c., and are surmounted with I-steel girders, which run from one to the other, and so on, into and over the coke-bins in the generator-house.

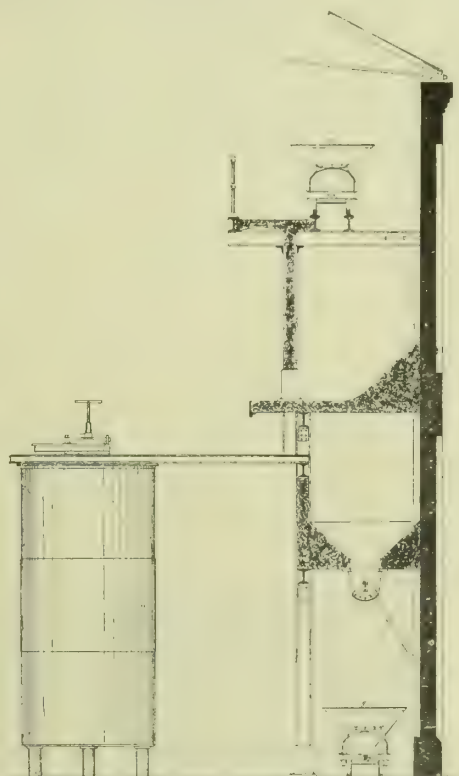
Inside the generator-house (as will be seen by the sectional drawing), the system of coke-bins is again somewhat novel. It will be noticed that they run the whole length of the house, and that they are in two heights, the upper one being for the coke supply, and the lower one for the screened breeze and brushings from off the operating-stage. The upper bin takes its supply of coke from the side-tipped coke-waggons. The floor of this bin is 3 feet above the operating-floor—one side being formed by the house wall, the other by iron standards and girders (again from the old retort-house) filled in with reinforced brickwork. There is an opening the full length for 18 inches above the bin-floor, through which the coke gravitates at an angle of about 40° on to the extended floor of the bin. The coke is then fed by coke-forks into the generator feeding buggies ready for charging. Mr. Woodward's idea in this is that, if the coke is observed and screened at its last stage, the possibility of dust and dirt being introduced into the generator is reduced to the lowest possible extent, and that better gas making, less clinkering of fires, and less possibility of blowing dust into and through the plant, is the result.

Under this upper bin and below the operating-stage level is another large bin also running the full length of the house, and formed as the one above—from reinforced brickwork and iron standards. But this bin is constructed with slide and swing doors at the bottom, by which its contents can be immediately emptied into carts or trolleys, as desired. The idea of this bottom or lower bin is to collect all the coke screenings taken from the upper bin in forking, and all the sweepings from the operating-stage. These are brushed into the bin from the level of the operating-floor. Consequently neither mess nor dirt is

occasioned on the operating-floor or the clinkering-floor below; and the resultant breeze is stored and carted away as required, to the boilers or for sale, and is handled by the carters alone—there being no lifting into carts or trolleys.

THE CARBURETTED WATER-GAS PLANT.

After fully considering the question with their Engineer, the Directors concluded that, for their special purpose, Messrs. Humphreys and Glasgow's twin-generator plant would be most suitable; and, to cut direct from inception to completion, there are in the house to-day two sets of the plant, each of a guaranteed producing capacity of 750,000 cubic feet a day, but capable, as test has proved, of yielding nearly 1 million cubic feet. The plant has been arranged to allow of the most ready and economical extension to a third section, which, if thought fit, may be larger and may be operated independently of, or together with, the other sets. The figures as to capacity require a word of explanation. Each of the present sections is capable in continuous work of producing in twenty-four hours 750,000 cubic feet when working in series; but, when working in parallel, each section is capable of yielding 850,000 cubic feet. Here we have the interesting fact that on this ground space, which contributed, under the old order of gas manufacture, some ½ million cubic feet to the output of the works, carburetted water-gas plant can find accommodation equal to an output of between 2½ and 3 million cubic feet per day. The plant, it is also interesting to note, has been designed so as to, at some future period, take advantage of the waste heat of the blast products from the generator and carburettor for the raising of steam in specially constructed boilers.

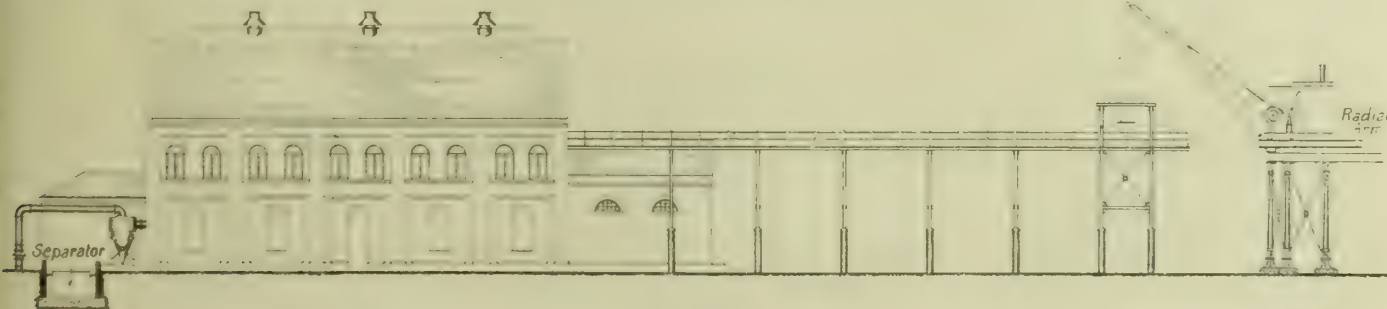


Section through the Coke and Breeze Hoppers.

In the adjacent house (already referred to) are two sets of turbine blowers, together with the registering mechanism connected with quite a new application of a Venturi meter to gas making. It is a meter which gives a positive registration, and not merely an inferential one. These features, with the plant and the compressors for delivering gas through a new high-pressure main to the St. Mary Cray distributing holders, will be described after dealing with the water-gas plant proper.

THEORY OF THE TWIN GENERATOR PLANT.

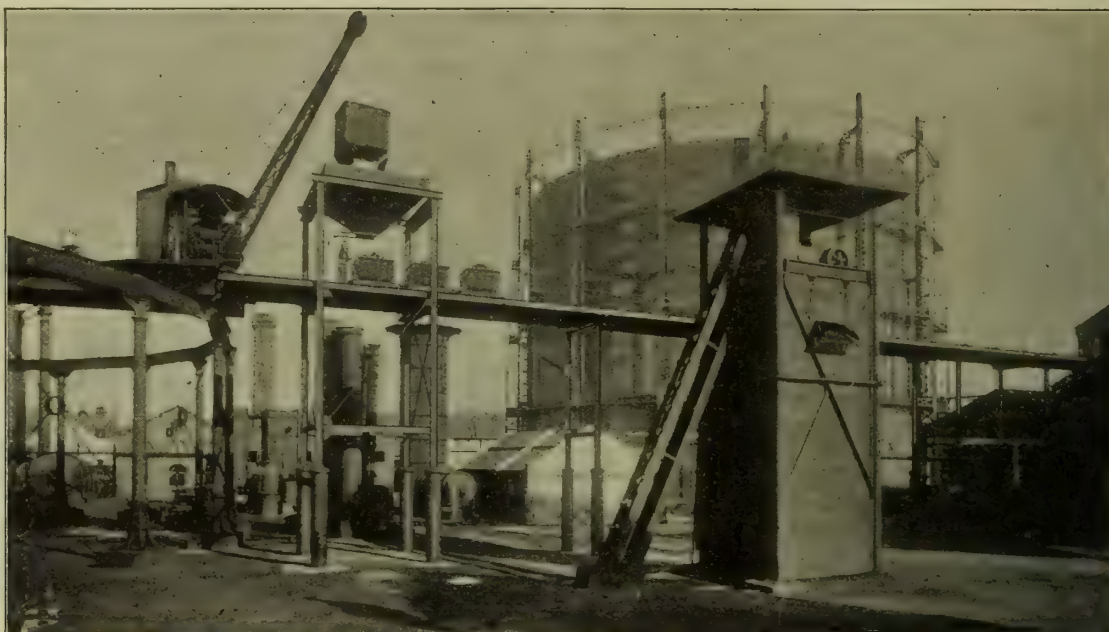
We believe that this is the first entirely new twin-generator plant that Messrs. Humphreys and Glasgow have erected in this country, although they have converted to the system existing plants, and have also introduced the new type at Berlin, Vienna



Side Elevation of the Carburetted Water-Gas House and the Coke Gantry.

W. WOODWARD, Engineer.





Special Coke Loading and Sorting Plant, Supplying Coke for the Carburetted Water-Gas House.

and other places on the Continent. It will be interesting to pause for a moment to consider the theory of this twin-generator plant. It is to be found in this simple explanation: The ends sought during the "run" and the "blow" in blue water-gas manufacture are antagonistic. In the "run" it is desired to produce no carbonic acid, while in the "blow" it is desired to produce no carbonic oxide. In practice, it is impossible to attain perfectly these opposite ends with one and the same fuel bed; and so practical working becomes a matter of compromise. The twin-generator system alters the distribution of the fuel bed for the "run" from that provided for the "blow." Two distinct generators are so connected together that the air-blast passes through them in parallel, whereas the steam passes through them in series in alternate direction. The maximum conversion of the oxygen of the steam to carbonic oxide is thus ensured by the passage of the steam in alternate direction through two zones of intense combustion, whereas the blast passes through but one such zone with practically no superlying reduction zones. Thus there is a minimum of carbonic acid in the water-gas and a minimum of carbonic oxide in the waste-blast gases. Several difficulties have been found in carrying out in practice the simple theory of the twin

generators; but the working of the plant has shown strikingly that Messrs. Humphreys and Glasgow have overcome every practical difficulty and objection while preserving all the theoretical advantages of the system. For the economical manufacture of carburetted water-gas of medium or low grade, the plant is particularly serviceable; and its production, it is pointed out, can be considerably increased by making gas in parallel, which change can be instantly effected. Another advantage is that either generator can be put out of action without interfering with the other.

#### DETAILS OF THE TWIN-GENERATOR PLANT.

The foregoing brief indication of the principles of the twin-generator plant will attach greater interest to the description of the installation. As already mentioned, there are two units of the plant of the capacity previously specified—each unit consisting of twin generators, connected for blasting in parallel, and gas-making either in series (reversible) or in parallel. The lining (the wearable portion above the grate being arranged so as to be easily renewable) is of special double fire-block form, with thick non-conducting lagging between the lining and the shell. The generators, it is observed, are supported upon heavy cast-iron



Equipment of the Operating-Stage of the Carburetted Water-Gas House.





Interior of the Carburetted Water-Gas House, with Coke and Breeze Bins in the Rear.



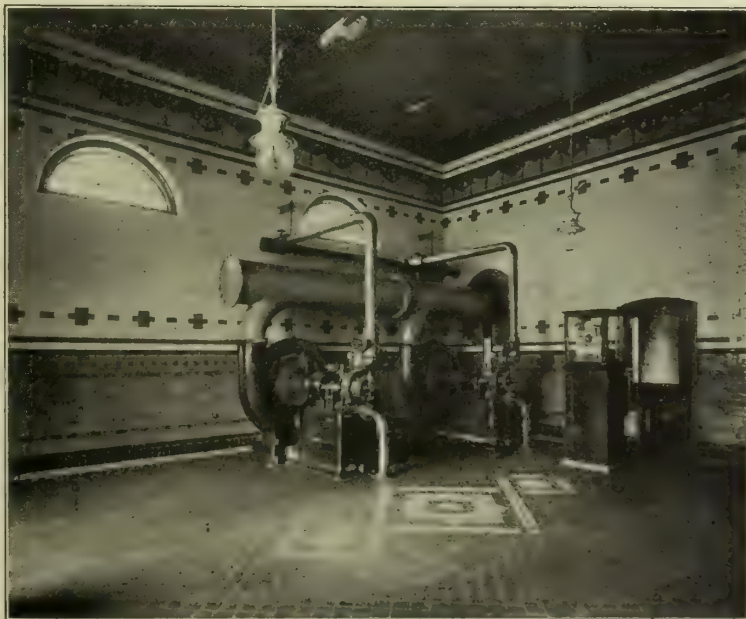
Interior of the Carburetted Water-Gas House, showing the Twin Generators.

columns, affording ample space beneath for collecting and quenching refuse during clinkering. Each pair of generators is fitted with reverse-make apparatus, consisting of fire-brick lined hot-gas connections between the generators and the carburettor, controlled by interlocked valves. By means of this arrangement (in conjunction with which are the steam-distributing devices), gas-making is changed from parallel to series or *vice versa* by one movement, without interference with the production of gas. Investigating the plant, it is apparent that safety in manipulation has been most carefully studied; for one finds a perfect system (Thuman's patent) of valve interlocking, by means of which all the valves—blast, stack, reverse-make, steam, oil, and vent—are so interlocked that it is impossible for them to be manipulated except in safe and proper relation, thus preventing mistakes on the part of the gas maker through inadvertence or ignorance. There are also found leakage vents and indicators, consisting of a system of piping in connection with the double-gate blast-valves, so that any possible leakage of gas or air past either face of the valves, when closed, is harmlessly discharged to the atmosphere, and its location indicated to the gas maker. This operating system is fully patented; and the explanations and details in regard to it that were afforded by Mr. Woodward on making an inspection of the plant were extremely interesting, both on account of the completeness of the system and the effectual achievement of object in every respect by the designed means. Before leaving the generators, it may be mentioned that there are dust-interceptors situated in the hot-gas connections between the generators and carburettors. The gases are deflected into the carburettor, while the particles of breeze and ash, by reason of their greater momentum, are projected into a collecting chamber, which is provided with a sub-discharging door.

Ascending to the operating-floor by the iron stairway (which floor is about 16 feet from the ground level), it is noted that it is spacious, and affords ample room for the operations. It is supported by the walls of the building and cast-iron columns, and is constructed of rolled iron checker plates, fastened to rolled steel joists by counter-sunk bolts. Though operations were in full progress at the time of the visit, everything looked spick-and-span on this floor. The compactness of the plant, and the completeness of the arrangements for operating, regulating, and controlling it in every detail, by air blast and steam meters, pyrometers, and gauges of various kinds, were points that could not fail to be observed. For instance, it was noted that the recording desks are attached to the steam and oil standards, where the gas makers are in constant view of the meters, gauges, &c., and in convenient reach of all operating gear. But to return to the main part of the plant. There are the carburettors and superheaters, one set to each pair of generators. They are of cylindrical form, and are lined with heavy fire-blocks and thick non-conducting lagging, and filled with special fire-brick checker-work. The oil-distributor is of the centrifugal type. The superheaters are fitted with self-sealing

gas-outlets and stack-valves, the latter worked from the operating-floor by interlocked gear. The smoke-stacks are supported by legs on the top of the superheaters, and project through the roof of the house.

Following the course of the gas, the gas take-off connections between the superheaters and the washers are water-sealed, and are provided with convenient openings for cleaning. There is nothing special to note about the washers; but it is next observed that scrubbers have been omitted, and jet-condensing arrangements substituted. There are also two multitubular water-cooled surface condensers, of extra large capacity, connected for use in series, and containing together 6760 square feet of cooling surface, with 22 square feet area of gas-way. Goose-neck gas and water connections between the condensers, compel the gas to travel throughout in the reverse direction to the current of cooling water. On top of the condensers service-tanks are formed, by means of which the hot effluent condensing water is made available for boiler feed if desired. By 20 inch connections from the condensers, the gas passes to one of Dr. Colman's "Cyclone" centrifugal tar-extractors, of  $1\frac{1}{2}$  million cubic feet capacity, to assist in removing the condensation from the crude gas before it enters the relief holder. This "Cyclone" separator is situated outside the house; and hard by is the tar-separator, which is 30 feet by 8 feet by 6 feet deep, and built of steel plates. In the



Interior of the Blower House, showing also the Venturi Meter Recorder.



bottom of the separator is a cast-iron sump, in which the tar collects, and from which it flows automatically and continuously through an ascension-pipe and adjustable overflow. A safety-valve in the tar-outlet connection automatically closes should any unexpected disturbance cause the water to break through the tar-overflow.

After leaving the centrifugal tar-extractor, the gas passes through 24-inch pipes into the relief holder, which is 100 feet in diameter; and from thence it is drawn in a constant stream through a Venturi meter of 100,000 cubic feet per hour capacity into the ordinary foul main of the coal-gas plant, where the mixture takes place. It then travels through the plant in the ordinary way with the coal gas to the holders, and thence for distribution—the exhausters, condensers, scrubbers, washers, and purifiers, being for the present of ample capacity to deal with the extra quantity. But everything is designed and prepared for the easy addition of special exhausters, purifiers, &c., when the time arrives at which the coal gas produced will absorb all the power of the existing exhausters, &c.

(To be continued.)

## NEW GAS-WORKS AT CARDENDEN.

### Description of the Plant.

ON Monday last week, the formal opening ceremony took place in connection with the recently erected gas-works at Cardenden, Fifeshire, in accordance with plans prepared by Mr. J. B. Scott, the Engineer and Manager of the Cowdenbeath Gas Company.

The works are situated in a hollow beside the railway, but at too low a level for getting railway lines into them. This, however, is of little moment, as nearly all the coal required is carted direct from the pits, the cost of cartage being 6d. or 7d. per ton. The site of the works is a slope, which makes it easy to handle the materials. The retort-house—a brick structure—is 48 ft. by 40 ft., and contains a bench of three ovens, two of which have been brought into use—one with a setting of six, and the other of four retorts. They are built on Brown's principle, with his patent conduit regenerators; the bench having been erected by Messrs. James Brown and Co., of Hamilton. The retort-house furnishings were supplied by Messrs. R. Dempster and Sons, Limited, of Elland; the contract including their patent self-sealing mouth-pieces, a travelling platform (the design of Mr. F. Scott, of Galashiels) in front of the bench, and a tar-column. The retort-house is built against a retaining boundary wall; and in this way provision is made possible for the shooting of the coal direct from carts on the public roadway into the store. Under the same roof are the boiler, pump, and engine houses, workshop, and exhauster-house, in the latter of which there is a steam-driven exhauster of 7500 cubic feet capacity, supplied by the Bryan Donkin Company, of Chesterfield.

The gas passes through a water-tube condenser, a two-brush Creeke annular scrubber and washer, and three purifiers, 10 feet square, with dry luting, all supplied by Messrs. Henry Balfour and Co., Limited, of Leven, who also erected a 60,000 cubic feet gasholder. This is in a steel tank, and the lift is spiral-guided, on the Gadd and Mason principle. A station meter, of a capacity of 8000 cubic feet per hour, was supplied by Messrs. Alder and Mackay, of Edinburgh; and the station governor is by Messrs. Peebles and Co., Limited, of Edinburgh.

The works are capable of producing 20 million cubic feet of gas per annum; and they have been erected at a cost of a little under £4000. Gas has been supplied from them since last October, when Mr. W. Brown, of Lasswade, was appointed Manager. The output during the winter has been nearly 2 million cubic feet.

### Opening Ceremony.

The inaugural ceremony consisted of fully opening the outlet-valve from the gasholder, which had been half closed for the occasion.

Mr. J. B. SCOTT welcomed the visitors, on behalf of the Directors of the Company, and introduced Mrs. R. A. Muir, the wife of the Chairman, who had been invited to formally open the works.

Mrs. Muir, working a specially made aluminium wheel, bearing an inscription, opened the valve. She expressed the pleasure she had in being there, and her thanks to the Directors of the Company for honouring her with the request to perform the ceremony. The one thing that was needed to put the village on an equality with other places had now been provided; and she hoped the gas-works would have every prosperity.

Mr. J. BARKER, on behalf of the Contractors, presented Mrs. Muir with the aluminium wheel.

Mr. R. Muir, speaking for his wife, returned thanks for the gift. He expressed his pleasure in saying that nearly the whole of the shares in the Company had been taken up by the inhabitants of the district.

Lunch was afterwards served in the "Gothenburg," to a company numbering about sixty.

Mr. J. HUTTON (Edinburgh) proposed "The Gas Company," and in doing so said the thanks of the whole community were due to those who had brought the gas undertaking to the stage which it had now reached. The Company had already six miles of mains laid and 800 meters in use. The works were very complete, and equal to producing a large output of gas. They had been well engineered; and he thought they could all see that the Manager appointed was a capable one.

Mr. Muir, in responding, said that on account of the rapid rise of the district they were obliged to put light of some sort into it. Different

kinds were proposed; but they always came back to gas lighting. One of the lessons they learnt was that coal gas could hold its own, on a commercial and an effective basis, with any other illuminant which it was proposed to introduce; and he thought they had been very well advised in putting down gas-works.

Mr. A. C. TAYLOR (Glasgow), representative of Messrs. Falk, Stadelmann, and Co., Limited, proposed "Gas Managers," and Mr. J. DICKSON (Kelty) responded.

### Gas Exhibition.

In the evening an exhibition of gas-stoves and lighting appliances was opened in the hall attached to the "Gothenburg." Mrs. Muir, in declaring the exhibition open, said she trusted that the lectures which were to be given would be taken advantage of by the women of the place, who were largely interested in cooking.

On the motion of Mr. R. B. MAIN, of Glasgow, a vote of thanks was accorded to Mrs. Muir.

The exhibition was open during the week, and lectures were given twice daily by Miss E. M. Dodds, of Dundee.

The exhibits included Messrs. Alder and Mackay's automatic lighting apparatus, also a prepayment meter in glass; an extensive range of gas-fittings and accessories in lighting schemes, by Messrs. Falk, Stadelmann, and Co., Limited, who had a brilliantly lighted stand; and a large display of cooking-stoves and gas-fires, by Messrs. R. & A. Main, Limited. Among the exhibits of the last-named firm was the "St. Nicholas" gas-fire, in which black fuel is used; and the appearance is exactly like that of a glowing coal-fire.

## COMPLETION OF THE VYRNWY WATER-WORKS.

### Outline of the Scheme.

LAST Wednesday, His Royal Highness the Prince of Wales performed the ceremony of marking the completion of the Vyrnwy scheme for the supply of Liverpool with water. The history of this great undertaking is known to most of the readers of the "JOURNAL" who are interested in water supply; but it may be again briefly recounted.

Parliamentary powers for carrying out the scheme were obtained by the Liverpool Corporation in 1880; and the first stage of the work—comprising the damming of the Vale of Vyrnwy, the impounding of the river and its tributaries, and the construction of 68 miles of aqueduct to the distributing reservoirs at Prescott, a few miles from Liverpool—was completed in 1892, under the supervision of Mr. Thomas Hawksley and Mr. George F. Deacon, neither of whom lived to witness last Wednesday's ceremony. Two years later, the present Corporation Water Engineer (Mr. Joseph Parry, M.Inst.C.E.) was instructed to report on the second part of the scheme, consisting of the impounding of the waters of the Cowny and the Marchnant, on the south-west and east respectively of the Vyrnwy valley. After making two reports, he was authorized to proceed with the working drawings; and these and the specifications were submitted in the autumn of 1896.

The Cowny works were commenced early in 1898. The tunnel conveying the water to the Vyrnwy reservoir is 6453 feet long and 7 feet diameter; and it was designed for a maximum discharge of 120 million gallons per day. It cost £19,050; that of the dam and culvert being £3655—making together £22,705. The watershed of the Cowny, above the point of diversion, was estimated to yield, in periods of dry years, rather more than 7 million gallons a day on an average. On the completion of the Cowny works, those for the diversion of the Marchnant were proceeded with. The tunnel is 7345 feet long and 7 feet in diameter; and it was designed for a maximum flood discharge of 88 million gallons daily. It was begun at the inlet heading in January, 1902, and at the outlet heading a year later. Work was suspended for a time; but the headings met early on the morning of April 6, 1908. The tunnel discharges on the north-east bank of the lake. The total cost of the Marchnant works was £18,900.

To convey the water to Liverpool required great resource and much labour. The lake is shut in by hills rising to 1600 or 1700 feet; and the preliminary task was to get the water through them. Accordingly, from the south-easterly corner of the lake they were tunnelled with a shaft 2½ miles long, driven in great part through the solid rock to Hirnant, where the 68 miles of aqueduct already referred to begin to run across the country to Prescott, where, in the large reservoirs, the waters from Vyrnwy and Rivington are mixed and sent on through three pipe-lines to Liverpool. On the way from Vyrnwy the water is filtered at Oswestry; and the aqueduct is tapped at many points along its course to supply various towns and villages. Very ingenious and interesting is the way in which the Hirnant tunnel receives the water from the lake. The outlet is at the handsome tower standing three-quarters of a mile from the foot of the lake on its north-east side. The water is drawn from the lake through two columns of 36-inch diameter steel tubes, housed in the tower, and at the bottom there are three openings connected with the aqueduct, controlled by throttle-valves, and covered by cylindrical screens or strainers of fine copper wire gauze. From these, starts the first section of the aqueduct, consisting of 730 yards of concrete culvert, circular in section and 4 feet in diameter, built in the valley bottom, and leading to the tunnel. The aqueduct proper is 7 feet in diameter, made of cast-iron pipes in 12-foot sections, jointed with lead and yarn. There are now two lines of pipe—a second one having been begun in 1902 and completed in 1905.



Easements were obtained by the Corporation for three pipe-lines; but it is not anticipated that the third line will be required for some years.

It has already been mentioned that the Engineers for the first stage of the work now brought to a successful conclusion were Messrs. Hawksley and Deacon; the latter being the Borough Water Engineer, and the former the distinguished Engineer whose name and that of his son and successor are associated with so many water undertakings. On Mr. Deacon relinquishing his position, he was succeeded by his Assistant, Mr. Parry, who has been solely responsible for the diversions of the Cowny and Marchnant and the laying of the second pipe-line. To the combined skill of these gentlemen, Liverpool owes its present magnificent water-works, which have been carried out without marring the natural beauty of the valley in which they are situated, but rather adding to it, and have evoked the admiration of visitors from all parts of the world. The extensions above described complete the whole of the impounding works authorized by Parliament at Lake Vyrnwy, and bring up to £2,936,182 the total expenditure on the scheme. The additional water available for Liverpool daily by the Cowny and Marchnant diversions is, in round numbers, 10 million gallons; and the total dry-weather yield of the three watersheds is about 60 million gallons per day.

#### Opening Ceremony.

To perform the opening ceremony, His Royal Highness the Prince of Wales travelled from Euston by special train to Four Crosses, in Montgomeryshire, which was reached just before two o'clock. Here he was received by the Lord Mayor of Liverpool (Alderman W. H. Williams), the Lord Lieutenant of the county (Sir Herbert Lloyd Watkin Williams-Wynn), and several official personages, including the Assistant Water Engineer of the Corporation (Mr. J. R. Davidson). His Royal Highness and the company then proceeded by motor cars to Llanfyllin, where he received an address of welcome. A move was then made to Vyrnwy, where, among others, the Chairman and Deputy-Chairman of the Water Committee (Lieut.-Col. Porter and Major Denton), the late Chairman (Mr. W. J. Burgess), and the Water Engineer (Mr. Parry) had the honour of being presented.

The company having taken up their positions, the Mayor read an address of welcome, in the course of which some particulars were given of the extent of the Vyrnwy scheme, the cost of which, from the commencement, had been nearly £3,000,000. The work had, however, it was stated, been carried out so economically, on the advice of expert and competent engineers, that the Corporation were able to supply water at a very reasonable rate. They considered that great credit was due to the original promoters of the scheme, and to the respective Water Committees and their Engineers, who had been responsible for the management and progress of the work.

In the course of his reply, His Royal Highness expressed his great pleasure in performing the crowning act of a vast scheme for providing an adequate water supply, the completion of which had occupied upwards of 29 years. The short description the Mayor had read of the inception and carrying out of this immense undertaking was a record of engineering science and a monument of municipal enterprise. They could see for themselves how the genius of man had transformed the valley of a mountain stream and its tributaries into a lake of more than 1000 acres, capable of yielding between 50 and 60 million gallons of water a day through an aqueduct nearly 70 miles in length, and supplying not only Liverpool, but many other districts with that inestimable blessing, abundance of pure water; and the work had been carried out not only efficiently but economically, so that this boon was obtained at a moderate cost. They would all, he knew, join with him in paying tribute to those who were the original promoters of the scheme—to the Engineers who designed and executed the work, not forgetting the men of mind and muscle, to whose labours this magnificent undertaking was a striking testimony; and he congratulated the city on having secured for many years to come an ample provision from that beautiful Welsh watershed. He added: "You have asked me to turn on to-day into this great lake the water which you have collected from the Marchnant River—a large and important addition to the scheme, the carrying out of which is due to your trusted Engineer-in-Chief. I shall do so with the greatest pleasure and with every good wish."

The next stage in the programme was the unveiling of the memorial tablet, which was affixed to a wall immediately over the Royal stand. It was surmounted with flags emblematical of Liverpool and Wales. At the request of the Lord Mayor, His Royal Highness unloosed, amid cheers, the temporary covering of the tablet, on which was the following inscription:

Corporation of Liverpool. This tablet was unveiled on the 16th March, 1910, by His Royal Highness the Prince of Wales, to celebrate the completion of the works authorized by Parliament for taking and impounding the waters of the Rivers Vyrnwy, Marchnant, and Afon Cowny. William Humphrey Williams, Lord Mayor; Robert Stephen Porter, Chairman of the Water Committee; William Denton, Deputy-Chairman. The Vyrnwy Reservoir was completed and the first instalment of water delivered into Liverpool 14th July, 1892. A second instalment was delivered 16th October, 1905. Joseph Parry, Engineer, 1890-1910. Edward R. Pickmere, Town Clerk.

Following upon this, the Llanfyllin Choir sang "God Bless the Prince of Wales."

At the close of the initial ceremony, the Prince, with the Lord Mayor, the Lady Mayoress, and the other members of the party, walked a short distance along the fine highway which encircles the reservoir to the point at which the Marchnant tunnel emerges into the lake, where stands and enclosures had been erected. On the principal stand, placed close to the mouth of the tunnel, there was a handsome gilt lever connected with the gates of the conduit, which were closed. Mr. Parry handed to the Lord Mayor a solid silver casket, the immediate purpose of which was to contain the handle of the lever, but it would also serve as a handsome cigar and cigarette box. On the top were

the Prince of Wales's Feathers in enamel; on the back an enamel view of Lake Vyrnwy; and on the front a liver, together with the following inscription: "Presented to His Royal Highness the Prince of Wales, by the Corporation of Liverpool, at the ceremony of the completion of the Water-Works at Lake Vyrnwy, 16th March, 1910." This was handed to His Royal Highness with a formal request by the Lord Mayor that he would accept it, and would turn on the water. The Engineers then screwed the handle on to the lever; and the Prince pulled the latter over, and promptly the sluice-gates opened, and the waters of the lake boiled as the pent-up flood of the Marchnant burst through the tunnel.

The last act of the great enterprise was complete, and another 5 or 6 million gallons of water per day were added to Liverpool's store in Lake Vyrnwy. The daily available volume of pure water from the reservoir was raised to its maximum of 60 or 70 million gallons; and the total watershed tapped to 22,742 acres. As the flood poured from the tunnel there was a hearty cheer from the assembled company.

The Prince subsequently examined with interest a number of photographs of the Vyrnwy works that were submitted to him by the Water Engineer. A pleasing feature of the ceremony was the presentation to the Prince, by Mr. Parry, of Mr. H. N. Giles, the Resident Engineer at the Marchnant works; Mr. Samuel Glossop, the inspector; Mr. David Ricketts, stonemason; and Mr. Samuel Dalzell, miner, who had been connected with the work since its inception.

Following this was a semi-private visit by His Royal Highness to the tower into which the water of the lake is drawn and strained before it is sent out through the great tunnel. He motored out to the handsome structure with Lieut.-Col. Porter, Mr. Parry, Lord Derby, the Hon. Derek Keppel (the Equerry-in-Waiting), and the Lord Mayor. The Prince was greatly interested in the methods by which the water is brought out of the reservoir and strained before being sent through the Hiranant tunnel and some miles of aqueduct to the sand filter-beds at Oswestry. Before leaving, His Highness planted a young oak as a commemoration tree. While he was at the tower, members of the Corporation visited the works below the dam, under the direction of the Assistant Water Engineer (Mr. T. Duncanson). A feature of the works is the compensation water-house, which regulates the supply of water given, under the terms of the Act of Parliament, to the River Vyrnwy.

At the conclusion of the ceremonies, His Royal Highness motored to the Lake Vyrnwy Hotel, where he partook of tea. He left about half-past four, with Lord Derby, for Huyton, on his way to Knowsley.

#### An Interesting Reminiscence.

The completion of the Vyrnwy scheme was the subject of a leading article in "The Times" on Thursday. In the course of it the writer made the following remarks:

The benefits of this undertaking are not confined to Liverpool alone. When the authorizing Act was passed in 1880, it contained a clause empowering the Liverpool authorities to supply water, by agreement, to any place situated within 20 miles of the line of the aqueduct; and advantage has been taken of this arrangement in no fewer than 33 instances, representing a population of over 100,000. The presence of the Prince of Wales at Lake Vyrnwy was particularly appropriate, for it was largely through the action of his father that this result has been rendered possible. In 1878, the King wrote a letter to the Chairman of the Society of Arts, in which he called attention to the fact that, while great cities like Manchester, Liverpool, and Birmingham were taking steps to obtain improved supplies of water, the smaller towns and villages were dependent on accidental sources, which in many instances were wholly inadequate for health and comfort; and he suggested that a conference should be called together for the consideration of this question. The conference was duly held, under the chairmanship of Sir Henry Cole, and its influence was quickly exhibited; for in the Thirlmere Act, obtained by Manchester in 1879, Parliament inserted a provision enabling any local authority in the vicinity of the aqueduct to demand a supply on certain specified terms. As a matter of fact, this compulsory arrangement has not proved so useful as the permissive one adopted in the case of Liverpool; and few places between Thirlmere and Manchester derive their water from the aqueduct.

Another matter to which the King invited consideration was the question how far the great natural resources of the country might, by some large and comprehensive scheme, be turned to account for the benefit, not merely of a few large centres of population, but of the general body of the nation. Apart from the instances just mentioned and a few others of a similar kind, it cannot be said that we have made much progress in this direction. We still permit large towns to take possession of gathering-grounds in Wales and elsewhere for their own uses, without much regard for the actual or potential needs of other places not less important; and, in spite of resolutions by the Metropolitan Water Board urging that Parliament should regulate the appropriation of water-supplying areas with due consideration for the requirements of London and other populous districts, the business of water supply continues to be conducted on a parochial rather than a national basis.

The offices of the Provincial Water Companies' Association (Mr. R. Leslie S. Badham, Secretary) were on Thursday last removed from Victoria Street to Palace Chambers, Bridge Street, Westminster.

A pumping-engine test made at the North station of the Milwaukee Water-Works affords an indication of the progress made in the design of this kind of machinery. The engine tested was a vertical triple-expansion crank-and-flywheel pump, with a rating of 12 million gallons per 24 hours, against a head of 275 feet. With steam at 125 lbs. pressure, it was guaranteed to give a duty of 165 million foot-pounds. In 1892, the Allis-Chalmers Company installed an engine in this station which gave an unprecedented duty of 154 million foot-pounds. The new engine furnished by the same builders developed during a continuous 24-hour run a duty of 175.4 million foot-pounds per 1000 lbs. of steam.



## LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Lecture by Dr. Harold G. Colman.

A Meeting of the London and Southern District Junior Gas Association was held at the Cripplegate Institute last Friday evening—Mr. W. J. LIBERTY, the President, in the chair—when Dr. Harold G. Colman (who on rising was warmly greeted) delivered the first of two promised lectures; the second being due early next session. A crowded audience, which included a number of visitors (some of whom spoke in the subsequent discussion), listened attentively to the lecture, and watched carefully the practical demonstrations by which it was accompanied. Previous to the event of the evening, it may be remarked, those present were afforded a welcome opportunity of an informal chat over a cup of coffee.

Dr. COLMAN's lecture was as follows :—

## THE DEVELOPMENT OF HIGH TEMPERATURES BY GASEOUS COMBUSTION.

After your Committee had kindly asked me to give a lecture at one of your meetings this session, I was for some time puzzled as to the choice of a subject, inasmuch as in this Association, although all the members are connected with the gas industry, some are chiefly concerned with the manufacturing department, while others are mainly occupied with the distribution and sale of the gas produced by their colleagues, and its employment by consumers in the best practicable manner. On consideration, however, it seemed to me that the subject of gaseous combustion was of primary importance to all of you, and that it might be advantageous to spend the time in considering, in the first place, the principles of the development of high temperatures by combustion, and, in the second, to discuss the bearing of these principles in connection especially with two practical applications of gaseous heating—namely, the heating of retort-settings by gaseous firing, and the heating of incandescent mantles; the former being of great importance in the manufacture, and the latter in the consumption, of the gas. I soon found, however, that it would not be possible to deal with both parts of the subject in a single lecture; and your Committee therefore agreed to my dividing it into two—the first part to-night, dealing with the more theoretical part, and the second, to be given next session, taking up the considerations of the practical applications.

In discussing the changes which take place when a gas burns with production of a flame, it will be easiest, in the first instance, to confine our attention to one of the simplest cases, taking as an example the combustion of the gases hydrogen and oxygen. When a jet of hydrogen burns in pure oxygen, it produces a flame which is only slightly luminous, but has a very high temperature; and in the flame the hydrogen and oxygen combine together to form water, which at the high temperature existing in the flame is, of course, present in the form of steam—*i.e.*, as a gas. It is well known to you that the combination of hydrogen and oxygen always takes place in exactly the same proportions—2 volumes of hydrogen combining with 1 volume of oxygen, yielding 2 volumes of steam, or 1 part by weight of hydrogen combining with 8 parts by weight of oxygen to form 9 parts by weight of steam, which, of course, if condensed, gives exactly the same weight of water. But, in addition, the total amount of heat produced by the combustion of a given quantity of hydrogen is also constant, and may be expressed quantitatively, if we fix on a certain quantity of heat to be employed as a unit. In this country, the unit of heat is the British thermal unit, which is the quantity of heat required to raise 1 lb. of water 1° Fahr.; but for the purposes of this lecture it is much more convenient to use the metrical system unit—namely, the quantity of heat required to raise 1 gramme of water 1° C., known as the smaller calorie, distinguished by using a small initial letter from the larger Calorie, always spelled with a capital "C," which represents the amount of heat required to raise 1 kilogramme of water 1° C., and is therefore 1000 times as great as the smaller calorie.

By direct experiment with the calorimeter, it has been found that 1 gramme of hydrogen, when burned in oxygen to form water, gives off sufficient heat to raise 34,170 grammes of water 1° C., or, put in other words, the calorific power is 34,170 calories per gramme. In making such determinations of calorific power, the whole of the steam produced by the combustion of the hydrogen is condensed to water in the calorimeter, so that the heat given out by the steam in condensing to water is also included in the above figure for calorific power, which is therefore known as the gross calorific power. In the actual flame, the water formed is always present as vapour; so that this heat due to the condensation of the steam is never evolved, and therefore for the purposes of high temperature production cannot possibly be utilized, and must be allowed for. It has been found by direct experiment that each gramme of steam at the boiling-point gives off 537 calories. In condensing to water at the boiling-point, this being the latent heat of steam, and as there are 9 grammes of water produced from each gramme of hydrogen, we must deduct  $9 \times 537 = 4833$  calories from the above gross value, giving a calorific power of 29,337 calories for each gramme of hydrogen, when the water produced remains in the form of steam—this being known as the net calorific power.

Now, while it is true, as stated, that a constant quantity of heat is always evolved when a definite volume or weight of a combustible gas is burned in oxygen, it is by no means true that the same temperature is always obtained; for the terms "total heat" and "temperature" are not equivalent to each other. Thus, for example, if we heat 100 grammes of water from 10° to 50° C., and 200 grammes from 10° to 30°, the amount of heat added is the same in both cases—namely, 4000 calories; but the temperature of the water has been increased twice as much in the first case as in the second. For an approximate analogy, we may take heat and temperature as having the same relation to each other as the weight and pressure or head of a volume of water. The pressure of a column of water, though due to and directly connected with its weight, is not dependent on the total weight, but on the height of the column above the point at which the pressure is taken; and, similarly, in a body at high temperature, the heat in it, though it may be small in total amount, may be regarded as being at "high pressure."

Now in the industrial application of gaseous fuel, the object is in most cases to obtain a high temperature; so let us next examine the question of the highest possible temperatures which could be obtained under ideal conditions by burning a combustible gas, still using hydrogen as an example. We have seen that 1 gramme of the latter, in burning to oxygen, yields 9 grammes of steam, and evolves sufficient heat to raise 29,337 grammes of water 1° C. As there are only 9 grammes of steam in the flame itself, the temperature of this amount would be raised  $\frac{29,337}{9} = 3260^\circ \text{C.}$ , if the

same amount of heat was required to heat 1 gramme of steam and water 1° C. As a matter of fact, however, it is found that much less heat is required to raise the temperature of steam than that of the same weight of water. Up to temperatures of 200°, the amount of heat required to raise 1 gramme of steam 1° C. is only 0.480 that required to raise the same weight of water 1° C. This ratio of the quantity of heat required to heat any substance 1°, to that required to heat the same weight of water by a similar amount, is known as the specific heat of the substance. It is obvious that, if steam requires less heat to raise its temperature than water, the same quantity of heat will raise a given weight of steam to a proportionately higher temperature than the same weight of water; so that our 9 grammes of steam would be raised by the action of 29,337 cal. to a temperature of  $\frac{29,337}{9 \times 0.48} = 6790^\circ \text{C.}$  or  $12,254^\circ \text{Fahr.}$  This, therefore, is the highest possible temperature which we could expect to obtain by the combustion of hydrogen under ideal conditions; and we may refer to this as the "ideal" flame temperature of hydrogen.

In calculating this temperature we have assumed certain conditions—namely (1) that the specific heat of the steam remains the same at the high temperature of the flame as it is at 200° C.; (2) that nothing whatever is heated in the flame but the steam formed by the combustion of the hydrogen; (3) that no heat escapes from the flame by conduction or radiation, but that the whole of it is used in the flame to raise the temperature of the flame gases. In practice, none of these three conditions is in reality fulfilled; and, in consequence, the actual temperatures obtained in practice, both with hydrogen and other combustible gases, invariably fall very far below those calculated in the above manner.

With regard to the first point, it has now been shown beyond doubt that the specific heat of gases does materially increase as the temperature increases—that is to say, that at high temperatures more heat is required to increase the temperature of a gas 1° than is the case at lower temperatures. This is very marked with steam and carbonic acid, which are the chief products of combustion from the common combustible gases. The elementary gases also have the same property; but the rate of increase of the specific heat is much smaller. The experimental difficulties in obtaining an accurate determination of the specific heat of gases at high temperatures are very great, and have not been yet altogether overcome. But it seems most likely that in the case of steam, for example, whereas the specific heat at 200° is about 0.48, the average specific heat at temperatures from 0-1400° C. is the much higher figure of 0.532. This supplies at once one reason why the flame of hydrogen cannot reach the temperature calculated above.

The second of the above conditions is also never fulfilled in practice. Even when a jet of hydrogen is burning in pure oxygen, it is necessary that a slight excess of oxygen should be present in the flame if the whole of the hydrogen is to combine with the oxygen and liberate the whole of its heat of chemical combination in the flame; and this excess of oxygen must also be heated up along with the steam, thereby further reducing the temperature. A very much larger reduction is brought about in the great majority of cases in practice, owing to the fact that the gas burns in air instead of in pure oxygen; so that then, taking our example of hydrogen, the heat evolved has to raise the temperature not only of the steam and excess of oxygen, but also of a large amount of nitrogen, amounting to four times the volume of the oxygen used.

If we now calculate the temperature of a hydrogen flame burning in air, and getting into the flame (say) 2 per cent. more air than the theoretical, and use the most probable values of the specific heats of the gases nitrogen, oxygen, and steam at high temperatures, we find that the highest temperature we could expect to obtain would be 2560° C., or 4640° Fahr.—a very much lower temperature than the ideal one previously given for hydrogen



burning in oxygen. Even this temperature is still much higher than we can actually obtain by burning hydrogen or any gas we know in air; and the reason is that the third assumption made can never be fulfilled in practice—heat being always lost from the flame either by radiation or conduction to the surrounding gas which is not actually taking part in the combustion.

The extent to which highly heated gases such as are present in a flame lose heat by radiation, is a matter about which but little is yet definitely known; although it is certain that the extent of the radiation from hot gases is very much less than that taking place from solid bodies heated to the same temperature. It is, however, estimated by Professor Callendar that in an ordinary bunsen flame about 15 per cent. of the total heat is not utilized in the flame, but is lost by radiation, &c.

Whatever may eventually be found to be the exact amount of such radiation, so long as it exists at all it is evident that it must result in the removal of heat from the flame, so that less of this energy is present to raise the products of combustion to a high temperature; and it further follows that the greater the time that elapses before the complete union of the combustible particles and the oxygen molecules takes place, the higher will be the proportion of heat lost in this manner, and consequently the lower the average temperature of the flame. If, therefore, we desire to obtain the highest possible temperature from the combustion of a given gas, we must endeavour to so arrange the conditions that the combustion can take place in the shortest possible time.

Let us next consider what the hindrances are to a rapid combination of the combustible gases and oxygen. The first of these is that known as "dissociation"—namely, the fact that when the products of combustion (e.g., water vapour and carbonic acid) are heated above a certain temperature, they commence to undergo a partial decomposition into hydrogen and oxygen, or into carbonic oxide and oxygen; the extent of this decomposition then increasing further with increasing temperature. Put in another way, when the temperature of a flame reaches a certain point, the combustible gases left uncombined are no longer able to unite with the oxygen present; and these only finally combine with the oxygen and evolve their heat of combination when the cooling of the flame by radiation has lowered the temperature sufficiently to enable them to do so. Thus, taking again our particular example of hydrogen burning in oxygen, the heat evolved by the combustion of a portion only of the hydrogen raises the temperature of the mixed gases to such a point that the unburnt hydrogen is no longer able to combine with oxygen, or, more correctly, at this temperature, as fast as hydrogen combines with oxygen, an equal quantity of steam is decomposed into hydrogen and oxygen, the heat of combination in the one case exactly balancing that absorbed by the decomposition in the other. In spite, therefore, of the uncombined hydrogen present, the temperature of the flame does not increase above this point; and the final combination of the gases only takes place as heat is lost from the flame by radiation.

This phenomenon of dissociation is, perhaps, the main reason why the flame temperature of hydrogen which can be obtained under the most favourable conditions is less than 3000°, instead of the calculated figure of 6790°, and renders it unlikely that it will ever be possible to obtain temperatures of much over 3000° by combustion. On the other hand, when temperatures below 2000° are required—which is the case in by far the greater number of practical applications of gas—dissociation has but little influence; the latest work on the subject tending to show that at temperatures lower than 2000° both steam and carbonic acid are only very slightly decomposed.

There is, however, a further factor of the utmost importance in determining the amount of heat which is lost by radiation from the flame—namely, the rapidity with which the combination of the combustible gas and oxygen takes place—for it is obvious that the shorter the time this takes, the smaller is the opportunity for loss by radiation to occur, and the greater the amount of heat retained in the flame, and therefore the higher the average temperature of the flame. Now, in addition to the dissociation, the rapidity of combination is affected by other conditions, and more especially by the extent to which the combining gases are mixed together before they reach the flame.

Let us consider, in the first place, what happens when a jet of hydrogen issuing from the open end of a tube burns in oxygen or in the air. In such a case, the hydrogen and oxygen molecules only meet on the outside of the flame; and the actual chemical combination only occurs in a thin film just where the different gases intermix. Under these circumstances, the flame is really a hollow sheath; the interior of the flame consisting of comparatively cool unburnt hydrogen, which merely gets somewhat heated by the surrounding hot sheath of flame. Here, therefore, though the thin sheath may be intensely hot, the average temperature of the flame throughout the whole flame is comparatively low.

If, on the other hand, we add to the hydrogen before burning the necessary amount of pure oxygen, and allow the gases to become thoroughly mixed, we get the very best conditions for the quick combination of the gases, as each of the hydrogen molecules finds the necessary oxygen close at hand; and with such a mixture a flame is produced which is exceedingly small, but has a very high temperature. Unfortunately, the rate of combination under these conditions is so rapid that, if any attempt is made to burn such a mixture from an open tube, the combination takes place not merely at the end of the tube, but the flame travels back along the tube as an explosion wave, the velocity of which increases

rapidly, until it is equal to that at which sound travels in the gas, and the whole of the mixed gas combines with explosion. For practical application as a flame, the mixture of the gases must therefore only be made just before the point of ignition; and this is done in the familiar oxy-hydrogen blowpipe, where a jet of oxygen at high velocity mixes with the hydrogen just before the end of the tube at which the latter is burning, thus producing one of the hottest flames with which we are acquainted.

If, on the other hand, we use air in place of oxygen, we get a lower flame temperature for two reasons—first, because, as already mentioned, in addition to the steam formed, the nitrogen in the air (amounting to four times the oxygen volume) has now to be heated up by the combustion of the hydrogen and oxygen, and as there is more matter in the flame to be heated up by the heat of combustion of the same quantity of hydrogen and oxygen, the temperature attained must of necessity be lower. But, in addition, another less manifest effect then comes into play, which further reduces the temperature—namely, that the inert nitrogen molecules get in the way, so to speak, between the hydrogen and oxygen molecules, and so increase the time taken before the whole of the hydrogen and oxygen combine, thus increasing the opportunity for loss of heat from the flame by radiation, and resulting in the production of a longer flame of lower average temperature. And exactly the same thing takes place if the combustible gas is mixed with an inert gas such as nitrogen or carbon dioxide; the flame temperature being again reduced, partly by reason of the additional quantity of matter in the flame to be heated, and partly because of the "blocking effect" of this extra quantity of inert gas, which slackens the rate of combination of the hydrogen and oxygen.

Although for the sake of simplicity we have so far mainly confined our attention to the case of the simple gas hydrogen, what has been said for this gas holds good for all combustible gases, and for mixtures of such gases as are present in ordinary coal gas or producer gas. From these considerations, it appears that if, in the application of such gases for heating purposes, we desire to obtain a very high temperature concentrated in a particular spot, the necessary apparatus should be so designed that the gas and oxygen required for its combustion should mix together as rapidly as possible so as to enable the necessary chemical combination to take place in the shortest possible time, and that the amount of inert gases present, whether mixed with the combustible gas or the oxygen, should be reduced to a minimum. On the other hand, if it is desired to heat a large apparatus uniformly to a moderate temperature, the opposite conditions are required, and arrangements must be such that the gases combine comparatively slowly, and give rise to a long flame which raises the apparatus more or less equally through its whole extent.

As an example of the latter, we may take the heating of a gas-fired retort-setting, where it is desired to raise the whole of the retorts in it to a uniform carbonizing temperature of about 1000° C.; while for the former we may take the application of coal gas to the heating of an incandescent mantle, in which the object is to obtain by the combustion of the gas a high local temperature concentrated as far as possible on the mantle itself. In the next lecture, therefore, I propose to consider these two applications of gaseous heating from this point of view.

#### Questions and Answers.

The PRESIDENT said the subject dealt with was pregnant with points; and he hoped there would be a good discussion.

Mr. E. G. STEWART (Fulham) remarked that there were two points on which he would like information. The first was, assuming a flame fully aerated, what was the effect of the composition of the surrounding atmosphere upon its temperature—by which he meant an excess of carbonic acid or nitrogen? This condition, he thought, was often likely to be met with where the combustion took place inside a closed chamber, like a furnace. Also, in connection with combustion under these conditions, it would be interesting to know if the temperature of the flame was increased in consequence of the presumably decreased radiation from it owing to the surrounding walls and bodies being hot. He also asked whether the heat evolved by cooling the condensed water in the calorimeter to atmospheric temperature, should not also be deducted, as well as the latent heat of steam in calculating flame temperature.

Dr. COLMAN said he was dealing entirely with flames burning in free air. In a furnace, they had radiation of heat from the flame to the setting; but it was manifest that they could not raise their brickwork to a higher temperature than they could get in the flame to start with. They wanted to know the maximum temperature that could be got with a flame before going into the other part—as to the effect of the flame on the heating of the setting. With regard to deduction for latent heat in determining the net calorific power, when considering only the question of flame it was only necessary to deduct the latent heat of the steam, and it would not be correct to deduct also the heat evolved by the cooling of the condensed water, as that heat was present in the flame.

Mr. A. W. ONSLOW always found it interesting, he said, to hear Dr. Colman speak; but one or two remarks that he had made had appealed specially to him—particularly the reference to dissociation. Several times he (the speaker) had had a talk with Mr. A. F. Browne, of Vauxhall, on this very subject—as to when the point of dissociation began, and how it was to be detected. When one was dealing with very high temperatures, the point arose as to



determining when dissociation began, and its effect. He hoped one day Dr. Colman would give them a little enlightenment on this. Then the lecturer spoke about heating in a small compass. He (the speaker) had lately experimented largely on this matter; and he found that getting the burner close in contact was a thing that had to be watched most carefully. In combustion chambers, they should not lose a fraction of space. He had found a difference to the extent of nearly 15 per cent. in the alteration of a combustion chamber for gases to the extent of 1 inch. The sort of "hit-and-miss" arrangement that many of them had for heating gases was, he thought, quite wrong. They did not take sufficient advantage of the conductivity of the fire-clays at the sides; and they did not utilize the gas when they had at last got it in combustion in the spot where it was actually needed. He had seen a flame cross from one side to the other of a furnace, when it was supposed to heat a plate above, though it was doing nothing of the kind. It took two hours to eventually find its proper basis, when probably twenty minutes was quite sufficient.

Mr. J. G. CLARK (London) put a question with regard to a flame of air burning in an atmosphere of coal gas. It had occurred to him that such a flame would be a very good one for incandescent lighting. He thought he would get a bunsen flame that would just fit the mantle. He rigged up a piece of apparatus to do it; but unfortunately it was so difficult to control that he did not get any further. He had expected to produce a flame of very high temperature; but he did not know whether he was right.

Dr. COLMAN replied that, theoretically, he did not see why Mr. Clark should not do so. At the same time, it would be so exceedingly difficult to get a flame of just the same shape as the mantle, that he did not think it would be practical. In some respects, Mr. Scott-Snell did something of this sort. In his lamp, the air was compressed, and drew in the gas by aspiration, reversing the usual procedure; and as far as flame temperature was concerned, the result was probably pretty much the same.

Mr. J. W. HELPS (Croydon) remarked that he had known Dr. Colman for some time, and was always struck by his desire to acquire information. His wonderful faculty for obtaining this information was only equalled by the great pleasure it afforded him to impart it to anyone needing it. He felt sure everyone then present would go away feeling that he had acquired more information, and that what he had learned would enable him to understand thoroughly many matters that had been almost sealed books to him in the past. He felt confident the members appreciated the kindness of Dr. Colman in coming and giving them such an admirable lecture.

Mr. EVE asked whether it would be of any advantage in getting a higher flame temperature to heat the air or the gas, or to heat them collectively, before mixing with the flame.

Dr. COLMAN answered that undoubtedly if they could utilize the waste heat for heating the gas up, then they could get the advantage in the subsequent temperature of the flame. Whether this paid in the case of the incandescent burner, he was not prepared to say; but, of course, it was done, as he would have to point out in the next lecture, in the case of producer gas. Regeneration would not, however, be of much use in the case of flames which were already so hot that much dissociation took place. But in the case of gases containing a large quantity of inert gas, the preheating of the air and gas was of great advantage, as in the case of heating retort-settings.

Mr. C. J. DICKENSON GAIR (Vauxhall) remarked that they had been given many things to think of in the lecture, which mainly dealt with the first principles of combustion. This, he took it, was really the introduction to Dr. Colman's next lecture on the practical side. He wished to point out that the combustion of coal gas was only a series of exothermic reactions going on between the oxygen and the gaseous constituents. It was interesting to note the great increase of flame temperature caused by the combustion of hydrogen in pure oxygen. What would be the effect of pure oxygen on the luminous coal-gas flame? Mr. Clark had raised a very interesting point in his remarks; but he (Mr. Gair) did not think they would get the same efficiency by burning air in an atmosphere of coal gas as in the ordinary way, because in the burning of coal gas one of the secondary causes of high temperature was the formation of acetylene from the methane. Professor Lewes gave a very instructive series of figures on the luminous flame. With gas in a burner containing 4.38 per cent. of unsaturated hydrocarbons, the acetylene amounted to 0.035 per cent. Half-an-inch above the burner, there was 4 per cent. of unsaturated hydrocarbons and 0.34 per cent. of acetylene. An inch-and-a-half above the burner, there was 1.53 per cent. of unsaturated hydrocarbons and 0.56 per cent. of acetylene. At the tip of the dark region, there was 1.98 per cent. of unsaturated hydrocarbons and 1.41 per cent. of acetylene, which was the maximum. As the acetylene and other hydrocarbons passed on through the flame, complex changes took place, denser hydrocarbons were formed, and carbon precipitated. Therefore, if they turned the flame inside out—and this was what they were doing by burning air in coal gas—the acetylene passed off unburnt, and they would get a real loss due to this effect. They could actually prepare acetylene by burning air in coal gas. He was surprised on reading some other of Professor Lewes's figures at the very cold part of the bunsen flame half-an-inch above the top of the burner. He (Professor Lewes) only found at this point a temperature of 56° C. It seemed almost impossible that in any part there was such a low temperature as this; but evidently it was so in the lower part of the inner cone. There was, undoubtedly, a wide field of research

open to anyone who could invent a piece of apparatus for the better mixture of coal gas and air entering a burner. It was evident that, by eliminating as far as possible the obstructive action of the four molecules of nitrogen so as to bring fresh oxygen molecules constantly into play, a greatly increased efficiency would be obtained.

Mr. A. F. BROWNE (Vauxhall) said that, as bearing on the question of the theoretical or ideal temperatures of combustion, about which Dr. Colman had been talking, he thought he remembered having read something about ignition, or flame, being the point at which the temperature of combustion became exactly equal to the loss due to cooling influences.\* For instance, they might bring a combustible and supporter of combustion together, and apply a light, and flame ensued. But they might also bring about ignition by heating both bodies gradually until they reached a temperature when they flashed into flame. Was it or was it not a fact that these gases had started to combine, and had combined in a degree, before they reached the point where the heating and the loss of heat became equal to one another and flame occurred? If so, was not this a source of loss of heat which would reduce the flame temperature below the ideal or theoretical point? And was it likely to be a factor of importance, or of trivial amount?

Mr. COLMAN said that with regard to Mr. Dickenson Gair's point, he was not going to be drawn that night into discussing the luminous flame. It was vastly more complex than the other. Mr. Browne raised another point, which was probably true, though he did not think it of great importance. It was true, in most cases at any rate, that when they took a mixture of gases such as hydrogen and oxygen and heated them to a temperature below what was ordinarily known as their ignition-point, slow combination did take place; but the heat was evolved gradually, and most of it was dissipated and lost, so that the temperature of the mass did not rise rapidly. He did not, however, think that in ordinary practice, where they ignited their gases at a burner, this had any appreciable effect.

A MEMBER inquired whether it was of any real advantage to admit steam to the producer for heating a setting of retorts. He quite agreed with the advantage of simply allowing the steam emanating from the ash-pan to go to the producer; but he would like to know whether admitting live steam was beneficial.

Dr. COLMAN said the answer to this question depended largely upon local conditions. Even the steam from the ash-pan was a very variable quantity in different places. Any way, it was rather apart from the subject of the present lecture.

The PRESIDENT here remarked that Mr. J. W. Helps, the President of the Institution of Gas Engineers, had to leave the meeting; but he could not let him go without saying how glad the members were to see him. It was not the first or the second time they had seen Mr. Helps there; and he hoped, interested as he was in the younger men of the industry, that Mr. Helps was gratified to see the progress the Association were making. The members wished him a happy time during his presidency of the Institution of Gas Engineers; and he could assure him that, as far as the juniors could do so, they would support him.

Mr. HELPS said he was much obliged for the kind remarks that had been made. It was always a pleasure to come among the younger members of the industry. He felt he had still a good deal to learn; and he did learn something when he came among the juniors. It was gratifying to note the great progress of the Association to which the President had referred. It seemed to him that everyone attended the meetings with the idea of gaining knowledge that would help him in his business, and, what was even more important, would help the industry. He congratulated the Association, and believed the members were doing splendid work for themselves, for the undertakings they served, and for the industry at large. It was very good of them to welcome him as they had done.

Mr. A. E. BROADBERRY (Tottenham) said there was one point in the lecture which had caused him a certain amount of surprise. In dealing with the question of dissociation, Dr. Colman approached it in regard to oxygen and hydrogen. He (the speaker) was always under the impression that with heat alone it was not possible to dissociate water vapour; and he took it that dissociation was due more to the presence of carbon compounds than to the direct action of heat.

Dr. ROSTIN expressed his pleasure at hearing the lecture, but remarked that Dr. Colman had dealt so much with undebatable facts that there really was not much room for discussion. As to burning air in an atmosphere of gas, he himself had made a few experiments in this direction; and it would be interesting to him to hear more about it.

Mr. L. F. TOOTH (Senior Vice-President) said he had made a considerable number of experiments with regard to furnaces for melting purposes for the use of coal gas; and in the early stages he found that the results with air pressure were not so good as those with high-pressure gas. He had known the use of furnaces to be discontinued for the simple reason that the adjustment of the air pressure with the gas at various temperatures attained could not be expected of those in whose hands the work was generally left. With high-pressure gas, the thing was much more simple. He would, however, be glad to know whether in actual practice gas pressure was preferable to air pressure. Personally, he found he obtained the best results with various

\* A letter on this subject from Mr. Browne appears in our "Correspondence" columns to-day.



pressures according to the heats required, and preheated air at 600° C.

Mr. T. F. CANNING (Junior Vice-President) asked whether a proper mixture of oxygen and gas could be supplied by gas undertakings on a large scale, or whether there would be any stratification of the gases, owing to their different density, in the mains while travelling to the consumer. There was another point rather outside the lecture on which he would like information. In an electric arc, was there, owing to the high temperature, any vaporization of the carbon, or was it simply that the positive carbon wore away, and the small particles of the positive carbon were carried on to the negative?

Dr. COLMAN replied that, with regard to air pressure and gas pressure, this was a point that would rather come into the next lecture. What they wanted for high temperatures was a uniform mixture of the gas with the primary air; and whether they could get it better by having gas pressure or air pressure, probably depended to a large extent on the construction of the burner. He thought possibly, with a properly constructed burner, it would be feasible to get very good results for temperature with the air under pressure; but the practical experience of the last few years had tended on the whole to show that it was better to have the gas under pressure. As to adding oxygen to coal gas, this, he thought, would always be too risky to undertake on a large scale for gas that had to be distributed; but if the gas and the oxygen were once thoroughly mixed, there would be no trouble from stratification. As to volatilization of carbon, undoubtedly it did volatilize in the arc, to some extent, as well as burn. Even with ordinary carbon filament lamps, where the temperature was much lower than in arcs, there was a film of carbon deposited on the inner surface of the globe, which diminished the light.

Mr. W. H. VANNER (Walton-on-Thames) proposed, and Mr. J. HEWITT (Old Kent Road) seconded, a hearty vote of thanks to Dr. Colman for his lecture and experiments; and this was carried with acclamation.

Dr. COLMAN, in acknowledgment, said it had been a very great pleasure to him to come and deliver the lecture. He had thoroughly enjoyed it; and he trusted that his audience had been able to get some reflection of this enjoyment. Of course, the lecture had been mainly theoretical; but he hoped next session to be able to continue the subject with a further lecture which, while perhaps being also to some extent theoretical, would have a very practical bearing on their work.

It may be mentioned that the latest recruit to the ranks of membership of the Association is Mr. A. Turner, the Manager of the Amersham Gas-Works.

**The Flooded Gas-Works at Gennevilliers.**—In the "JOURNAL" for the 1st inst., we gave some views of the works of the Société d'Éclairage, Chauffage, et Force Motrice at Gennevilliers, which, with the accompanying particulars, enabled our readers to form an idea of the extent to which the works were affected by the recent floods in Paris. We are pleased to learn from M. Chamon (who is a member of the Board and of the Technical Committee of the Company, and not the Vice-President, as was stated), to whom we were indebted for the views and information published, that the works are once more in full operation; and we cordially join with him in expressing the hope that they may never again be stopped by such a disaster as that which lately visited them.

**Progress of Italian Gas Companies.**—Judging from the report of the meeting, held on the 3rd inst., of the *Società Italiana per il Gas*, and its allied Companies, increasing output and greater sales of gas are the order of the day in Italy as elsewhere. The Company named are chiefly concerned in gas-works in Turin, Bergamo, Tortona, and Girgenti. The amount of gas sold by the Company in these four towns in 1909 was respectively: 20,136,802 cubic metres; 1,694,051 c.m.; 451,055 c.m.; and 325,389 c.m. The average increase compared with the previous year is over 5 per cent.; but the small undertaking at Girgenti is of interest, as the increase there was no less than 40 per cent.—showing what can be done by active propaganda even in small towns. The *Società Italiana* is also interested in two other Companies, the *Società Industria del Gas* and the *Società Ferrarese*. The former have an increase of 4·9 per cent., the latter of 6·3 per cent.

**Revivifying and Utilizing Gas-Purifying Materials.**—A patent has been taken out by the Société d'Éclairage, Chauffage, et Force Motrice, of Paris, for a method of revivifying gas-purifying materials by means of ozone; and another by M. Simonini for the utilization of these materials. According to abstracts of the specifications in the "Journal of the Society of Chemical Industry," the Gas Company's process consists in treating ferric oxide, sawdust, and lime, which have been used in the purification of gas, with ozone in the presence of moisture in a closed vessel; the ozone being in the form either of ozonized air or ozonized oxygen. By the method of M. Simonini, the purifying materials, comprising ferric oxide, sawdust, and lime, are first extracted with carbon tetrachloride or other organic solvent in an autoclave, in order to dissolve out the sulphur, which is afterwards separated from the extract by distillation of the solvent. The insoluble residue is treated with steam in an autoclave for two or three hours, and finally the residue is submitted to destructive distillation, or to distillation with alkali, in order to obtain the nitrogen as ammonia. The residue, after treatment with steam, may alternatively be treated with sulphuric acid.

## YORKSHIRE JUNIOR GAS ASSOCIATION.

At an Informal Meeting of the Association held in December, Mr. M'Nab, of the Low Moor Gas-Works of the Bradford Corporation, introduced the question of the revision of existing methods of testing meters; and so much interest was manifested in the subject and his suggestions thereon, that he was requested to embody them in a paper for inclusion in the printed "Transactions." His promise to do so was fulfilled in his contribution to the meeting held on Saturday at the Leeds Institute, under the chairmanship of the President, Mr. S. W. SHEPHERD.

Mr. P. M'NAB (Low Moor) then read a paper, of which the following is an abstract, entitled,

### SUGGESTIONS ON "THE SALES OF GAS ACT, 1859."

I propose to call your attention to the necessity for the revision of the statutory methods in connection with the testing and stamping of meters. These are governed by the Sales of Gas Act of 1859; and the very mention of that date is sufficient to provoke the inquiry as to its adequacy for modern conditions. A few years ago, some of the most prominent men in the gas industry spent a great deal of time and labour on the question of the standardization of meter-unions, and there can be no doubt that such an arrangement would mean a saving to all gas concerns; but I beg to suggest that my present subject is of far more importance, considering that the meters are working year after year under altogether different conditions from those to which they are subjected while being passed as gas measures.

I will give you a few reasons why I think the present Act unsatisfactory. After fixing the standard, the Act states in the first portion of clause 13—

Firstly, the meters shall be tested for soundness or leakage only, and not for percentage of error, when fixed on a horizontal base, and with gas under a pressure equal to a column of water three inches high, with a light or lights consuming not more than one-twentieth part of its measuring capacity per hour marked thereon, nor less than one-half of a cubic foot per hour, for all meters of a measuring capacity not exceeding one hundred cubic feet per hour, and not more than one-fortieth part of its said measuring capacity per hour for all meters of any greater measuring capacity per hour than one hundred cubic feet; and all meters found to work under such test shall be deemed sound meters, and any meter found not to work under such test shall not be stamped.

It is here that my first objection is raised. I think that the pressure employed for this test is insufficient, because the day of low pressure has gone by, and many ordinary consumers' wet and dry meters have to work under pressures very much higher than this. In fact, many are fixed for ordinary domestic purposes where the pressure reaches 6 inches water-column. Where wet meters are used, there is a greater displacement of water, some of which is often blown out of the meter altogether, through the tube in which runs the vertical spindle to the index, and often at the filling-tube. In some meters, this is prevented by the spindle having to pass through a stuffing-box. This leaves the filling-tube the weakest place, as it depends on how long the leather washer will stand the necessary unscrewing and tightening up. These precautions take away the vent from the front of the meter; and after watering, water is driven into the back portion, until gas reaches that place also, and comes on to the top of the water—thus forming a back pressure. If an attempt is made to work these meters above their capacity, the back pressure is relieved. Then it is only a question of the pressure at the inlet lowering the water in the front, and the float cutting off the supply. This continues until a vent has been given, and has been known to happen when the capacity of the meter was not being exceeded. To some extent this may be remedied, if the old practice of supplying a meter for double the number of lights marked on it is avoided.

A new dry meter will stand a much more severe test, but after several years' working will often show the necessity of an increased pressure when being tested for soundness. Dry-meter diaphragms are made from the skin of a mountain sheep or goat. Modern gas seems more readily to absorb the oil, and thus tells sooner on any bad workmanship, or an inferior quality of oil. A certain amount of gas is thus enabled to pass through the meter without being registered, which would probably not be shown under the present test, but still be taking place while the meter was working at a higher pressure on the consumer's premises. For instance, a meter may be gratuitously passing one or two bye-pass lights for incandescent lighting or in connection with automatic lamp-lighting. This may appear a mere detail until calculations are made of the number of such meters, with the amount the bye-pass consumes per hour, and the number of hours it is burning per year.

The second portion of clause 13 reads as follows—

The meter to be tested for percentage of error shall be fixed on a horizontal base, and shall be tested at a pressure equal to a column of water five-tenths of an inch high, and passing the quantity of gas or atmospheric air per hour which shall be marked thereon as its measuring capacity per hour; and the water used in such testing, and the air of the room in which such testing shall be made, shall be as nearly as practicable of the same temperature as the gas or air passed through the meter.

As these rooms are kept at a temperature of 60° Fahr., the



water, air, &c., used must be about the same. A difference of 1 per cent. is made by 5° variation in temperature. Now, supposing the account of a consumer through some cause or other is larger than usual, the registration of the meter is at once disputed; and it is sent to the Government inspector to be tested. The inspector keeps the meter in his room for some time, until it is at the same temperature (60° Fahr.) as the room; while in the majority of cases the meter has been working in a temperature of from 45° to 50° Fahr. in the summer, and in winter it often gets near freezing-point. Is this a fair test? Then it is tested for registration at 5-10ths pressure. Where are there consumers' meters to-day working at 5-10ths pressure? It must be admitted that there is room for improvement in the registration of all meters when worked to their full extent, with the higher domestic pressures now used. The following tests, using air at about 60° Fahr., show that an improvement would be made by an increase of pressure in the registration test.

These meters were regulated to pass their full capacity (18 cubic feet per hour) at each of the following pressures:—

"A" 3-Light Wet.		"B" 3-Light Wet.		"C" 3-Light Dry.	
Pressure in Tenths.	Percentage of Error.	Pressure in Tenths.	Percentage of Error.	Pressure in Tenths.	Percentage of Error.
5	2.4 Fast	5	1.42 Fast	5	Correct
10	2.5 "	15	2.40 "	15	0.5 Fast
15	3.0 "	25	2.60 "	25	1.0 "
25	3.6 "	35	2.46 "	35	1.5 "
35	3.9 "	45	2.25 "	45	2.0 "
45	4.1 "	60	2.25 "	60	2.4 "

A pressure of 50-10ths blows water out of meter "A."

The following were set to pass their respective full capacities only at 5-10ths pressure, and the pressure was then gradually increased:—

Pressures.	5-10ths.	15-10ths.	25-10ths.	35-10ths.	45-10ths.	60-10ths.
Size of Meter.	Per-centage of Error.	Per-centage of Error.	Per-centage of Error.	Per-centage of Error.	Per-centage of Error.	Per-centage of Error.
5-lt. Wet No. 1.	1.25 fast	0.75 fast	0.40 fast	Correct	0.4 slow	1.0 slow
3-lt. " No. 2.	2.00 "	1.60 "	1.00 "	0.75 fast	..	..
3-lt. " No. 3.	2.40 "	1.83 "	1.01 "	0.60 slow	..	..
3-lt. " No. 4.	1.52 "	1.25 slow	3.38 slow	4.76 "	..	..
3-lt. Dry No. 1.	Correct	1.48 "	Correct	2.04 fast	Irregular	..
3-lt. " No. 2.	0.50 fast	0.50 "	..	2.40 slow	2.50 slow	3.0 slow
3-lt. " No. 3.	0.50 "	Correct	1.00 slow	1.75 "	2.00 "	2.4 "

The meters tested were all new, and made by various manufacturers. The wet meters were of different construction; the 5-light being one of the most suitably constructed wet meters, to give good and steady lights, and also maintain supply when working under the higher pressures. You will observe that this particular meter, and Nos. 2 and 3 of the dries, are within the limits of error allowed, at all the pressures stated; but they go gradually "slow" with the increasing pressure. From these tests, it may be assumed that, with meters stamped when 3 per cent. slow at 5-10ths pressure, there will be a further loss to the gas concern in proportion to the increase in pressure, and the extent to which the original capacity of the meter is exceeded. The loss to the consumer would be reduced in proportion to the extent that the limit "fast" is exceeded. There are very few cases, however, where the consumer's meter is not called upon to deliver gas above its capacity at various times, owing to the rate of consumption, when unregulated, or even the smaller class of stoves, fires, &c. The wet meters tell more readily when their capacity is being exceeded, as when the stated pressure had been reached with Nos. 2, 3, and 4, it was shown by the action of the floats that satisfactory lights could not be obtained with an increase in pressure, or that water would be blown out. There being no such inconvenience with dry meters, it has led to their more general adoption in connection with heating purposes; and it will be seen that more care should be taken that they are not overworked. When works' station meters are not kept at 60° Fahr., corrections are usually made when stating the amount of gas manufactured. But it is not practicable to do this with consumers' meters; and as the unaccounted-for gas is the difference in the registration of these two, this forms an important contribution.

Clause 12 provides—

Meters not to be stamped if more than 2 per cent. incorrect in favour of the seller or 3 per cent. in favour of the consumer, and to be stamped if erroneous to no greater extent.

This means that a meter would be stamped if 2 per cent. fast or 3 per cent. slow. I do not think that the range of error should be greatly reduced; but why should it not be the same on each side? If this difference of 1 per cent. in favour of the buyer has been allowed on the assumption that all meters go gradually "fast," it is like admitting that they are only meters within the meaning of the Act for a few years. Personally I cannot say, from the recorded testings of meters changed, or brought in through removal, whether the majority do so or not, because if our meters are found faulty in any of the previous tests, for soundness, lights, escapes, &c., as a rule, time is not wasted by this further test. Even if the time could be spared, I should

not rely very much on it. Only in special cases—such as doubtful or disputed accounts—is this test made. Mr. James Stratford, Gas Meter Inspector for the City of London, in the course of his report for the year ending Dec. 31, 1908, says: "Of the meters tested for disputed registration, 3083 were found to be correct, while 3527 were wrong; 1304 being fast and 2223 slow." Evidence of this kind provokes thought, and should lead to action. It is evident that the meter "without float" is considered a special, and should be tested as such—viz., at the pressure and temperature of the place where it is intended to be used.

Clause 10 reads—

No meter duly stamped under the authority of this Act shall be liable to be re-stamped, although the same may be used in any other place than that at which the same was originally stamped, but shall be considered a legal meter throughout the United Kingdom, unless found to be incorrect within the meaning of this Act.

This appears to be the greatest objection to any alterations being made; but surely a more approximate average of the conditions could be obtained which would bring the testing more up-to-date.

Clause 19 reads—

The fees for examination, comparison, and testing, with or without stamping, meters shall be sixpence for each meter delivering a cubic foot of gas in four or more revolutions or complete repetitions of the action of the meter, and one shilling for each meter delivering a cubic foot of gas by any less number of revolutions or complete actions or one revolution or complete action; and for each meter delivering more than one cubic foot of gas by one revolution or complete action, the further sum of one shilling for every cubic foot of gas delivered at one revolution or complete action beyond the first cubic foot.

This makes the fee for stamping—

Wet Meters.			Dry Meters.		
2 light 6d.	..	150 light 7s.	2 light 6d.	..	150 light 5s.
3 " 6d.	..	200 " 10s.	3 " 6d.	..	200 " 6s.
5 " 6d.	..	250 " 12s.	5 " 6d.	..	250 " 7s.
10 " 1s.	..	300 " 15s.	10 " 1s.	..	300 " 8s.
20 " 1s.	..	400 " 20s.	20 " 1s.	..	400 " 14s.
30 " 1s.	..	500 " 25s.	30 " 1s.	..	500 " 20s.
50 " 2s.	..	600 " 30s.	50 " 1s.	..	600 " 22s.
60 " 3s.	..	800 " 40s.	60 " 1s.	..	800 " 25s.
80 " 4s.	..	1000 " 50s.	80 " 2s.	..	1000 " 33s.
100 " 5s.	..		100 " 2s.	..	

To have meters stamped *in situ* is even more expensive. All gas-meters should bear the Government stamp. Is this the case with water or electricity meters? If not, why should such large sums be charged for the larger sizes of gas-meters?

The success which in recent years has attended the supplying of high pressure gas direct from the mains to the point of consumption may be considered a reason for the insertion of a new clause, dealing with meters intended to register the consumption of this gas. Theoretically, gas at high pressure can be measured by both wet and dry meters, as the pressures should be the same on each side of the drum or diaphragms, as the case may be. For practical purposes, the dry will be found the most advantageous, as the wet will require a great deal more attention to give satisfaction to each party, owing to the amount of water being evaporated, due to the extra dryness of the gas, causing unsatisfactory lights, or the supply to fail altogether. Where a meter "without float" is used, the liability to pass gas unregistered will be much increased.

The dry meter is affected by the dryness of the gas abstracting oil from the diaphragms, thus allowing the gas to pass through the pores, and be consumed unregistered. The valves must also suffer in this case, as the gas has generally been relied upon to contain sufficient lubricants for them. But before this stage has been reached, a wet meter would probably have cost a deal more in attention, besides having to be watered more frequently than when working at ordinary pressures. As they are at present made, the cases of the meters are likely to prove a weak place in both instances.

Referring again to clause 13. These meters have been tested for registration at 5-10ths pressure water-column, and have passed as measures if not more than 2 per cent. fast or 3 per cent. slow; but while working at 54 inches of water, or 4 inches of mercury which appears to be the pressure most generally employed, the meter would be registering about 13 per cent. slower than when originally tested, and will not be a meter within the meaning of the Act.

The matter of payment for the gas, corrected for the loss of volume due to compression, may be arranged with the consumer by agreement. Still, it is not advisable to keep adding to the several existing agreements between consumers and gas undertakings, even if such a course be quite legal. A better method would be to use a specially made index, and charge in the usual way. As the demand for this gas increases, it will be met by improvements in the meters to be used for its registration; but testing such meters at 5-10ths water-column pressure is wide of the mark.

Unlike other weights and measures, it is optional whether a meter when once tested and fixed shall be re-verified; and many work twenty or more years without being tested again. This is an unsatisfactory state as between buyer and seller; and some reasonable period for re-verification should be determined. In addition to the report by Mr. Stratford, evidence has been supplied by the Manchester Corporation, who recently decided that all gas-meters which are owned by the consumer and have been used by them in the Manchester area of supply for a period of



ten years should be re-tested. Out of a total of 676 such meters tested, there were only 135 found correct, while 541 were incorrect, equal to 80.1 per cent. Where this is not done at present, there should at least be a periodical testing of meters for soundness. This can be carried out to a certain extent *in situ*, by having the full supply on at the inlet and burning the gas at the tap nearest to the outlet side of the meter until the pointer on the small testing-dial has reached a figure; or with wet meters a figure on the testing drum above the index should be brought opposite the stationary pointer, and the gas then be reduced to a small light by means of the tap on the outlet side. An observation of a few minutes will then show approximately the condition of the meter.

The necessity of an index test has already been urged; many errors in the registration of meters having been traced to this part. In the event of the present index being adapted to register the correct amount of gas consumed through high-pressure meters, it will be most essential that a test for this part of each meter should be incorporated in any future Act. Some material difference should be made in the seal affixed to all meters used for the sale of high-pressure gas, so that the two classes of meters may be easily distinguished.

The Act exercises no control over the automatic attachments to meters, though in prepayment consumption they are the predominant measures. Being part of the whole prepayment meter, this mechanism should be tested for accuracy before the meter is stamped. Take, for example, a few prepayment meters set to give (say) 25 cubic feet for 1d. At times some of these will give only 23 or 24 cubic feet; but for the next coin inserted 26 or 27 cubic feet are given, or *vice versa*. So that with four coins put through, and then tested, the proper amount of 100 cubic feet is given. The average of another meter gives 1 cubic foot over for every coin. Thus, when 2500 cubic feet have been paid for by inserting 100 pence, the meter indicates that 2600 cubic feet have been used. This is generally called a "short" by the collector, and an "overplus" is given by attachments with an average below what they are set to give. Many complications have arisen through such prepayment meters; for though a consumer will be delighted to have money returned from the meter, it is not desirable to be knowingly inaccurate, and it cannot be legal to retain an "overplus" to make up for other "shorts"—especially so where signed agreements have been made so that in cases of dispute the consumer pays for what the meter has registered. It is another thing to obtain payment for "shorts" where there is no agreement, if the meter proves correct within the present meaning of the Act.

Perhaps the growing proportion of prepayment meters in use may hasten the revision of the whole question of meter testing, as, being an invention subsequent to 1859, they are only dealt with under the Act so far as the measurement is concerned, and not as regards the accuracy with which they give the purchased amount of gas. Through some cause or other, the whole question is bound to be re-opened sooner or later; and, in the meantime, the compilation of statistics of meters coming under our own observation, with full details of extreme cases, is a profitable piece of preparatory work for any who can join in it.

#### Discussion.

In response to the Chairman's invitation,

Mr. W. HOLE, Superintendent of the Gas Distribution Department of the Leeds Corporation, opened the discussion. He remarked that it was not easy to follow intelligently the experimental details given in the paper without having copies of them actually in one's hands, still less to criticize them profitably. One point of view adopted in the paper was very important and interesting—viz., the obvious difference between the conditions prevailing now and those under which meters worked fifty years ago, and its consequent bearing on the adequacy and satisfactoriness of the existing tests for meters. Thirty years ago, pressures of from 5-10ths to 10-10ths of an inch at the burner were considered to be meeting all requirements; now 15-10ths to 25-10ths were necessary. It was obvious, therefore, that a meter was not necessarily satisfactory because it passed the statutory tests. For example, in the case of a wet meter, there was, while it was working, a difference in the level of the water inside and outside the drum, caused by the back-pressure thrown by the drum. If this amounted to (say) 2-10ths, the water-level inside would be depressed 1-10th, and outside it would be raised to a similar extent. If the quantity that the drum was meant to pass was largely exceeded, friction, and consequently the back-pressure, increased. The level of the inside water was then still further depressed; the measuring capacity increased; and the meter therefore registered slow. In some of his tests, Mr. M'Nab had found meters becoming faster and faster with greater pressures. This would almost presuppose a lessening of friction, which could hardly be probable. He should like further light on this point. It was desirable never to work wet meters above their normal capacities, not only because, as he had just mentioned, this led to their registering slow, but because, if carried too far, it would result in some gas passing through the meter without being registered. To lessen the friction and allow of the ready passage of water from one chamber to another, the central edge of the partitions of the drum was cut away in a curve, and an extensive lowering of the internal water-level would allow gas to pass by this means from the receiving to the discharging chamber. This applied also to an overworked station meter. In this connection, the question of gas temperature was even more important. The

volume recorded by the station meter was commonly corrected to 60° Fahr.; but in many cases this was still not done. He knew of works where the average gas temperature at the station meter would be about 50° Fahr., and no correction was introduced. As every 5° Fahr. represented a difference of 1 per cent. in the gas volume, such works would start with the unaccounted-for gas 2 per cent. lower than similar works where the gas volume was corrected to 60° Fahr. He congratulated Mr. M'Nab on his industry in obtaining details of valuable comparative tests, and on his lucidity in expressing his views on a very important and pressing subject.

The PRESIDENT asked if Mr. M'Nab had any suggestions to make as regards dealing with the difference between the temperatures at the station meter and at the consumers' meters.

Mr. J. H. HILL remarked that, after all, they had to work pretty much by averages, though he admitted that this might be bad with slot meters, where they needed to be as accurate as possible. Unaccounted-for gas often admitted of some degree of adjustment, especially on the score of temperature. He had had a good many observations taken of the temperature of the gas in his mains during the wet and cold summer of last year, and had been struck with the extent to which such readings were below the average for the time of year. He would take the opportunity of thanking Mr. Hole for calling their attention, in his book on the "Distribution of Gas," to the possibility of meters passing small amounts of gas without registering; for he had himself found the need of keeping a strict look-out on this point.

Mr. W. CRANFIELD pointed out, in extenuation of the absence of copies of the details of tests, that these were to have been put on a blackboard, so that all could follow them; and it was only when too late that the absence of such a convenience in the room was noticed. He would emphasize the need of the very finest quality of almond oil for use on dry-meter skins. He said it would never do to ignore the great distinction between what were known as English and foreign almond oil, or to incur the risk of using an adulterated article because it was a little cheaper. A consignment of such an oil might entail far-reaching consequences in rapidly deteriorating skins and gas-meters soon becoming leaky and slow, and this being unnoticed and unsuspected because happening early after being repaired. The American Gas Institute, in their recent report on "Calorimetry," recommended that all experimental gas-meters should be tested at the pressures under which they would be likely to work—thus admitting the validity of Mr. M'Nab's main contention.

Mr. M'NAB, in reply, pointed out to Mr. Hole, in regard to his tests, that he had stated in his paper whether the meters were regulated to pass their respective full capacities at only 5-10ths pressure or at all pressures. In the former case, increase of pressure uniformly produced increasing slowness of the meter, as Mr. Hole had stated would happen; and this would be the condition with ordinary meters. Only in meters re-adjusted for each change of pressure so as to deliver no more than their indicated capacity did increasing fastness show itself. As regards Mr. Shepherd's question, he thought that even if 60° Fahr. was an average air temperature, a lower figure might well be adopted as an average gas temperature.

[Specimens of sewn and unsewn skins, diaphragms, &c., were passed round for examination.]

#### Gas-Fires and Ventilation—A Correction

Some misconception has been caused, and not a little dissatisfaction, by an erroneous report that appeared last week in the "Yorkshire Post" regarding a lecture by Mr. E. W. Smith on "Fuel and Ventilation." The report was necessarily much condensed; and the keenest regret is felt in gas circles in the district in which the "Post" circulates that any unfair representation of the views of Mr. Smith—a representation derogatory of gas-fires—should have obtained such publicity, inasmuch as it is widely known that that gentleman is responsible for the gas-heating research work that is being carried on, in connection with the Institution of Gas Engineers, at the Leeds University. The words in the report (which, it is obvious, are not Mr. Smith's, but an inference of the reporter's) that are misleading are the concluding ones in the statement: "Gas-fires were a saving in expense, but he did not particularly advocate their use." A correcting letter from Mr. Smith has since been published. In the course of it, he writes: "One of my objects was to give an impartial account of the state of our knowledge with regard to the efficiency of gas-stoves. In comparing them with coal fires, I did not wish to express any preference or final judgment; but I should like to say that my sympathies are with the use of gaseous fuel, and that I look forward with confidence to its extended application in gas-fires of the best modern type."

**Gas Companies Standard Burner Bills.**—It will be seen from our "Parliamentary Intelligence" that these Bills have been referred to a Select Committee of the House of Lords, to be presided over by Lord Joicey, the Chairman and Managing-Director of Messrs. James Joicey and Co., Limited, and the Lambton Collieries—the two largest colliery companies in the county of Durham. The Committee will meet on the 7th prox.; and all parties concerned may, we think, congratulate themselves on the selection of the Chairman.



## COMPETITION & DEVELOPMENT OF GAS SALES.

In last week's "JOURNAL" (p. 738), there appeared a paper by Mr. B. J. BELL, on "Competition and the Development of Gas Sales," which was read at the last meeting of the Midland Junior Gas Engineering Association. Unfortunately, the report of the discussion was crowded out of that issue; but it is given now.

Mr. R. J. ROGERS (Birmingham), after voicing the pleasure of the members at having submitted to them a paper which gave such ample scope for discussion, remarked that the question of developing their business was, of course, an all-important matter. Electricity undertakings, as shown on Diagram No. 1, were making very extensive progress; and he thought gas engineers generally were fully alive to the need for activity and vigilance to combat this competition. With reference to Diagram No. 2, he noticed the author said this showed the sales of electricity for lighting and power purposes in the case of certain undertakings. He (the speaker) took it that the figures did not include the power current employed for traction purposes. As to the methods of charging for electricity, it was stated in the paper that these were varied. There was no doubt that they were very varied; and electricity companies did not seem able to come to any satisfactory agreement among themselves as to what system they should adopt. The proposals of a "Fixed Price Company" were mentioned. Well, it would be rather interesting to note the results of this scheme in twelve months' time. He did not believe it was a system that was going to prove very satisfactory. It did not seem to him that gas had much to fear from the competition of electricity for heating purposes. Of course, at present it was more or less of a novelty; but it really appeared as though the heating of such things as curling irons was about the most useful purpose to which electricity could be put in this direction. Certainly, no opportunity should be lost whereby people might be educated further in the uses of gas. Doubtless the public generally were becoming more enlightened as to its advantages; and many of the old prejudices were dying out. The importance of paying attention to the builders and architects was a point that could not be too strongly emphasized. From his own personal connection in business with architects and builders, he found that at the present time they were not well advised as to gas matters generally. As the author of the paper remarked, they were usually rather inclined to electricity. The system he had himself adopted, however, in his particular portion of the business was to obtain the addresses of all the architects and the builders in the district, and systematically call upon them from time to time. Thus he was able to keep in touch with them, and, when premises were being erected, to advise them as to the size of pipes necessary and the provision that should be made for gas apparatus. Very often the builder, if left to himself, did not give due consideration to these matters; and the result was that when the tenant got in, he found that no provision had been made for gas apparatus which he would otherwise have used. To instal these appliances subsequently might necessitate structural alterations, the cost of which the tenant would not care to incur; and so the idea of using gas would be discarded. Money and trouble were well expended by gas undertakings in seeing that architects and builders were fully looked after. As to small pipes, there, again, arose the necessity of keeping in touch with the builder. If pipes were put in too small at first, there was everlasting trouble afterwards. In the majority of cases, it was not the builder, the owner, or the architect who was to blame for this, but the "jerry" gas-fitter, who got in a point, or something like this, more by putting in the small pipes, and did not care what the consumer might suffer subsequently. They should do what they could to stop this. With regard to the inspection of gas-engines, he quite agreed that something should be done in this direction. He had sometimes come across engines working under very adverse conditions, due possibly to some slight defect. Gas engines might be given up in consequence of some little trouble which a proper inspection would have overcome. If such an inspection was carried out systematically, it should certainly lead to good. There was undoubtedly a great field for the development of high-pressure gas; and much attention was being given to the question. In Birmingham, they were hoping before long to hear more of this important phase of gas supply. In conclusion, he thought the maintenance of consumers' gas-fires should have more attention than was at present the case. Frequently he came across gas-fires working under villainous conditions, which certainly were of no advantage to the gas undertakings. In some places, he believed, it was the custom in the early part of the autumn to make calls on all consumers who were known to use gas-fires. This was done either at a nominal charge or gratuitously. This was a matter that everyone interested in increasing the consumption of gas should take in hand.

Mr. B. SKIDMORE (Smethwick) inquired whether the system of hire-purchase of gas-engines was adopted in any particular town; and, if so, with what results, both to the hirer and to the gas undertaking. With reference to the use of high-pressure gas for industrial and other purposes, a short time ago, in another place, he had the pleasure of listening to Mr. S. R. Barrett, who gave an instructive lecture on the subject.\* On that occasion the exhibi-

tion of apparatus in use and the results of experiments made were greatly appreciated by the audience, and were of great use to himself and other people engaged outside Birmingham who had not had an opportunity of seeing anything of the sort. A lecture of a similar character would no doubt be of great benefit to many members of the Association.

Mr. W. GIBBS (Birmingham) thought that there was very great scope even now for the increase of the sale of gas. One point was the hot-water circulator, which gas authorities should push, as there was a good field for them. They enabled a householder to discard his coal-range altogether, certainly through the whole of the summer. Great attention should also be paid to shop lighting, especially outside lighting. The only thing the electricians seemed to have to say was that they could put their lights inside the windows; and this had proved fatal in some cases lately. They hoped in Birmingham to more than hold their own with the aid of high-pressure gas. As to architects and builders, they should be induced to put in rather larger pipes than they had been in the habit of doing. When approaching a consumer, if the supply was in readiness, it would often lead to an order for the fixing of gas-fires. The gas undertaking really wanted in houses a little scullery to themselves now, for the cooker, the wash-boiler, and the circulator; but with a little persuasion, they should succeed in getting more room still in the future. Maintenance needed to be taken up very strongly, when good results should accrue. It was a means of retaining a consumer after an installation had once been put in.

Mr. A. N. COMELY (Windsor Street), referring to the question of gas-engines, expressed the opinion that gas undertakings would be more than repaid if they followed on the lines laid down by Mr. Bell—namely, indicating the gas-engines in use for power purposes, or generally advising consumers on their plant. When a customer had a new engine installed, he should be encouraged to make a set of gauges so that the positions of the valves and cams could be checked after the engine had been at work some time, because wear and tear always took place. If the engine got out of order, the consumption per horse power was much more. Another thing that was worth the attention of gas suppliers was the pressure. Many unsatisfactory results with engines were largely due to this matter. Engines would work well and satisfactorily with 15-10ths pressure, and they might run at 13-10ths or even less if the load was not great compared with the total horse power; but if they were loaded to within (say) 10 or 20 per cent. of their rated capacity, and the pressure dropped below 15-10ths, trouble began straight away. No engine would work well unless the bunsen tube was at a good heat; and unless there was a proper supply intelligently arranged, there was bound to be trouble on this account. In his opinion, as long as they could explode the charge in the cylinders with gas, it was a great pity to fall back on electrical ignition, simply owing to difficulties of this kind. Any trouble taken on behalf of the users of gas-engines, would repay the gas undertaking tenfold.

Mr. F. J. WARD (Knowle) said that, at the beginning of the paper, the author remarked: "If gas is to retain its present position, consumers and their requirements should be considered in much the same way as any ordinary manufacturing business caters for its customers." Were they to take this as a confession that gas undertakings had not done so in the past? If so, he must certainly demur. In his own particular case, he not only made the gas, but supplied it right up to the burner. He believed that about 98 per cent. of the work done in the district was carried out by his Company; and this had been so ever since he had been connected with the undertaking—about thirteen years. Therefore they were able to give that satisfaction to the consumers which they required. He believed he knew almost every single burner in his town; and he was aware of their peculiarities, as well as of the peculiarities of the customers. He did not, of course, suggest that this could be carried out to the same extent in Birmingham. With regard to the consumption of electric current shown in Diagram No. 1, if this included the amount used for traction purposes, the tremendous rise would be accounted for. Personally, though he was a gas manager, he was not going to say that gas was everything. There was a certain field for electricity. This was a fact that had been recognized by other gas managers, for some even had it in their own works. His feeling was that it was a great mistake that electricity and gas should be produced by different authorities, or at different works. They should be controlled, as they were in some places, by at least the same committee or the same board, if not by the same engineer. In this event, it would be possible to go to customers and say: "You can have electricity at a cost of so much, or gas at a cost of so much. Please yourself which you adopt." Only last week he attended the meeting of a gas company in which he was interested; and he suggested to the directors that they should take into consideration the fact that electricity would have to come into their district before very long, and that therefore they should be prepared, when the time arrived when it would pay anyone to supply it, to do the thing themselves, and so stop that miserable cut-throat competition which was seen to-day. If this course were adopted, there was no doubt that both suppliers and consumers would benefit. In his own case, he believed his Directors had resolved to do this when the time came that it would pay to supply electricity. Whatever gas people might do, there were some persons who would have electricity if possible; and it must be recognized that it was hopeless to expect them to do otherwise. Notwithstanding this, however, he

\* A full abstract of this lecture appeared in the "JOURNAL" for Nov. 30, 1909, p. 607.



had great faith in the future of gas, which he believed was even more promising than its past. Gas-fires had recently been improved beyond all measure. The single fuel fire of to-day, with air and gas adjusters, was a vastly different thing from the fires of even a few years ago; and they were able to offer the public something, and say it was the thing they required, without hurting their consciences. But it was necessary to take into account the place in which the fire was to be fixed. Most of the fires were made for radiating purposes pure and simple. This had been made a great point of; and no doubt there was a great deal in it. But it must be recognized that all situations and all rooms were not the same; and before they could properly decide what to supply the consumer with, they must know the peculiarities of the apartment in which the stove was to be placed. His own office, for example, was damp; and he had put in a stove that heated and dried the air. A radiating stove pure and simple would be a failure there. It was necessary to exercise discrimination. He often tried to dry the air where rooms were damp. In his district, they piped practically all the houses. He frequently took a contract on at a loss, simply that he might keep other people out, and so be able to put in pipes which he knew would be efficient. He always made it a point that pipes should be put in so that gas-fires could be used in any room without giving any trouble to the consumer. It might not be possible for some to do this; but in his case, the matter was in his own hands entirely. The author suggested that rotary meters should be used. There was no doubt they were accurate if there was a fairly large amount of gas passing through; but were they correct if the consumption was rather small? He believed it was possible to pass gas without it being measured. It was necessary that gas-engines should be carefully looked after. There was a considerable amount of gas used in engines that was not consumed at all. A good many charges went through an engine that were never exploded. The bunsen tube not being kept hot was, of course, a great thing. By looking after this matter a good deal more satisfaction could be given than if it were not attended to. He had a gas-engine driving an exhaustor in his works; and he thought all gas-works machinery should as far as possible be driven in this manner. It was not a good advertisement for a person to go to a gas-works to talk of gas-engines, and to find a steam-engine doing the work there. There were good and bad fitters; and it was their duty to educate them as much as ever they could. They required better workmen; for if they could secure them, they would obtain better results. With reference to gas pressures, he might say that he never made any alteration, night or day, year in and year out. One must be judged by results; and his leakage was not more than  $3\frac{1}{2}$  per cent. His pressures were, of course, a little bit higher by day than at night; and he maintained that with a high pressure during the day, the fitters could do better work. A leak would be noticed with a high pressure which would not be with a low one. If work was being done with low pressure in the pipes, that was to say, leaks would not show which would manifest themselves at night when the pressure was increased. Further, in small works the pressure was likely not to be put on and taken off when it should be. He would not alter his pressure for a great deal. Had Mr. Bell been troubled with petrol gas? In country districts this commodity had to be considered. If the author had any figures available, he would be glad to have them. Petrol gas people were quoting some extraordinary figures in competition with him. He heard they could supply at a price, including everything, equal to coal gas at 2s. per 1000 cubic feet. With regard to inverted burners, he would use an adjuster that would give one, two, or three holes, as desired.

Mr. HAROLD JONES (Stourbridge) asked what was the price of gas in Birmingham for power and industrial purposes. In using furnaces of any size, the price of gas would be a serious consideration. It would be a very good thing if someone connected with high-pressure gas supply would some time give the Association the benefit of his experiences of the use of this system for furnace work.

Mr. W. H. JOHNS (Saltley) remarked that at one time the gas manager was content to remain on the works and let the district look after itself. It was only of recent years that the sale of gas in the district had been pushed to any extent. As to Mr. Ward's reference to rotary meters, he took it that Mr. Bell meant that the meters he alluded to in his paper should be used as secondary meters. He (the speaker) knew that rotary meters were not absolutely correct; but he did not think the inaccuracy would be such as to make much difference in the gas account, seeing that the gas would have to pass through an initial meter. If anything, it would be to the advantage of the gas undertaking, because he thought the arrangement in most cases was to charge a certain price for lighting and a lower rate for heating or power. As the gas was measured initially, the secondary meter became really a small consideration. He was surprised to hear that at Knowle the pressures were not varied at all. Having been connected with a gas undertaking in the South of England where the pressures were varied, he might say, every two hours during the day, it astonished him to learn that a gas-works could be run throughout the 24 hours without any alteration of the pressure. He was also surprised to hear that the unaccounted-for gas was as low as  $3\frac{1}{2}$  per cent. But to put the matter perhaps in a better position, he would like to know the initial pressure at the works. Possibly, after all, the pressure was not so high as some of the members were accustomed to. Referring to Diagram No. 1, he did not know whether this was the usual way in which electrical engi-

neers tried to show their increase. It seemed to him to be simply a means of endeavouring to show a greater increase in output than had actually taken place. At least, it appeared to indicate this diagrammatically. The author thought that the supply of electricity to workmen's dwellings was likely to increase in future. He (the speaker) remembered reading some time back that some buildings put up by the London County Council had been provided from top to bottom with electric wires and fittings; but when they were finished, there was some difficulty in obtaining tenants. At last the Gas Company—he believed it was the South Metropolitan Company—were approached, and it was then arranged that the whole of the premises should be fitted with gas lighting and cooking appliances. The result was that every tenement in this particular building was now let. He thought this was sufficient to show that electricity, at any rate in London, had not got such a hold on the working man as some people believed. There was no mention in the paper of the type of cooker that should be adopted for hiring-out—whether it should be packed or unpacked. In a great many towns—no doubt with due regard to capital expenditure—unpackaged cookers were fixed; but his experience of the unpacked cooker was a very unsatisfactory one. Probably the consumption of gas was much greater; but he did not think that this was a proper way of cultivating business, because it led to dissatisfaction, owing to the time that the food took to cook. And even when it was cooked, he did not think it was done nearly so well as in a packed cooker. He was also much surprised to find in the paper no mention of the advantages of a central show-room. They heard sometimes of places where accounts could be paid; but when they came to look, they found it difficult to discover them. There should be a prominent place in all towns, which had not got to be looked for, but which would make itself known very quickly. Some gas undertakings did not possess such a show-room; but they should be provided, and fitted with everything of an up-to-date character. Whether they thought they could sell an appliance or not, it should be there for people to see; and lectures and cookery displays should be occasionally arranged. He knew of at least one place where for the last three or four years gas had been compressed and supplied at a high pressure direct to a number of outside lamps at a fixed charge, which included hire of lamp, maintenance, and gas. It was not originally intended to supply gas in this fashion. The installation was at first meant to light the show-room; but owing to the satisfactory results, various consumers asked if they could not also be supplied. The consequence had been that gradually the main had been increased for the service of further outside lamps, which were fed from it without governors. He would like to know what would be the pressure in the Birmingham high-pressure installation. The pressure he was thinking of was about 12 inches. Also, would the gas be measured by wet or dry meters? He should think dry meters; but the general practice in Birmingham up to the present had been to supply wet meters. Further, would any charge be made above the ordinary rate for compressing, &c.?

Mr. B. W. SMITH (Walsall) said it had afforded him great pleasure to attend the meeting and hear Mr. Bell read his paper. He did not agree with Mr. Ward in the matter of having one general pressure. If he had had experience in a town of varying levels, he would find the pressures would have to be varied according to requirements. Of course, too, in a manufacturing place the conditions were entirely dissimilar to those of a residential one. If Mr. Ward would think these points over, he would not be too emphatic as to the desirability of adhering to one particular pressure. With regard to electricity, he (Mr. Smith) had an undertaking which, as was the case in Birmingham, was under the control of the Corporation; and there was always keen rivalry. There was no doubt that electricity was being pushed in every shape and form. What annoyed him most, however, was that the electricians were not satisfied with taking a consumer from the gas undertaking, but often that customer did not pay them to supply. The gas concern was paying a good sum over to the rates—which was a debatable point—and the electrical people took these consumers away to make a loss. This kind of competition was most unfair, and especially if electricity was being supplied for motive power and other purposes at a figure much below that at which it could be produced.

Mr. H. E. COPP (West Bromwich) expressed his appreciation of Mr. Bell's paper, which he thought was an admirable one in every respect. A great amount of information had been compressed into a very small space. He could have said a lot about the paper; but as the discussion had been long, he would let the members off with a few remarks. At the beginning of the paper, the author gave some figures as to the growth of electricity. This was surprising; but there was also shown the growth of gas, which he (Mr. Copp) considered still more surprising, when everything was taken into consideration. Electricity was a new thing; and a great many people were infatuated with it. He used the word advisedly, because it amounted to nothing less than infatuation with some persons. Of course, he admitted that electricity had its uses. It would be absurd to decry it on every point. In fact, he often recommended consumers to make use of electricity—he did himself—for compressing gas. Competition with electricity he thought was very healthy. He was not at all afraid of competition—he welcomed it. The more they had of it, the better gas would do in future, provided that the competition was fair, or as fair as they could expect to have it, at any rate. One point he wished to emphasize was that gas people should take the



greatest care to be strictly accurate in everything they might put forward, so that nothing might recoil upon the undertaking they served. Inaccurate statements were the sort of thing that did more harm than any amount of competition.

Mr. J. HEWETT (Birmingham) said, with regard to the progress of electricity, that Mr. Copp had drawn their attention to the fact that there was also an increase on the gas side; but he did not think he had made the position quite so strong as it actually was. Looking at the matter in one way, it might be said that the increase in electricity over the period referred to in the paper was shown to be something like 3000 per cent., while that of gas was only about 50 per cent.; but there was another way of looking at the matter. There was an increase in both cases; and of the total increase, the electrical people had only secured 25 per cent., while gas had obtained 75 per cent. This proved that gas was still in the running, and maintaining its lead. Reference had been made by Mr. Ward to rotary meters. He agreed with what was said by this gentleman. Some time ago, he (the speaker), when in the Black Country, saw a rotary meter being taken out to be replaced by a very much smaller one. He asked the reason, and was told it had been in use some time, but it had not measured any gas. If they were going to use rotary meters, perhaps the consumer would object if he had no deduction through the secondary meter not registering. The meter in the Black Country to which he referred was a large one.

Mr. JOHNS said he agreed with what had been said as applied to large meters, but not as regarded discount meters. He had some of the latter fitted up. They were not absolutely correct; but he thought they were near enough for all practical purposes when there was a differential price charged. He could not depart from his opinion that such meters were excellent things for arriving at the deduction to be made off the lighting rate for a power or heating supply.

Mr. WARD, in answer to a question Mr. Johns had put, said his pressure was 25-10ths always. As to Mr. Smith's remarks on the subject of a constant pressure, he (the speaker) could only say that he was foreman in a manufacturing district for many years; and he came to the conclusion then that if ever he was in a position to alter matters, he would do so. When he found people running to the works time after time, saying that they could not get engines to work because of the want of pressure, he thought it was only right that a change should be made. With regard to the rotary meters, he fully appreciated that they were to be secondary.

Mr. COPP, alluding to an inquiry by the last speaker about petrol gas, said that if Mr. Ward would take the calorific value of a gallon of petrol, and dilute it with as much air as he liked, he would find there was only a certain number of heat units. It was very easy to ascertain the flame temperature; and if he would do that, and spread it over as many cubic feet of air as he thought advisable, he would find that the price of petrol air gas was by no means comparable with that of coal gas at ordinary prices. It was, if he remembered rightly, equivalent to town gas at between 3s. and 4s. per 1000 cubic feet. At West Bromwich, they considered themselves to be among the pioneers in maintenance, and also in the inspection of consumers' gas-engines. They had not done much of the latter lately; but some time ago they were quite busy indicating consumers' engines, &c. This work was thoroughly appreciated by the consumers.

The PRESIDENT (Mr. A. O. Jones, of West Bromwich) remarked that the paper before them was one they could all discuss. Those on the works should do their best to get prices down, and those on the district should use every effort to increase the consumption of gas.

Mr. BELL said the discussion had been a long one; and it was not his intention to make a lengthy reply—more especially as many of the points raised had been already answered. The second diagram did not include anything for traction purposes. In the case of Birmingham, for instance, the increase would be five times, instead of three times, if traction was included. They were in the position at the present time that, however much they might admit there was a field for electricity, with the large amount of capital that was invested in gas undertakings, they must make this field as small as possible. Wherever they could, they must increase the consumption of gas, and eliminate the possibility of consumers becoming dissatisfied and ceasing to use gas. His paper was meant to draw their attention to the main points, so that they might be more thoroughly alive to the position of gas and electrical undertakings at the present time. The rotary meter was only proposed as a means of measuring gas for discount purposes. The cost was small; but the chief features were that very little space was taken up by them, and they could be fixed in any convenient position. They were, too, sufficiently accurate for the purpose for which they were required. As to fitters, the remark he made was intended more to apply to advertising. They could not help noticing that the contractors for electrical work were more pushing than contractors for gas work. Wherever there was an opportunity, they were actively canvassing, primarily to get work, but eventually for the electrical undertaking. In the case of one large concern, at any rate, it was not found necessary to employ canvassers, for the simple reason that every contractor was a canvasser. They could not say the same in connection with gas undertakings. It was a point whether it would not be better to have canvassers, as was done in some instances, to push the sale of gas. When he said canvassers, he meant men to call on every consumer in order to see how things

were going on. The advantages of show-rooms were admitted; but they were so uniformly adopted, that he did not think the point worth mentioning. It was generally agreed that packed cookers were best; and unpacked ones were only used as a matter of expediency. He noted that high-pressure gas had been supplied to consumers without governing; and no doubt in future this field would be increased. The pressure in Birmingham, he understood, was to be 60 inches. The price would have to be decided later. The charge for gas for power in Birmingham was 1s. 6d. per 1000 cubic feet; and there was 3d. off the lighting rate for industrial purposes. He would like to congratulate Mr. Copp and their President, because he had noticed a remark from an electrical source that, with the cheap gas supply at West Bromwich, lighting was a secondary consideration. Cheap gas and inverted burners had upset the calculations of the electricians there. He was asked if he could give particulars of any place where gas-engines had been installed on hire-purchase. He had before him a letter from a gentleman connected with a large undertaking who had supplied the following engines on these terms: Two 190 H.P., two 140 H.P., one 110 H.P., and one 15 H.P. Of course, the consumption of gas would be considerable in the course of a year.

## FORMATION OF COAL.

By Mr. H. E. DORAN, Assistant Chemist at Granton.

[Abstract of Paper read before the Scottish Junior Gas Association, Eastern District, March 12.]

The author began by saying he proposed to give a very brief sketch of the formation of the rocks constituting the coal strata, and a general idea of coal itself. The group of rocks with which they, as gas makers, had to deal comprised sandstone, shale or bind, limestone, coal, and underclay. That coal was mineralized vegetation was a point on which there was practically no doubt. It was composed of carbon, oxygen, hydrogen, with a small proportion of nitrogen, and therefore consisted of the elements which make up all vegetable organic compounds.

Taking a block of coal, the author pointed out that it consists of bright, clean coal, parted by thin layers of mineral charcoal. When a slice of this coal is cut parallel to the bedding, and ground down thin enough to transmit light, and examined under the microscope, it is found to consist of two parts. There is a black or dark brown granular ground mass, and scattered through this there are numerous semi-transparent discs and rings of a yellow colour. In a section perpendicular to the bedding, elongated yellow bars run through the ground-mass, roughly parallel to the bedding, and some of these are like vertically flattened hoops. It is clear that these yellow patches are the round spore-bags, which have been flattened by pressure. These bags average 1-20th inch in diameter, and inside them, and sometimes scattered through the ground-mass, very much smaller yellow spots have, in some cases, been noticed. Professor Huxley believed the dark ground-mass to be highly carbonized spores.

As coal is always found beneath a layer of shale and sandstone, and as these rocks were formed at the bottom of the sea, it follows that the land surface must have been submerged several times. On many parts of the coast, what are called submarine forests may be seen. These consist, for the most part, of stools of oak, beech, and fir trees; the roots being still embedded in the clay in which they grew. If one of these forest beds could be gradually depressed and covered up by new deposits, it would present the same character as an underclay of the coal. Wherever a coalfield is now found, a dense forest has at some period existed, consisting for the most part of gigantic club-mosses and tree-ferns; and as the seasons rolled on, these plants developed their spores and seeds and shed them in enormous quantities. These spores were of a resinous nature. This fact accounts for their preservation, while the greater part of the stems and leaves were rotted away by the long-continued action of the air and rain, or became converted into mineral charcoal; on the other hand, the spores and sporangia, preserved by their resinous nature, became converted into a compact and intermediary substance.

Coal far surpasses every other substance in value and importance as a fuel; yet it has come comparatively slowly into use—it being towards the end of the Thirteenth Century before it was much employed in London. In some parts of England, however, it had been burned long before this, as it is known to have been, to an extent, an article of household consumption by the Anglo-Saxons in the Ninth Century. There is also evidence to show that the Romans were acquainted with its use, as coal cinders have been found in the ruins of Roman buildings. For a long time after coal was introduced, strong prejudice existed against it. Proclamations were issued by Parliament forbidding its use in the reign of Elizabeth and Edward the First; and as late as the middle of the Seventeenth Century petitions were presented to Parliament against its employment in London, on account of its smell. Change and invention, however, soon made its use compulsory, as, for instance, the introduction of steam navigation in 1801, gas lighting in 1810, and, finally, the large extensions of the railway systems. The iron industry has also been a great factor in its use. A patent for employing coal for iron smelting was taken out in 1612; but it was a failure. It was tried again in 1618; but this attempt also failed. A third attempt was made



in 1713, but still without success; and it was not until coke was introduced in 1750 that this outlet for coal was assured and finally made certain by the introduction of the hot-air blast in 1830.

The PRESIDENT (Mr. H. Rule, of Falkirk) said the paper was one which, perhaps, could not be very much discussed; but if any members cared to offer any remarks, the meeting would be very glad to hear them.

Mr. D. BISSET (Edinburgh) observed that the subject was one which had been seldom dealt with in the Junior Associations, but thought it was just as well that they should have some theories and opinions as to how coal had been formed. They in the gas industry—and he supposed people generally—just accepted coal as coal; but Mr. Doran had taken them back thousands of years, and had shown them how coal was likely to have originated.

Mr. W. GEDDES (Edinburgh) said perhaps at some future time it might be a good thing if some other member were to take up the subject of the special kind of coal used by gas makers, and go into the matter thoroughly.

Mr. W. DUNLOP (Kirkcaldy) observed that with most of them their interest in coal ceased when they found out the yield of gas per ton, the quality of the coke, and the number and degree of impurities in it. Mr. Doran had taken them away on a different tack; and he thought they would be benefited by his paper.

The PRESIDENT said he was sure he voiced the opinions of all when he said they were very much indebted to Mr. Doran for his geological and historical paper. They were accustomed to seeing coal coming into the works, and they seldom paused for a moment to consider how it had been formed, or to reflect upon the countless ages it had taken to produce the material upon which their industry so much depended. Many theories had been advanced by geologists as to how coal came to be formed. Possibly they might never know the real truth of the matter. The best they could do—and this was what Mr. Doran had done—was to present to their minds a picture of what Nature was doing at present, in the way of depositing vegetable matter, and to think of the huge overturning and subjection to enormous pressure for centuries which coal had undergone.

## THE RATIONAL ANALYSIS OF CLAYS.

A considerable part of the March meeting of the London Section of the Society of Chemical Industry was devoted to the consideration of a paper by Mr. W. C. Hancock on "The Rational Analysis of Clays." The subject is one in which interest has been intensified in the gas industry by Mr. F. J. Bywater's paper, on "Refractory Materials," read before the Gas Institution in 1908. In the opening of the paper, the author referred to the ultimate analysis of clays; and then at once admitted that the rational analysis does not give much information of use in the actual technology of the manufacture of clays. The rational analysis aims at the mineralogical separation of clays into three stages—clay substances, quartz, and felspar. But the accuracy of the results of the rational analysis appears to depend upon the method employed throughout the process. Consideration has to be given to the effect of the reagents upon the minerals present in the clays, the ratio of the amounts of these reagents, the strength of the reagents, and the methods by which the mass is dealt with. The author went largely into the history of the subject, and showed the various methods proposed for carrying out the rational analysis. He also exhibited a number of tables. In these there was nothing to complain about between the quantities calculated and the quantities found, except in the case of the felspar, which appears very susceptible to attack on the part of the reagents. In all cases there was considerable divergency in regard to the felspar between the calculated and the amounts found by the rational analysis—this being explained to be due to a large amount being carried over with the soluble clay substances.

In the discussion, Mr. J. W. Cobb, of the Farnley Iron-Works, near Leeds, said that he had found the rational method somewhat unsatisfactory. The ordinary treatment with alkali was too drastic. Dr. J. W. Mellor, of the "Ceramic Journal," regarded the subject as a very difficult one; and he should have liked Mr. Hancock to have expressed himself more particularly on what he considered was the bearing of the process. In published work on this subject, there were glaring inconsistencies, which were not cleared away by what had been seen and heard that evening. In his view, the rational analysis was a mere juggling with figures. Mr. Bertram Blount thought it should be the business of the chemists to discover a more perfect method of rational analysis. They wanted a method, which might be partly physical and partly chemical, by which they could quickly make an approximate analysis of the mineral bodies present in the clay. He thought perhaps that a synthetic method of attack could be adopted; and then, in his opinion, a great deal more would be ascertained than now. Dr. Howe remarked that Mr. Hancock had undertaken this work at his instigation; and the result was that he (the speaker) had come to the conclusion that the rational analysis as it stood at present was of no practical use. If some sure and quick method could be found, it would be very valuable. In replying to the discussion, Mr. Hancock observed that there was no doubt the rational analysis did afford a method of sorting out clays very rapidly indeed; and, for this purpose, it might be useful. But otherwise he confessed he could not say much for it.

## MEASUREMENT OF LIGHT AND ILLUMINATION.

For the Meeting of the Illuminating Engineering Society last Tuesday, the subject chosen for discussion was "Recent Developments in the Measurement of Light and Illumination." The PRESIDENT (Professor Silvanus Thompson) was in the chair.

The PRESIDENT, in opening the proceedings, said the discussion that night would be devoted to the methods, rather than to the results, of photometry. The latter would be dealt with at the meeting a month hence. He had been asked by the Council to open the discussion with some brief remarks, and the exhibition of some simple and rough pieces of apparatus which he had used from time to time to illustrate to those who did not generally work with photometers, and who were not familiar with the process of photometry, the elementary matters on which photometry rested. The President then called attention to the large rough photometer that he used at the York meeting of the British Association to explain, approximately and quantitatively, the illumination of different sources of light; and, by its aid, he demonstrated many things well known to those versed in the art of photometry. A difficulty in the art was that of deciding equality when two illuminants were not quite of the same tint. It was a matter of judgment and experience in many cases. Assuming one had, by practice, attained good judgment on this point, then all the rest was science and not art. He next dealt with the various standards of light proposed, and in actual use, in different countries. Photometer heads and discs next came in for comment. The President is much in favour of the use of two blocks of paraffin wax, with a sheet of tinfoil between. It makes one of the simplest, and one of the best photometers. Another favourite disc of his consists of a thin piece of paper folded, with a piece of cardboard between, in which is a circular hole. "I do not like the grease spot," said the President. He referred to the Lummer-Brodhun photometer as a most beautiful and sensitive optical attempt to give a perfect bunsen grease spot. In conclusion, he dealt with the principle of flicker photometers.

Professor A. G. VERNON HARCOURT (one of the Metropolitan Gas Referees) remarked that he was afraid the subject of photometry, as the President had put it before them, was rather too large to be dealt with in its different aspects by anyone in a discussion of this kind; and he would only attempt to refer to one or two points. As to the question of the comparison of lights of different colours, this had been, as the President had told them, tried in various ways. There was the plan of Sir William Abney, which really gave rather good results. In it the movement made was a very rapid one, and corresponded therefore to some extent with the flicker arrangement. By presenting at short intervals a bluer light and then a redder light, it was possible to form a judgment as to the relative illumination of the two much better than could be formed by the actual adjustment of the distance. This certainly was so; and if there was no alternative, it was better to cause the two to quickly succeed one another before the eye, and so obtain the needed abstraction of the difference of illumination as a thing distinct from the differences of colour. He (Professor Harcourt) had tried various methods; and the one he had found to be the best was this: It was a disc that was in use some 40 years ago. It was called the Leeson disc, and consisted of an arrangement such as the President had shown as being better than the grease spot—that was to say, two surfaces of the same translucent paper, with another piece of opaque paper between, in which a hole was cut. In this way, one could obtain and compare one with another the illuminations at the opening which was covered by the folds of the translucent paper through which the light shone, and by which light from the opposite side was reflected. Having referred to the star disc, Professor Harcourt alluded to the experiments made some years ago at the South Foreland (in which, at the request of the Board of Trade, he took part), for estimating the amount of light which was given by lighthouses with different illuminants. There were three experimental lighthouses, one of which was fitted with an oil-lamp, the invention of Sir James Douglass, and which had been introduced into the Trinity House service. In another, there was gas, used in gas-burners arranged concentrically—one ring inside another. In the third house was a very large electric arc with carbons something like  $1\frac{1}{2}$  inches diameter. For the measurement of these lights, there were set up butts at different distances from the lighthouses, which were placed in a straight line at a distance of something like 30 to 40 yards apart. Perpendicularly with the line of the lighthouses, the butts were built— $\frac{1}{2}$  mile, 1 mile, and 2 miles away. The further distances were not so useful as the  $\frac{1}{2}$  mile one. In measuring the lights, there was used a small lamp that he had contrived, giving a flame light of 1 candle. It was a pentane arrangement. At this distance the 1-candle light had to be (say) 12 to 15 feet away; while the beam from the lighthouse (each one of them in turn) was projected through a lense at the open window; and this was received on the surface of the photometer. These lights were different in colour, especially the arc light. The practice was to use the star disc which was placed in the photometer; and on its one side was received the light (say) from the arc light, and on the other side that from the pentane light. Not in the actual experiments he was describing, but in others, a long tunnel was built (also for the purposes of photometry) at the South Foreland. A bar photometer was used with a star disc in the middle—the



electric arc being at a distance at the one end and the flame standard at a short distance at the other end. He had an opportunity of trying how far judgment by the plan he had described could be made by a number of men in the service of the Trinity House who had no experience of photometry, but were capable men. He gave them instructions as to what they were to do. He said to them: "Look at that star. You will notice that by moving it backwards and forwards, you will see a pink star on a blue ground, and a blue star on a pink ground. Now do not mind whether the one is blue or the other is pink, but think of the degree of clearness with which the pattern stands out on the background." He found it was not difficult to get these men to think of that. That was the point—the degree of distinctness of the pattern; and in that was his experience on the subject of colour photometry.

The PRESIDENT said the members were extremely indebted to their honorary member for giving this account from his experiments and experience at the South Foreland. He hoped that on some future occasion they might have a great deal more from the same source.

Professor J. A. FLEMING spoke on the subject of primary and secondary standards. He said that, in spite of the enormous amount of work that had been done in the attempt to realize a physical standard, he did not think they could consider they were yet in a thoroughly satisfactory position. There were three standards in actual use: In Great Britain and America, the pentane lamp; in Germany, the Hefner unit; and in France, the bougie decimale. These were all flame standards; and the light varied in a most marked degree, with the percentage of water vapour, the atmospheric pressure, the amount of carbonic acid, the composition of the fuel, the disturbance of the air by draughts, and other minute circumstances. These made differences in the lights which were not small matters; but the differences were not discovered until they began to apply the standards to electric light photometry. What was an astonishing thing to him in a great institution like the National Physical Laboratory was that, when they began to work on flame standards, they soon adopted secondary electrical standards; determinations were made for humidity and other things, and then they threw away the electric light standard. He did not think sufficient work had been done on an incandescent standard of light; and more pains should certainly be taken to obtain the advantage of the platinum incandescent standard. It was admitted that this was a difficult subject. But the purposes for which great national institutions were established were not to do the easy experiments, but the difficult ones. Difficulties had been largely minimized by recent experiments. And he did think the time was rapidly approaching when the question ought to be considered from the very bottom as to an international standard of light based on the incandescence of some material; and, in his view, no material was more suitable than platinum taken at freezing-point. At present there was nothing superior to the large bulb incandescent lamp for an incandescent standard. At University College, they began to make tests in 1895 with such lamps. They had some with which thousands of tests had since been made; and there was one of these lamps concerning which they had no evidence that it had varied  $\frac{1}{2}$  per cent. in fifteen years. This lamp had been compared with standards at the National Physical Laboratory, at the Pender Laboratory, and at the Reichsanstalt; and the figures were in remarkable agreement. If a secondary standard could be found to be so constant, he ventured to think much more labour might be put into the question of obtaining a primary incandescent standard that might be universally accepted, and which would be absolutely independent of moisture, of atmospheric pressure, of carbonic acid, and so forth. This was a work that really needed research at their great national laboratories.

Mr. A. P. TROTTER, referring to a list of questions that had been circulated in view of the meeting, addressed himself to the first one: "Are the courses of instruction and experimental facilities at technical colleges and scientific institutions for the study of photometry adequate, and what changes are desirable in the existing methods to suit modern requirements?" He said that when he began to write a series of articles on the subject of photometry some two-and-a-half years ago (which would probably go on for another year) he had not done any photometry for eighteen years. He did not want these articles to be from the arm-chair point of view only; and so he went round to see what was going on, and visited photometrical establishments of three kinds. He inspected the photometrical testing-rooms of various engineering works, the testing-rooms of lamp manufacturers, and those of the laboratories of technical colleges. Without even hinting at names, he must confess that he was amused at the antiquated and very limited apparatus that he found in the teaching laboratories. The teaching of photometry fell into two classes—the science and the art. Photometry seemed to him to be likely to fall between two stools—the two stools of physics and engineering. Physics alone as regarded the laboratory was most lamentably treated. In the laboratories he had seen, there had been apparatus twenty, thirty, or forty years old. That was all right in its time of long ago for testing gas; but from that they went to the other extreme, and had a highly accurate photometer, with nothing between. The subject from the educational point of view must be divided into two sections: The scientific part, which was extremely interesting; and the practical part—the art of getting good accuracies and avoiding errors—which was fascinating.

Mr. C. C. PATERSON (National Physical Laboratory), referring to Professor Fleming's remarks, said if he told those present all that had been done at the National Physical Laboratory, they would not get home that night. Professor Fleming had run-down the pentane lamp rather severely; but, in his opinion, the pentane lamp served them exceedingly well for the present as a temporary standard. One was able, with care in using the lamp, to reproduce the value of the candle from the pentane lamp with an accuracy of 0.2 per cent., *plus or minus* 1 per cent. It must not be forgotten that they were faced with the practical question of getting a unit that could be used commercially. As to Professor Fleming's suggestion that they should follow up Professor Violle's work, it had originally been their intention to do this at the National Physical Laboratory; but he was afraid there was one point which ruled out the possibility of the usefulness of the Violle standard. That was the colour of the light. Suppose one could make an accurate standard of it, the colour of molten platinum was a very red light. It was redder than the pentane lamp; and this seemed to him to rule it out from useful photometry. His impression was it was a great deal worse than the Hefner unit. As to the electric lamp standard, he was second to none as to its usefulness; but they must get it in terms of some other standard. In connection with the question of colour, it seemed to him they were face to face with something that was a physiological problem. One man for some reason would see a red light better than a blue one; and another a blue one better than a red one. The colour problem must be based fundamentally on some form of average value. They must get some eye which might be considered an average eye. He did not know exactly how that was to be done; but on a really wide scale it was possible to attack the problem. If they got a number of men whose colour sight was individually normal, and tested these men very carefully, by letting them observe sets of standards, they were able in this way to get, so to speak, a calibration for each man. They could find out in this way the value that one man obtained for a set of standards differing in colour as compared with another. If one worked these men down by different gradations of colour, the results would help one a great deal to see the value of what one man did as compared with another. He had a primary set of electric standards—some of Dr. Fleming's lamps. They were running at a little over 4 watts per candle, another set  $3\frac{1}{2}$  watts per candle, another set at 3 watts, and then they jumped (with metallic filament lamps) down to 2 watts per candle. Supposing they took these lamps (all good standards that had been well seasoned) in different classes, and set upon them six observers, each observer comparing each about six times or so. They were able in this way to get the value of one set of lamps to an accuracy of 0.1 per cent.—that was to say, the probable error was 0.1 per cent. [Mr. Paterson showed two sets of such comparisons on diagrams.] It seemed to him that if they could get a number of observers comparing lamps in this way at the National Physical Laboratory, and in America, France, and Germany, the inter-comparison of these standards would give them a good notion as to the average obtained from a whiter light in terms of the pentane lamp. He hoped this would spread the idea that they were not wasting time at the National Physical Laboratory.

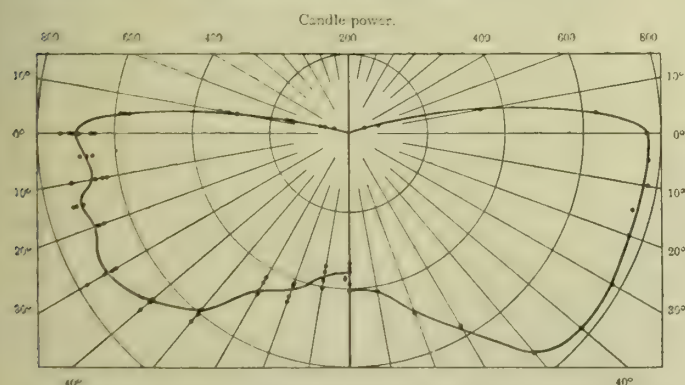
Professor SUMPNER (Birmingham) said he would address himself to the question: "What are the best modern methods of obtaining the polar curves of light distribution, and of measuring the mean spherical candle power of different sources, and what possibilities are there of simplifying and improving such processes in the future?" The question seemed to him to divide itself practically into two points: What was the best thing to do with reference to glow lamps; and what was the best thing to do with reference to arc lamps. Practically, it was a difficult matter to get the actual mean spherical candle power in the case of an arc lamp; but it was comparatively easy in the case of a glow lamp. He thought the best way to define the candle power of the glow lamp was by its candle power in the direction at right angles to the filaments. This was an easy test; and it was preferable in the case of glow lamps to use this figure rather than the mean spherical candle power figure. The mean spherical candle power could be obtained by multiplying with 0.8 in all cases. With arc lamps, they had to deal with a distribution that varied in a very complicated sort of way, and also they had to deal with something that was not constant. There were very few arc lamps that were constant for more than a fraction of a second. He ventured to say that, though students at colleges had to work these things out, and although writers of papers showed at great length how people could work them out, he did not think many people did actually do so, because it was very difficult and long. Something was being tested that was not constant; and unless a method could be devised for ascertaining at one measurement the mean spherical candle power, or something upon which it depended, he did not think the mean spherical candle power would ever be taken. He should like to mention the way he tried to obtain the mean spherical candle power of arc lamps some years ago. He found the method rather troublesome; and he offered it merely as a suggestion. In all the photometers that had been described at this meeting, the principle of light being reflected from a white matt surface was used. There was no reason why they should not use the principle twice in photometry. He used it by means of a white surface—such as a screen, or a surface of white drawing paper which did not shine under the action of light, but gave a good diffusing surface. He used a sheet of white paper in such a way that the light received from it in the photometer was a



measure of the mean spherical candle power of the arc lamp. To illustrate the method, he said, supposing the group of lamps there [pointing to those illuminating the hall of the Society of Arts] to represent an arc lamp, and the screen on the wall [the lantern screen] a sheet of white paper, and that this he was going to use as a secondary source of light to measure the mean spherical candle power of the lamps. If they imagined the white paper to be divided into horizontal strips, the light which reached the top strip would be the light measured from the arc lamp in one particular direction; and the light received by the bottom strip the light from the arc lamp in another direction. If the strips were of equal length, they influenced the photometer to different degrees, and generally fairly represented the proportion of light from the arc lamp in different directions. Supposing the arc lamp was throwing off light equal in all directions, then the top strip, being near the arc lamp, would have more light from it, and would possibly influence the photometer more than the bottom strip. But this could be arranged by having the strips of unequal length. They could by calculation design the shape of a sheet which would be opposite the arc lamp at a particular level; and the photometer would then give a measurement which would represent the mean spherical candle power of the arc. Briefly the objects were to obtain a simple method, consisting of a sheet of white paper cut in a special way, put in particular directions and distances with reference to the arc lamp and with reference to the photometer, and so arranged that a single photometrical measurement would measure the mean spherical candle power of the arc lamp. He managed to get good results, though there were difficulties about it. The idea might very possibly suggest modification by others.

Mr. W. J. LIBERTY, invited by the President, said too much importance could not be attached to this question of photometry. At the present time, they were a little bit in the air through the multiplicity of photometers, standards of light, and burners; and the multiplicity tended to confusion. He for one was looking forward to the time when there would be a standard instrument, which would give universally comparable readings. Those who used photometers for street-lamp testing, for instance, knew that if they used one quite different results could be obtained by using another. If a photometer could be devised which all men could employ, the results would be free from suspicion; and there would be more reliability attaching to their work. He believed, however, with the amount of work that was being directed to this subject, they were really coming to something which all would be able to use. There was no doubt about it that photometry was going to play an important part in the question of public lighting in the future.

Professor J. T. MORRIS (East London College) observed that he had worked with different photometers; and he found the grease spot photometer was as satisfactory as any of the others. He got just as accurate results with a well-made grease spot as with the Lummer-Brodhun photometer. But the grease spot must be carefully made. He believed it was best to work with a very small grease spot—to let a single spot of candle grease fall on a good piece of paper, and then remove, while the grease was still hot, the little piece of the spot that would peel off, and then slightly heat the paper over a bunsen flame. Such a grease spot would give as high a degree of accuracy as the Lummer-Brodhun; and it certainly was not so expensive. Regarding the testing of high-power lamps, he had some diagrams of the polar curves of incandescent gas and electric lamps, showing the amount of variation found in the candle power at different angles taken at different times. It was little use measuring the candle power in different directions, and then, having done so, take out the results. One had to make a number of observations, and take the mean of them. Professor Morris showed a number of illumination curves of different lamps. One of them was for the Keith high-pressure inverted gas-lamp. In relation to it, he said that his experience with these lamps was that the intensity of the beam was considerably steadier than that of the electric arc lamp as far as rapid changes were concerned. Next he showed a series of observations with an ordinary hand-feed arc lamp. From these results and a number of others, he was convinced that he could get the mean spherical candle power of such a lamp to within 3 per cent. from each test. Regarding flame carbons (hand-fed), they were not capable of giving such constancy of results, as could be seen



Polar Curve of Distribution of Light of Single Keith Inverted Incandescent High-Pressure Gas-Lamp, having a Double Clear Glass Enclosure. Two Tests. Shade in Position.

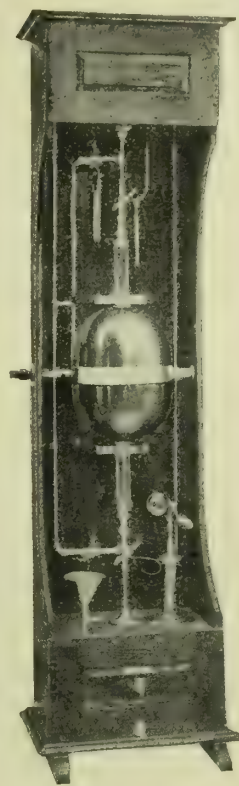
by the way the observations were peppered about on the diagram. There was still further difficulty with complete lamps which contain feeding mechanism.

Mr. J. S. Dow passed (the hour being late) lightly over a number of communications received from various corresponding members abroad—Dr. Clayton Sharp, Dr. A. C. Humphreys, Dr. Williams, and Dr. Stockhausen. One point on which he dilated was that of the "sensitiveness" of various photometers; and, in the course of his remarks, he mentioned that experiments he made some time ago showed that the sensitiveness of certain photometers would vary with the degree of illumination.

The PRESIDENT remarked that one thing had come out clearly, and that was that the subject was much too big for one evening's discussion. This was not astonishing when they considered that the Society had entered a field largely unworked by other societies.

## MOUNTED CUBIC FOOT BOTTLE.

On the occasion of the meeting of the New York Section of the Society of Chemical Industry at which Dr. Elliott, of the Consolidated Gas Company, read a paper describing the apparatus



used by him for testing gas, as noticed last week, p. 663, Mr. E. C. Uhlig, the Chemist of the Citizens' Gas Company, directed the attention of members to a mounted cubic foot bottle for calibrating volumetric gas-testing apparatus. It is shown in the accompanying illustration, for which, as well as for the following particulars, we are indebted to the "Journal" of the Society and its Editor (Mr. Watson Smith).

The bottle consists of an oval copper vessel joined at the top and bottom with water-tanks. These tanks are of wood, metal lined, and are connected with each other directly by piping. At the bottom there is a pump which enables the water to be forced from the lower to the upper tank. There is a funnel on the lower tank, through which water may be added, and a cock by which it may be drawn off. Immediately above and below the copper vessel are two small wooden shelves, which are fastened to the wooden back of the instrument, running from the upper to the lower tank, and binding the whole together. The pipe leading from the copper vessel both above and below is all glass for about 6 inches, and on these glass portions are marked the upper and lower limits of the cubic foot. Six inches above the upper glass tube are a three-way cock and a small tube which permit the escape of air.

Above this is a valve by which the cubic foot may be shut off from the apparatus under test; and there is a similar valve below the copper vessel for controlling the flow of water from the upper tank to it. There is also a three-way cock connecting with the lower tank, the pipe, and the vessel above.

This apparatus is standardized and certified by the Bureau of Standards at Washington. By its means a cubic foot of air or gas can be passed through the outlet connection; and by repeating the operation any number of cubic feet may be passed.

## Extension of High-Pressure Gas Supply in the City.

At the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee submitted a report in regard to an application by the Gaslight and Coke Company for permission to extend the high-pressure main from Ludgate Circus along Farringdon Street and Seacoal Lane to a point about 100 feet north of the railway arch, and recommended that no objection be offered to the proposal, subject to the work in Ludgate Circus being commenced on a Saturday afternoon, and carried on continuously by day and night until completion, and no part of the main being laid or constructed over the public sewers, and otherwise to the regulations. The recommendation was agreed to. The object of the Company in making this extension of their high-pressure main is to meet the demand of the large printing and publishing premises of Messrs. Cassell and Co., Limited, who require the power for trade purposes.

**Private Bills and Orders of the Session.**—According to the usual report by the Board of Trade on the Private Bills and Provisional Orders of the session, the total number of the former is 89, of which 30 are for gas and 22 for water; the capital proposed to be raised being £1,386,865 and £2,170,466. Applications have been made for 55 Provisional Orders—15 in respect of gas, 5 of water, and 25 of electric lighting; the proposed capital being £394,251, £89,166, and £86,998.



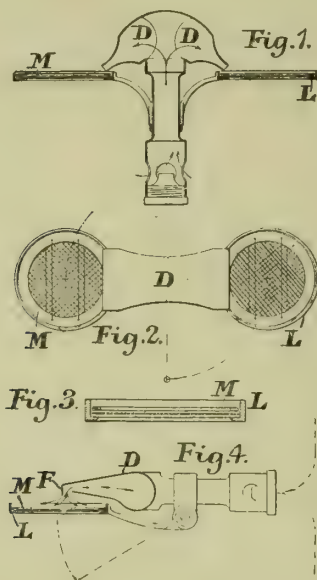
## REGISTER OF PATENTS.

### Incandescent Gas-Lamps.

BOURRELLY, G., and LABRY, A., of Paris.

No. 1531; Jan. 21, 1909. Date claimed under International Convention, Jan. 21, 1908.

A lamp made in accordance with this invention comprises a flat luminous body and a burner orifice which is substantially rectangular, is narrow, and very long—that is, of “a length practically equal to the width of the luminous body, and is so arranged as to give a broad, flat, and thin flame which spreads over the whole of the luminous body.”



A Gas-Burner with a Flat Incandescent Disc (instead of Mantle).

Fig. 1 shows in section a complete burner with two flat discs; and fig. 2 is a plan. Fig. 3 shows in cross section (to a larger scale) a complete flat disc carrier. Fig. 4 shows, in elevation and section, a burner for one or more flat discs; the gas being brought to the injector from above or below.

In figs. 1 and 2, the gas, on issuing from the burner injector, sucks in a quantity of air necessary for combustion; and the mixture rises into the chamber D, and passes out through the rectangular orifices. “The flames thus produced are flat, thin, and very hot (blue flames). They will, of course, come into contact with the whole surface of the flat disc, which will be brought to a dazzling incandescence.”

In fig. 3 is indicated the method of supporting the disc; the carrier having two small platinum wires for the purpose. The ring or crown M also carries two small platinum wires for preventing the buckling of the disc during incandescence. In order to put the disc in place, therefore, it is sufficient to drop it on to the disc carrier L, and then to place the crown M over it.

In fig. 4, a horizontal burner is shown. In this case, the outlet orifice for the blue flame is always of rectangular section; but in order that the issuing flame may entirely cover the flat disc, the end of the surface F is turned in such a way as to direct the flame downwards.

### Production of Incandescent Light by Generator Gas.

ERNST, E. U. G., of Frederiksberg, Copenhagen.

No. 4361; Feb. 22, 1909. Date claimed under International Convention, March 12, 1908.

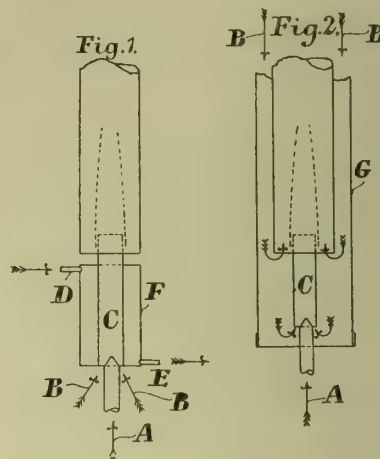
This invention relates to the production of incandescent light by means of generator gas and the like—in fact, any gas which, rich in nitrogen alone, is not considered applicable for lighting purposes. In the text-books thereon, the patentee points out, complaints are often made of this state of things. It has been investigated, among others, by Pfeifer (“Heating Gas and its Application,” Munich, 1901), who made experiments both with alcohols and lamps and with Welsbach gas-lamps. The first-named lamps would not light at all, and the others would not give light at ordinary pressure. It was only when the pressure exceeded 50 mm. that light was emitted with an intensity equivalent to 11-candle power. The consumption came to 600 litres per hour, or more than double the amount that would be consumed if the gas were used as a source of power in an electric installation for producing incandescent light of the same quality.

It has, in consequence, been proposed in incandescent lighting to mix generator gas, previously passed through the products of combustion, with air and oxygen; the oxygen also having been previously passed through the products of combustion. Also it has been proposed in producer or water gas burners to heat the air, before mixing it with the producer or water gas, in order to obtain a better light, by passing it over the surfaces of hoods arranged over the usual air inlets of the bunsen burner and deriving their heat by conduction from the burner. But according to this invention, generator gas or the like is consumed with air only, so that the percentage of nitrogen is not reduced, as would be the case if pure oxygen were added, and such a degree of heat is imparted to the mixture by heating either the air or gas (or both) that the temperature of the flame, which is low in itself, is raised beyond a certain limit which is critical, and below which no practical light emission takes place.

This leading idea of the invention will be more easily followed on referring to the following example: Assuming that the available tempera-

ture of the flame of the gas rich in nitrogen may be about 900° or 950° C., while the temperature of the light emission of the mantle in a number of practical experiments may be reckoned to be at least 1000° C., it will be found that the temperature of the flame must be raised 50° to 100° C., or more, in order that this kind of gas shall be applicable in glow lamps.

The experiments made by the patentee have confirmed the correctness of this assumption; and they are shown diagrammatically in two examples.



Ernst's Generator Gas Incandescent Burner.

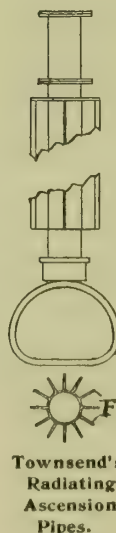
When generator gas or the like (indicated by the arrow A) and air (arrows B) are passed through the burner-tube C, fig. 1, and burn in the usual manner on the mantle, no emission of light will at first take place, but at most a shining zone will appear on the lower part of the mantle. But if steam (arrows D and E) be passed through the jacket F, then light is emitted. The same effect is obtained if the regenerator glass chimney G is put on as shown in fig. 2.

The mode of preheating is, on the whole, of no importance. “The mixture of gas and air may be preheated, or the air alone, or the gas alone, and the gas does not require to be mixed with the air before the ignition. Furthermore, the degree of preheating may be made much higher than above assumed; but such a further heating is in itself not characteristic of the invention, because the latter is distinguished from the known application of lamps with preheating or regenerative effect—that is to say, with purely quantitative increase of an already existent effect—thereby that a flame temperature low in itself is raised beyond a certain limit, which is critical, while practically speaking no light emission takes place below this limit. By the stated small increase of temperature of the flame a real change of quality sets in, together with an accompanying disproportional great rise in the intensity of the light.”

### Radiating Ascension Pipe for Gas-Retorts.

TOWNSEND, W. W., of Hereford.

No. 4709; Feb. 26, 1909.



Townsend's Radiating Ascension Pipes.

The patentee's proposal is to so construct the ascension pipe as to dissipate the heat of the gas as quickly as possible, “in order to prevent or minimize stoppages in the pipe.” The invention is said to be particularly advantageous when used in connection with a system of dry collecting mains and “anti-dip” valves; the gas being “cooled to such an extent in passing up the pipe that no stoppage occurs in the valve or in the dry collecting mains.”

As shown, the ascension pipe is made with a number of longitudinal radiating ribs F running almost the whole length of the pipe on the outside, and cast in one with the pipe. The size of the ribs may be varied to suit requirements; “but the total area of the surface of the ribs should be as large as possible.” An alternative way of carrying out the invention is to form stud-like pointed projections all over the exterior of the pipe.

The principle of the invention is, “that the hot gas issuing from the retort should be cooled as soon as possible, and this is effected by making the ascension pipe as described, which increases its radiating surface very considerably.”

### Inverted Incandescent Gas-Burners.

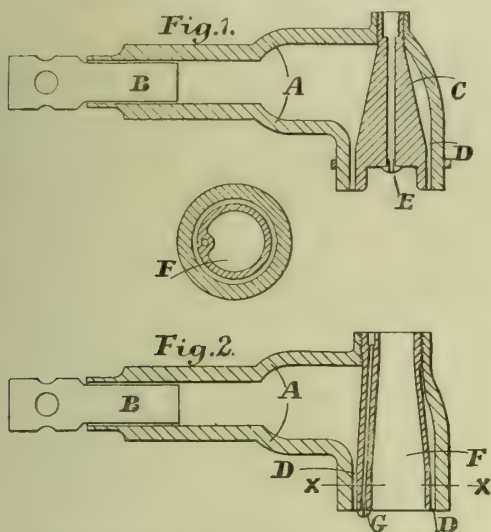
BROWNING, E. M., of Buckhurst Hill, Essex.

No. 5963; March 12, 1909.

This burner (connected to an ordinary mixing-tube) has a solid cone-shaped body passing through its centre, with its base parallel with the lower end of the burner, and slightly smaller in diameter. The annular space thus formed between them is the point of ignition, and the point of greatest resistance to the flow of gas and air through the burner; so that any tendency to light-back is reduced, and the necessity of the use of gauzes is obviated. The burner-head, of course, becomes heated; and the temperature of the air and gas mixture passing through it to the point of ignition is raised, and increases the velocity at which the mixture is consumed. This preheating of the gaseous mixture is further assisted by the cone-shaped body, retaining the heat of the burning



gas. In a modification filed, there is substituted for the solid cone-shaped body a hollow passage, which extends throughout the burner-head, allowing part of the products of combustion to pass through the centre of, as well as around, the burner-head, and thus providing a larger heating surface to the body over which the gaseous mixture has to pass before reaching the point of ignition.



Browning's Inverted Incandescent Gas-Burner.

Fig. 1 shows the burner-head with the solid cone-shaped inner body; and fig. 2 the hollow cone-shaped body. This plan is through the line X of fig. 2. A is the head of the burner which forms the superheating chamber; and B is the ordinary mixing-tube, which may be of any suitable dimensions. C is the solid cone-shaped body screwed to the burner-head, D is the annular space formed between it and the lower end of the burner. There is a central gas-way or passage through C. E is a small burner at the lower end of the gas-way for supplying the ignition jet. As shown, there is an enlarged space within the base of the cone serving to protect the jet from draughts.

In fig. 2, the hollow cone-shaped body has a centre flue or passage extending through the top of the burner-head. Here G is the bye-pass to the ignition jet.

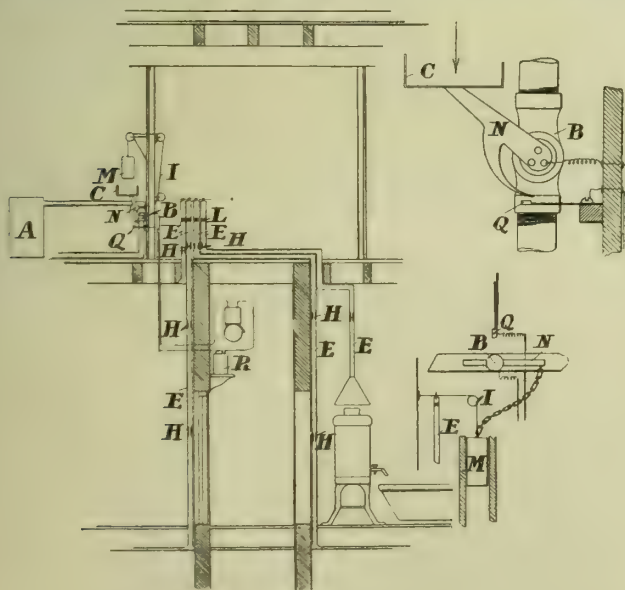
### Signalling an Escape of Gas.

VAN DE KAMP, W. A. J., of Haarlem, Holland.

No. 9487; April 21, 1909.

This invention relates to apparatus "for preventing explosions and obviating the risk of poisoning, for reducing the waste of gas due to its unintentional escape from pipes in buildings and closed rooms, and for giving warning of the accumulation of dangerous gases."

Various means, as the patentee points out, have been devised to obviate these risks, and at the same time to decrease the amount of gas which can escape in buildings, by causing the gas escaping from a pipe without ignition automatically to turn off the main gas-cock, and actuate an alarm signal. In other cases, the escaping gases have been caused to pass over an igniting means—such as platinum sponge or the like—and a fusible filament or wire suspended above the igniting means is caused to fuse by the flame produced and thus set in operation a device that effects the closing of the main cock and actuates an alarm signal.



Van de Kamp's Gas-Leakage Indicator.

The operation of the apparatus shown is as follows: The gas passes from the outer piping through the meter A into the house, and, after passing the main cock B, is distributed to the various rooms. Within the building there are arranged special pipes E, the lower orifices of which are funnel-shaped so as to catch any unignited gas escaping. These pipes are so arranged that the orifice of each is either at the

highest point of the room where the gas would accumulate or directly over the spot where the escape would occur—as, for instance, in a bath-room over the geyser. In the upper orifices of the pipes E are igniting pellets of platinum sponges and the like. Should gas now accidentally escape, it will be caught by the pipes E, and render the igniting pellets incandescent so as to become ignited thereby. To avoid the possibility of the flame produced by the ignition pellet flashing back into the pipes, they are provided close to the outlet orifice with a wire gauze L; while arranged within the pipes safety devices, such as small glass tubes H, are placed.

By means either of the flame or of the ignition pellet, the cord I, put in tension by a weight M, is fused, whereupon the weight falls, and either directly (as shown in the details) or by means of intermediate mechanism, such as a tray C on which the weight falls, rocks the arm N of the main cock, and thus cuts off the gas supply. The lever arm N is provided with a projection which, when the arm is rocked, makes contact with a spring Q, and thereby closes the electric circuit of a bell or other alarm signal.

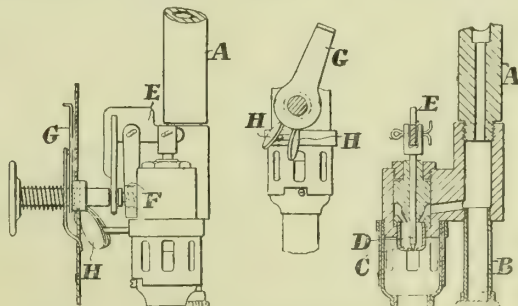
In the first arrangement shown, an electric battery R is connected with the bell S. By the closure of the cock of the main supply pipe "further loss of gas is prevented, while the occupants of the buildings are warned by the sounding of the signalling device of the fact that gas is escaping—the ignition pellet coming into action long before there is any real danger to the occupants."

### Incandescent Gas-Burner Fittings.

HANDS, G., of Farringdon Road, E.C., and BREEDEN, F., of Moseley, Birmingham.

No. 1594; Jan. 21, 1910.

According to this invention, the lever for operating the valve of a gas-lamp is a bell-crank lever which acts directly upon the gas-control valve, is supported upon the burner-fitting, and is under the control of a screw screwing into the burner fitting.



Hands and Breeden's Burner Regulating Fitting.

The illustration shows an elevation of the burner fitting, a central vertical section through the burner-tube and supply pipe, and an elevation of the air-regulating device.

The pipe A, for the supply of gas to the mixing-chamber of the burner, is provided with a removable dust-trap—a short length of tube B. Just above the trap there is a lateral passage for conducting the gas to the mixing-chamber. To regulate the size of the orifice in the nipple C, and at the same time to permit of clearing the orifice in case it should be choked, there is a small valve D, preferably conical or of the needle type, adapted to seat in an orifice similarly formed. The spindle of the valve is connected to one arm E of a bell-crank lever the fulcrum of which is formed by a split pin passing through two perforated lugs mounted on the duct leading to the mixing-chamber. The other arm of the lever has a fork, which takes into a groove F in a screw passing through a hole in a boss and provided at one end with a milled head.

To regulate the amount of air passing into the mixing-chamber, the latter is provided with the usual perforated revoluble sleeve, which has a rigid arm or projection on it. Mounted in a hole in the casing is a lever G, of the double-armed type, one arm of which serves as a handle, while the other arm H is forked and adapted to embrace the projection on the sleeve. The boss or fulcrum of this lever is perforated, and the screw employed to regulate the gas-valve D in the nipple passes through it and into the internally screwed hole in the boss or lug on the lateral branch pipe forming part of the casing of the valve for admitting gas to the nipple.

**New Reservoir for Tiverton.**—There were 22 tenders received by the Tiverton Town Council for a new reservoir and other works of water supply. Eight of them were for both solid and reinforced concrete, and six for reinforced concrete only. The Water Committee decided to have the work carried out in solid concrete, and accepted the tender of Mr. E. G. Coles, of Taunton, for £2278.

**Increased Cost of Public Lighting at Newport (Mon.).**—A reduction of 2d. in the pound in the rates at Newport (Mon.) having been announced, the Secretary of the Ratepayers' Association (Mr. J. P. Elms), in a letter to a local paper, remarks that, while this relief will be welcomed by the ratepayers, the most cursory examination of the estimates will show that the diminution is due to adventitious circumstances, that the ordinary expenditure on revenue account is still advancing by leaps and bounds, and that unless economy is practised there will be a great increase in the rates at no distant period. Among the increases in one year Mr. Elms mentions £700 for street lighting, which he characterizes as "a monstrous charge," and evidently the result of replacing gas by electricity, and of having the same Committee in control of the public lighting and the electricity works. He points out that for the year ended March 31, 1901, the charge for public lighting was £4771; whereas for the year ending March 31, 1911, it is estimated at £7900—an increase of about 66 per cent., against an increase of a little more than 20 per cent. in the population of the borough.



## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### The Phenomenon of Flame.

SIR,—With reference to Dr. Colman's lecture before the Southern Junior Association at the Cripplegate Institute, I find the source of the ideas to which I tried to give expression to be an address to the Chemical Section of the British Association delivered by Professor Arthur Smithells in 1907; the subject being "The Phenomenon of Flame." I enclose an extract from it.

Though it is made evident that this knowledge was not new at the date of the address, I am inclined to think that it is still more or less unfamiliar to some of us who are concerned with flame temperatures. This is probably to be explained by the fact that, though doubtless of great scientific interest and significance, it is not—as appears from Dr. Colman's reply to my question—of much, if any, practical importance to the gas industry.

Whether under these circumstances, it is desirable that the extract should appear in the columns of the "JOURNAL" I leave, of course, to your decision.

A. F. BROWNE.

South Metropolitan Gas Company, Vauxhall, S.E., March 21, 1910.

[ENCLOSURE.]

#### PROFESSOR SMITHELLS ON THE PHENOMENON OF FLAME.

Annual Meeting of the British Association held at Leicester, July 31, 1907.

One of the first questions to meet us in the study of flame is that of the temperature at which, in any given case, the phenomenon becomes evident. Here, I think, a great clarification of view has taken place. The old idea that there existed a fixed temperature at which inflammation suddenly took place cannot now be maintained; and the term "ignition temperature" has acquired a different meaning. It is now known that in a very great number of cases a mixture of two flame-forming gases, when gradually raised in temperature, will develop luminosity quite gradually *pari passu* with the chemical combination that is being induced. This phenomenon is, of course, known universally in connection with phosphorus; but it is not so widely known in connection with other combustible substances. I do not know how many times the independent discovery has been made that sulphur, arsenic, carbon disulphide, alcohol, ether, paraffin, and a whole host of other compounds, inorganic and organic, will phosphoresce as truly as phosphorus itself—that, in fact, phosphorescent combustion is the normal phenomenon antecedent to what we ordinarily call flame.

This is, after all, only in harmony with the general truth that chemical combination between two gases does not set in suddenly, but comes into evidence quite gradually as the temperature is raised from a point at which the action, if it occurs at all, is so slow as to be negligible. The change from phosphorescence to ordinary flame is not sudden; but the appearance of ordinary flame is the end-point of a continuous, though rapid, development. This end-point is the temperature of ignition. What, then, determines the temperature of ignition? The answer to this question has been given with characteristic conciseness by Van 't Hoff as "the temperature at which the initial loss of heat due to conduction, &c., is equal to the heat evolved in the same time by the chemical reaction."

### Official Testing of Meters.

SIR,—With your permission, I would add further to my previous observations in the "JOURNAL," on official testing of gas-meters, published Sept. 28 last. I believe that my remarks will be of interest to those who have read that part of the recent addresses of the Presidents of the Manchester District Institution of Gas Engineers and the Southern District Association of Gas Engineers and Managers, relating to the unsatisfactory registration state of dry meters and the law regulating their use in the sale of gas.

Both Mr. Ellery and Mr. Kendrick confirm much of what I set forth. Mr. Kendrick goes so far as to declare that the new meters he had tested were nearly as bad as the old ones. This is matter for the serious consideration of the district in which they were stamped—especially seeing that the old meters were tested straight from the district. The law provides that a 3-light meter shall not be stamped until it has been found to register any amount between 0.9 and 0.5 cubic feet per hour, under penalty for default.

Undoubtedly the specification of a fixed pressure and a fixed rate per hour with the testing of meters for accuracy of registration is now out of date and appears absurd. The results are not satisfactory to anyone concerned. A buyer or a seller of gas does not really know which party obtains the advantage or disadvantage with a meter that varies in registration at different rates of working. Meters are seldom worked at the rate per hour they are officially tested at. It is confirmed that meters are fixed to pass any rate per hour from the smallest amount to as much as may be demanded. The law prohibits gas consumers using meters beyond the badged rate per hour; but even supposing that this was carried out in practice, a consumer is not supposed to always work the meter at the full load at which it was officially passed as correct. Meters that would register small rates correctly, and also register correctly at their badged rate per hour, do not register incorrectly at rates per hour beyond the badged rate—that is, as regards dry meters. Wet meters may register small rates correctly, and also register correctly at their badged rate per hour, but if worked at rates beyond their badged amount per hour, they may register most seriously incorrectly.

The only apparently reliable method of testing wet meters for varying registration with dispatch is to test them at increased rates about double that of their badged amount, or (say) 3 inches of water pressure, with the outlet conditions remaining the same as for the badged rate per hour at five-tenths of an inch of water pressure—the basis of capacity being that of 6 cubic feet per hour per light, or 120 revolutions per hour. Where meters register correctly at different rates of working, there is no injustice in fixing them to work at rates beyond their badged amount per hour, only to the manufacturer who guarantees them for a stipulated period. Increase the pace, and you shorten the life disproportionately.

The more serious consideration is that meters so worked soon become impaired; not only as regards life, but as regards accuracy of registration. I have known of from 40 to 60 per cent. of meters of different makes rejected as incorrect within two years of stamping. The official seal is not long evidence of accuracy of registration in such cases; and there is no provision whereby meters are to be periodically verified. It has, however, appeared reasonable that meters should be officially tested at different rates of working, and that the more expeditious method would be to test at the increased rate. There are many meters that do register correctly at different rates even to an extraordinary extent; and were it not for the specified conditions under which the Sales of Gas Act rules require accuracy of registration to be ascertained, Section 12 would enable inspectors to refuse to stamp meters that were capable of incorrect registration by means which are practically prevented in good meters.

Reverting again to the testing for the passing of unregistered gas in meters, the London County Council have resolved that the test is unnecessary with new meters, and greatly delays the work of testing stations. ["JOURNAL," Nov. 27, 1906.] I agree that the time taken up with the test is considerable; but I think the importance of the test warrants even the more stringent and lawful test being applied. There would be no official guarantee or safeguard that even new meters were as sound as formerly; whereas they are now looked upon as far from satisfactory in this particular respect. The stringency of the tests inferred by the experiments put forward by Mr. Ellery and Mr. Kendrick could only at considerable cost be officially applied.

All parties concerned have their own particular views, which only goes to show how necessary it is that the matter should be well thrashed out, especially as no one appears satisfied with the present conditions. Regulations based on a new or amended law appear necessary by which practicable accuracy and uniformity of practice with the testing of meters would be ensured. To my official mind, the chief defects of the present law and system are the fixed rate and pressure at which the accuracy of registration is ascertained, the extremely wide range in rate at which many meters are permitted by law to be tested for the passing of unregistered gas, the absence of facilities for ascertaining the correctness of the index registration, and the need of some provision whereby meters would be systematically submitted for reverification.

Nottingham, March 18, 1910.

F. COE.

### Gas Engineering Section at the Japan-British Exhibition.

SIR,—Having accepted the chairmanship of the Gas Engineering Section of the Japan-British Exhibition, which opens at the beginning of May next, under the auspices of the Imperial Japanese Government, I am asked by my Committee to state that they are extremely anxious that the gas engineering exhibits from Great Britain should be such as to show the high position occupied by us in this important branch of engineering.

The Organizing Committee have made arrangements whereby gas will be available for use in connection with working exhibits; and I am venturing to address this letter to you with the object of bringing before your notice the importance of showing our allies the splendid field which exists for opening out a market in this direction.

I, therefore, hope—not only for reasons mentioned above, but with a view to ensuring that the Gas Engineering Section in Great Britain should be represented in a manner worthy of its eminent position—that you will recognize the importance of having a display worthy of the occasion.

I should like to call particular attention to the large number of very eminent Englishmen who are interested in this exhibition, which interest is shared, one might almost venture to say, in a still larger degree by the Japanese nation and Government. As evidence of this, I would inform you that this nation have taken half the space in the exhibition and the surrounding buildings. In fact, the exhibition has become quite a paramount consideration with the Japanese, who appear to be putting aside all their own exhibitions in order to concentrate their efforts upon making the greatest possible display of Japanese industries ever seen out of their own country.

It is very probable that the Japanese nation have made little or no advance in the direction of gas engineering; and it behoves us, therefore, to exercise every endeavour to make this section an absolute success.

Personally, I look upon the Japanese not only as our allies, but as the "Englishmen of the East" with whom in future we are likely to have much closer relations than even in the past.

H. GRAHAM HARRIS,

Chairman, Gas Engineering Committee, Japan-British Exhibition.

Shepherd's Bush, W., March 18, 1910.

### The "Pax" Patents.

SIR,—In thanking you for the very clear and comprehensive manner in which you have been good enough to describe the inventions shown here last week, may we ask you to place us still further in your debt by pointing out that Mr. P. Curral Pace is the inventor of the "Pharoso" system of gas lighting, heating, and cooking by petrol, but is not (as your article would convey) the inventor of the angle bracket light nor of the "Pax" switch.

John Street, W.C., March 17, 1910.

PAX PATENTS COMPANY.

In an article on "Fog-Free London" in the "Daily Mail" on Monday last week, the question was asked: "How has London acquired its immunity?" and the explanation is given: "The introduction of gas-fires and gas-cookers, electrical heating apparatus, and the systems of water heating installed in so many City buildings, has an important bearing upon the problem of the lost fogs. Half-a-million new gas fires, cookers, and heaters have in recent years been introduced into London."



# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Cambridge Water Bill. Bills reported: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill; Farnham Gas and Electricity Bill; Wicklow Gas Bill.

The opposition to the Southend Water, Thorne and District Water, and Wicklow Gas Bills has been withdrawn.

The Gas Companies Standard Burner Bills (Nos. 1, 2, and 3) have been referred to a Select Committee, consisting of Lord Joicye (Chairman), Lord Willoughby de Broke, Lord Vivian, Lord St. Levan, and Lord Ritchie; to meet on Thursday, April 7.

The Matlock Bath and Scarthin Nick Urban District Council Bill has been referred to a Select Committee, consisting of the Duke of Northumberland (Chairman), the Duke of Wellington, the Earl of Lindsey, the Earl of Harewood, and the Earl of Lovelace; to meet on Tuesday, April 5.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Glasgow Gas Consolidation Bill, Mallow Gas Bill, Mountain Ash Water Bill, Wishaw Burgh Extensions, &c., Bill.

Bill reported, with amendments: Brighton and Hove Gas Bill.

After the second reading of the Mountain Ash Water Bill, it was ordered, on the motion of Mr. Stanier (Newport), that the Committee on the Bill be instructed that they have power to inquire whether the promoters have made adequate provision by the Bill for the supply of water at reasonable rates to the agricultural community within the area of supply, and to any person or persons from whom any existing or natural supply is, or may be, withdrawn owing to the works or undertakings authorized by the Bill; and that they further have power to insert in the Bill such clause or clauses as they think necessary to impose upon the promoters the obligation to provide such supply.

In answer to a question by Mr. Kenneth Foster (Coventry), as to whether any action is contemplated by the Government, in view of the recommendations of the Royal Commissions on Water Supply (1869), Salmon Fisheries, and Sewage Disposal, and of the representations made to him by the County Councils' Association in 1903 and the Metropolitan Water Board in 1907, in reference to the appropriation and regulation of catchment areas for public water supplies, Mr. Burns said the matter was engaging his attention in connection with a Bill which would shortly come on for consideration in another place.

Last Thursday, Mr. Salter (Basingstoke) asked the Secretary of State for War: (1) What was the distance to be covered in each case by the proposed extension of the Aldershot electric lighting installation to the camps at Deepcut, Blackdown, and Ewshott, and whether, in view of the fact that the gas-mains of the Aldershot Gas and Water Company are in close proximity to the camps named, he had considered the possibilities of utilizing their system; (2) what was the estimated cost per unit for the supply of electricity to the camps, and whether he had obtained any tender from the Aldershot Company for the supply of gas to them in lieu of electricity, and, if so, whether he would state the price per cubic foot [*sic*] for which the Company were willing to supply it; and (3) whether, in view of the cost of the proposed extension of the electric lighting installation to the camps, a considerable saving might be effected, both in first cost and current expenditure, by utilizing the system of the Aldershot Gas and Water Company, especially having regard to the fact that the use of gas for heating and cooking purposes would save the necessity of carting quantities of coal to these camps at great expense. In a written reply, Mr. Haldane said: The distance to Deepcut is  $5\frac{1}{2}$  miles, and a further three-quarters of a mile to Blackdown; that to Ewshott is  $3\frac{1}{2}$  miles. The question of using the gas supply from Aldershot has been considered, and it has been decided that it would be more economical to extend the War Department's electric light installation, which will also provide a more satisfactory illuminant. The Aldershot Gas Company tendered; but their price is presumably confidential. The cost of the electric lighting is an estimate, and cannot at present be disclosed.

**The New Gas-Works for Belfast.**—At an adjourned special meeting last Wednesday, the Belfast Borough Council passed the following resolution: "That the experts' report called for on Oct. 4, 1909, having now been presented, the site known as the Twin Islands site, appearing to be the most advantageous offered, be selected for the proposed auxiliary gas-works; and that the Gas and Law Committees be authorized to take the necessary steps to acquire it." The experts' report here referred to, it may be pointed out, was reproduced in the "JOURNAL" for Feb. 15 last (p. 454).

**San Paulo Gas Company, Limited.**—The Directors report that for the year 1909 the profit was £44,678, to which is added £838 dividends on investments, and £6432 brought forward; making a total of £51,959. After transferring £5000 to reserve account, and charging £3000 for part cost of a small gasholder which is no longer serviceable, and £2000 for the renewal of the Company's tramway, they recommend a further dividend on the ordinary shares of 6 per cent., tax-free, making 9 per cent. for the year; and leaving a balance of £6561 to be carried forward. The total number of public lamps at the end of the year was 5818, an increase of 598; and the quantity of gas consumed in the public illumination was 70 per cent. more than in 1908. The use of gas by private consumers continues to increase, notwithstanding the keen competition from electricity; the quantity sold last year being, in the aggregate, 10 per cent. in excess of that of 1908.

## BRIGHTON AND HOVE GAS BILL.

House of Commons Committee.—Tuesday, March 15.

(Before the Hon. ARTHUR STANLEY, Chairman, Mr. HENRY, and Mr. GUINNESS.)

The object of this Bill is to confer additional powers on the Brighton and Hove Gas Company, including authority to provide a redemption of capital fund with which to write off capital in respect of disused and abandoned works, and the adoption of the "Metropolitan" No. 2 argand burner.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. CLEASE appeared for the promoters. The petitioners in opposition were represented as follows: Brighton Corporation, by Mr. G. J. TALBOT, K.C., and Mr. HUTCHINSON; the Portslade-by-Sea, Southwick, and Shoreham Urban District Councils, by Mr. VESSEY KNOX, K.C., Mr. TYLDESLEY JONES, and Mr. JOHN FLOWERS; the Hove Corporation, by Mr. A. J. RAM, K.C.; and the East Sussex County Council, by the Hon. EVAN CHARTERIS. On behalf of the West Sussex County Council, Counsel was reserved.

Mr. BALFOUR BROWNE, in opening, said, so far as he knew, there was really no opposition to the preamble. Certain clauses were, however, objected to by petitioners.

Mr. RAM said he could not assent to the statement that there was no preamble opposition. So great was his opposition to certain clauses, that unless they were largely modified—if indeed they were not entirely altered—he should certainly ask the Committee to throw out the Bill.

Mr. BALFOUR BROWNE, continuing, said he believed that really a little modification of certain clauses would satisfy the whole of the opponents. The Company was incorporated in 1839, and had obtained various Acts of Parliament since. The capital now stood at about £700,000. In the inner area of supply, which covered Brighton and Hove, the standard price was 3s. 3d. per 1000 cubic feet, and the price actually charged was 2s. 11d. In the outer area, to the north and west of Brighton and Hove, the charge was 6d. more; and in the area further to the west and in the east, the charge was 1s. more. The Company had been away from Parliament since 1893. Most of the facilities now sought were in the Model Bill; and if the Brighton Bill passed in its present form, it would bring their statutory powers into line with modern practice. The principal clauses to which exception was taken were those relating to the creation of a special purposes fund, and to the incorporation with it of the insurance fund; to the provision of a redemption of capital fund; to the carrying forward of sufficient money to pay one year's dividend; to the adoption for testing purposes of the "Metropolitan" No. 2 argand burner; and to certain reductions in the power of charging for gas. The clause regarding the special purposes fund was in accordance with the Model Bill. As to the clause enabling the Company to increase the carry-forward, originally companies could carry forward very large sums; and this was one of the first companies to which restriction was applied—the limit in their case being £15,000. The interest of the consumers was best served by the price for gas being fixed instead of varying from time to time; but with such a small sum as could now be carried forward, the Company would not be able to tide over a period when the conditions were temporarily bad. Clause 11, which provided for the redemption of capital, was a new proposal; and reason for it would have to be shown. The true principle in any undertaking of this sort was that the dividend should relate merely to effective capital. The Brighton Company had on two separate occasions abandoned certain of their works. In 1870, they were forced to abandon works in Hove and to remove to Portslade; and in 1884, on an amalgamation of two Companies taking place, the manufacture of gas at the Black Rock works was discontinued. The result in each case was that a large amount of capital was left on the Company's hands. The amount of capital that was obsolete was something like £57,000. Of course, interest had to be paid on this; and while it remained obsolete and unwritten off, the Company would have to charge a price for gas which would enable this interest to be paid. In these circumstances, the Company thought it would be a good plan to form a capital redemption fund to pay off the obsolete capital. But the fund was limited so that, whenever the Company's capital had been reduced to an amount equalling £500 per million cubic feet manufactured, the writing-off would cease. The Committee which sat in 1899 under the presidency of Sir James Rankin recommended that "efforts should be made, by any company having obsolete or unproductive capital, to redeem such capital by a sinking fund or otherwise;" and in 1903 a clause was inserted in a Bill promoted by the Gaslight and Coke Company enabling them to write off unremunerative capital. The Brighton Company proposed to do the same, by purchasing preference stock in the market and cancelling it—thus getting rid of the burden which they now had to bear. The clause was new and important; but it was justified by the report of the Committee to which he had referred, and by common sense. It would inure to the benefit of the consumers, because at present they were paying for an instrument that was not effective, whereas in the future they would pay for an instrument that was effective, and that was sound economy. By clause 19, the No. 2 "Metropolitan" argand burner would be adopted. The No. 1 argand had been given up in London entirely. It was the burner prescribed by the Brighton Company's Act of 1903; and it was approximately a fair burner for testing coal gas. Now, however, that carburetted water gas was mixed with coal gas, it did not give a reasonably accurate test, because the compound gas required less air for its combustion than coal gas alone. At present, in order to satisfy the defective and inaccurate testing of the No. 1 argand, the Company had to supplement the illuminating power and keep it in excess of statutory requirement. The proposed burner was specified in the Model Bill, and it was prescribed by the London Gas Referees and, whenever possible, by the Board of Trade. So far as the Company knew, the change was not of importance to the consumers; but, if adopted, it would relieve the Company from the necessity, in order to guard against the uncertainty of the present test, of providing a large margin in the illuminating power. The projected



reductions in price were designed to encourage consumption, which, in the outer areas, was at present very small. The Brighton Corporation in their petition stated:

By clause 11 of the Bill, it is proposed to authorize the Directors of the Company to appropriate half yearly, out of the revenue of the Company, an amount equal to  $\frac{1}{2}$  per cent. on the paid-up capital of the Company (including premiums and moneys borrowed on capital account) for the purpose of the formation of a capital redemption fund, and to apply such fund in purchasing ordinary or preference stock of the Company for the purpose of cancellation. Your petitioners strongly object to the powers sought by such clause, and submit that the same are entirely novel, unprecedented, and unjustifiable. The operation of such provisions would be very prejudicial to the interests of the consumers of gas in the borough, and would, or might, prevent or retard the reduction in the price of gas; and your petitioners submit that the powers sought by such clause should not be sanctioned.

While this proposal was novel, it was not unjustifiable. It must tend to reduce the price of gas; for the less capital there was to pay interest on, the less the consumer would have to be charged. The petition went on to object to the provisions of clause 16 as to the price of gas and the dividends payable by the Company on their ordinary capital:

Your petitioners would desire to point out in this connection that the standard price of gas on which the dividends payable by the Company was regulated was fixed so long ago as the year 1881, and your petitioners submit that such price is not justified under the existing conditions, and having regard to the present position of the Company. Your petitioners further object to the proposals of such clause with reference to the increase and reduction in the dividends payable by the Company, and submit that such provisions should be altered by providing that the dividends in respect of the capital of the Company which only bears 7 per cent. should be reduced or increased by the sum of 3s. 6d. per year, or 1s. 9d. per half year, in lieu of the proposed increase or reduction of 2s. 6d. per half year. Your petitioners accordingly submit that the clause should not be sanctioned in its present form, and that amendments should be made therein in respect of the above-mentioned matters.

This, perhaps, was the most important clause in the petition. All the capital of the Company had been raised on the faith of the standard price of 3s. 3d., and of the power to increase the dividend by 5s. for every penny of reduction in the price of gas; and yet the Corporation asked for an alteration. If the standard or dividend arrangements were altered, it would be a breach of faith with every person who subscribed to the capital of the Company. It would be not only bad for the Company and ruinous for the subscribers, but a bad thing for gas companies generally, if it were known that the terms on which capital had been found were liable to alteration. He therefore asked the Committee to ignore this part of the petition. The Corporation next took exception to clause 19, by which it is proposed to enact new provisions relating to testing the quality of the gas, and submitted that, if any further powers were conferred on the Company, as proposed by the Bill, additional provisions should be inserted relating to a number of further matters. The first of these was the placing of the Company under obligations limiting the percentage of carburetted water gas and carbonic oxide in the gas in accordance with the report of the Departmental Committee. The amount of water gas at present being used by the Company was, on the average, about 33 per cent.; whereas many companies used about 50 per cent. It would be very serious if, on the occasion of (say) a coal strike, the Company could not add to the illuminating power by means of water gas. So far as Counsel knew, there was no case in which the amount had been limited by Act of Parliament. Another of the suggested additional provisions dealt with the fixing of the standard calorific power of gas to be supplied by the Company, and the making of adequate provision for the testing of gas for calorific power. It was quite true, Counsel remarked, that the heating power had become more important, now that gas was largely used for heating, than formerly, when it was employed exclusively for lighting purposes; but this argument did not apply nearly so much in places like Brighton and Hove as in places where it was used in connection with manufactures. There was no satisfactory calorific test; and he did not know that there was an instance in which testing for calorific power had been provided for, except in the case of the Gaslight and Coke Company last year. The fact that the Brighton Company's gas was to be of 15-candle power was of itself an indication of its calorific power; and it would be hard if the gas had to be tested in respect first of its illuminating and then of its calorific power, and if the Company were to be under penalties in regard to both.

Evidence was then called in support of the Bill.

Mr. A. M. Paddon, the Chairman of the Company, examined by Mr. HONORATUS LLOYD, stated that there were very special circumstances which led the Company to wish to create a capital redemption fund. He did not know of anything corresponding to the present case. In 1870, the whole of the manufacture of the Company at Hove was abandoned and taken to a comparatively remote and isolated peninsula at Portslade. This was done largely, he believed, at the instance of the Hove Corporation, who wanted to rid their area of the manufacture. Then, in 1884, the manufacture of gas was discontinued at Black Rock, which was at the other extremity of the area. In each case a considerable portion of the plant was abandoned and thrown out of use. This meant that a lot of capital was left as non-profit earning, and therefore as a burden on the undertaking. Interest on this capital had to be paid, and went to increase the price of gas to the consumer—thus operating detrimentally both to shareholders and to consumers. The Company had tried, by economical administration, to avoid the creation of new capital in connection with the gradual extension of the business, in order to reduce the capital per million. They still, however, dragged the two wounded limbs. In order to get rid of them, the Company sought power to set aside out of revenue a sum per annum until the capital was reduced to £500 per million. This would make the process convenient and not very long. The burden of providing this amount would fall on the consumers and the shareholders in the proportions of the sliding-scale. Broadly speaking, it would be five-sixths against the consumer and one-sixth against the shareholder; but, immediately the process was effected, five-sixths of the benefit would go to the consumer and only one-sixth to the shareholder. This was an equitable arrangement as between the shareholder and the consumer; and it was

to the interests of both parties. In one of the Gaslight and Coke Company's Acts, there was a provision somewhat on the lines of the one the Brighton Company were seeking. The Gaslight and Coke Company, however, wrote off their capital out of profits—and thus at the expense of the shareholders alone. This was forced on them as a penalty. In the Brighton case, the proposal was quite voluntary. The Company objected to the No. 1 burner, because it no longer tested the gas supplied by the Company. It destroyed a portion of the illuminating power, which portion the Company had to make good—thus giving the consumer something which Parliament had not given him under the existing Acts. They did not, however, attach great importance to this, because the amount which the burner destroyed, and which the Company had to make good, could not, he thought, be reduced into practical financial value in the price of gas. There was, however, another objection to which the Company did attach importance—namely, that the burner not only misrepresented the gas by destroying a certain amount of its illuminating value, but gave results which varied as the proportions of coal gas and water gas in the gas supplied varied. It was never accurate, and it was impossible to work to. With it, the Company really only guessed at what they did. This was a most disadvantageous state of things for a company carrying on business in face of a hostile Corporation and a hostile test. They therefore asked that they should have the benefit of the No. 2 burner. One proposal of the Bill was to increase the remuneration of the Directors. The business of the Company had practically doubled since the remuneration was last fixed. The Company thought the matter a purely domestic one, which could not affect the Corporation, who took exception to it. The standard price of the Company was very low. The capital had been raised on the basis of the existing standard; and if it were reduced, it would be a breach of faith towards the proprietors of stock. That there should be a limitation in the proportion of water gas was about the most dangerous thing a consumer could propose. In 1900, a very trifling increase in the demand for coal sent up the price of it 60 or 70 per cent., and it was easy to imagine the price to which coal would rise if gas companies were deprived of their present alternative supply of water gas, and were forced into the hands of the coal seller. The supply of carburetted water gas in Great Britain was equivalent to the gas produced from nearly 3,000,000 tons of coal. From every point of view, a calorific standard was unnecessary. It existed only in the case of the Gaslight and Coke Company. In that instance, experiments had been carried on for a time. The circumstances were known, and the Company and the London County Council agreed in thinking that a test might be imposed. Moreover, the Gaslight and Coke Company had a 14-candle standard—the standard which was general throughout the country; whereas the Brighton Company were preserving the 15-candle standard, which, in itself, was an ample safeguard of the quality of the gas. The calorific test question was still much in the experimental stage. He did not think sufficient was known about the subject to advise what was a test. A calorific test was an intricate laboratory matter. It would be very unfair to impose two tests on the Company's gas—one for illuminating and one for calorific power. Although the Brighton Corporation came before the Committee as representing the consumers and ratepayers, they were also engaged in a keen industrial competition with the Company by supplying electric light, and anything which would place the Company at a commercial disadvantage tended to promote the sale of the Corporation's electricity. In addition to the test, the Company already had to face the keenest electrical competition in the United Kingdom. It was not fair for the Corporation first to come to protect the ratepayers and consumers, and then to try to get something which would enable them to bolster-up competition with the Company.

In cross-examination by Mr. TALBOT, witness said he did not think the standard price was ever considered to be the same as the sale price of gas. In establishing a standard a margin was always left. The only cases in which standard prices had been decreased had occurred recently. The reduction was in return for some very big compensation, such as a heavy reduction in illuminating power. There was a strong possibility of a rise in the price of gas throughout the country, on account of the Durham coal trouble. In the case of each of the London Gas Companies, a reduction in standard price had been coincident with a change in their illuminating power from 16 to 14 candle power; but he did not know how far the reduction in standard price in these cases was attributable to the mere fact of the change in illuminating power. Other things affected the matter. If the gas at present being supplied by the Company were burnt through the proposed test burner, it would bring out greater candle power than it showed now; but not 3 candles more. The proposed burner would show more than the present burner, because it would show what the present burner destroyed.

Mr. TALBOT: Do you not see that the effect of altering the burner is to reduce the illuminating power you are bound to supply?

Witness: It is not reducing it below the standard Parliament gave. It is reducing it from an excessive standard—a standard which we have to bolster-up in order to comply with the defects of the old burner. If we get the new burner, we shall no longer have to put into the gas a certain amount of illuminating power that we now put into it.

In other words, you will be entitled by Parliament to supply gas of lower illuminating power than you have to supply now?—At present; but not below the standard given to the consumer by Parliament. The difference to the consumer will not be enough for the Company to offer him anything in the way of price.

Professor Vivian B. Lewes, examined by Mr. CLEAVE, explained how the argand No. 1 burner came to be used, and how, as carburetted water gas was utilized for enrichment, this burner was found to be over-aerating the gas, and how Mr. Charles Carpenter, therefore, devised the "Metropolitan" No. 2 argand, in which there was the power to regulate the air supply until the best illuminating power of the gas was obtained. He strongly favoured the adoption of the latter burner, because it would bring in something like uniformity throughout the country. At present, owing to testing being accomplished with different kinds of burner, the illuminating power shown meant nothing to anybody. He did not think Parliament would consider the point of limiting the use of carburetted water gas. His view was that there should be not more than 16 per cent. of carbon monoxide in the gas



This percentage was safe for the consumer and fair for the gas companies, because it enabled them to mix in practically half-and-half water gas. Hitherto there had been no legal restriction.

Mr. CLEAVE: What have you to say as to the desire for a standard of calorific value?

Witness: I say that there is not the slightest doubt that a standard of calorific value will in future be the standard by which we shall test gas; but the time is not quite ripe for it. The thing is still more or less in the experimental stage. There is only one gas company in the country which has a calorific test; and that was put in by arrangement. There is not the least doubt, when you have it realized how important calorific value is, that the calorific value test will come in place of the illuminating value test. But as a Gas Examiner, and as also knowing a good deal about the manufacturing processes of the country, I should certainly say it would be indefensible to hamper and strangle any industry by putting too many tests on it. If you are working for illuminating value tests and put on calorific value tests, it will be a distinct advance; but do not try to make an already hampered gas manager work to both standards.

Mr. E. L. Burton, the Secretary to the Company, also gave evidence in support of the Bill.

### Wednesday, March 16.

Mr. Joseph Cash, the Engineer and General Manager of the Company, examined by Mr. BALFOUR BROWNE, stated that, notwithstanding the competition of the Corporation electric supply, which was perhaps more severe in Brighton than in any other town, the sale of gas had risen from 897,000,000 cubic feet in 1892 to 1,253,000,000 cubic feet in 1909; the increase being at the rate of 2 per cent. per annum. With regard to the proposal to establish a redemption fund, he was perfectly sure it would be to the advantage of the consumers and shareholders alike to get rid of the £57,000 of obsolete capital. In his opinion, it was imperatively necessary to do so.

Mr. BALFOUR BROWNE at this stage informed the Committee that, since the preceding day, the Parliamentary Agents had drafted a clause saying that the sinking fund was to be limited to £57,000. This would be more satisfactory than imposing the limit of £500 per million cubic feet of gas sold.

Witness, in further examination, said the amount which would be laid aside for this purpose each half year would be about £1700. The period within which the £57,000 would be paid off should not be a very great number of years. When it had been written off, of the benefit that would be derived one-sixth only would go to the shareholders and five-sixths to the consumers. The present capital of the Company, which amounted to £566 per million cubic feet of gas manufactured, was large; and it had been swelled by this sum of £57,000. The restriction to £15,000 of the amount that could be carried forward had worked unsatisfactorily from the time it was imposed, because they were never sure what the condition of the coal market might be. If the Company had been able to have a sufficient carry-forward, they would often have been able to prevent an increase of price; and increases of price were very much resented by consumers. As to the proposed alteration of the sliding-scale, the standard price (3s. 3d.) was very low. If the Company were applying for further capital powers under this Bill, a restriction in regard to dividends such as the Brighton Corporation proposed would probably be made; but he had never known such a restriction to be imposed on a company after parliamentary sanction had been given to the capital powers sought, and after the capital had been issued, on the terms specified, at a large premium. The Company had power to issue a considerable amount of further capital. Gas of 15-candle power could not be economically produced from coal from Durham—the principal source of supply of the Company. Some form of enrichment therefore was necessary; and carburetted water gas practically was the only means of enrichment. Gas so enriched, however, was not fairly tested by the burner at present used. There was no precedent for any limitation of the percentage of water gas. It would be wrong to impose such a limit. If the limit were sufficiently high, it would not be any good; if it was too low, it might prevent the use of water gas in case of necessity. Many things might cause the Company to wish to fall back on water gas. This gas was very valuable in case of emergency; and its use was really in the interest of the consumer. On an average, the Company used 33 per cent. of carburetted water gas; but the percentage, in case of emergency had risen to 41. If a calorific test were substituted for the illuminating test, it might be all right; but to have the two tests of the same gas would be wrong. The two tests did not run together. The gas consumed in Brighton and Hove amounted to over 90 per cent. of the whole; so that obviously the main interest of the Company was in these places. While in Brighton and Hove the number of consumers per mile of main was 201, in the outer areas the number varied from 130 to 34. There was no doubt that a higher charge should be made in the outer areas than in the densely populated inner areas.

Cross-examined by Mr. TALBOT: The standard price ought never to be disturbed. It had been disturbed very seldom. He knew of only three cases—the Gaslight and Coke, South Metropolitan, and the Lea Bridge Companies.

Mr. TALBOT: If the consumer wants gas both for heating and lighting, is it not important that he should know he has a satisfactory gas for both purposes?

Witness: The test imposed at present is one for illuminating purposes; and that we have complied with. The calorific test has been applied in no case except one—the Gaslight and Coke Company; and that is practically by way of experiment.

Witness went on to say that his objection to the calorific test was that while they could control illuminating power—that was to say, if the coal was a little under the mark they could add, by means of hydrocarbons and carburetted water gas, the amount required to bring it up to standard—calorific power was determined a great deal by the quality of the coal which they had to use; and they could not add to that calorific power to maintain a test except by means which were beyond their control. In other words, they were dependent on the quality of the coal which they received. During the last few months, owing to

labour difficulties in the North, coal had been of a very indifferent character; and, therefore, no doubt there would have been a diminution in the calorific power from a cause for which they were in no way responsible.

Mr. TALBOT: Is it not to the interest of the consumer that he should know that his gas is of a proper quality for heating, as much as for lighting?

Witness: I should think there is very little variation in the calorific power of gas from time to time.

Then I do not understand what you mean, because in that case there would be no difficulty in keeping a proper standard?—If we had coal of bad quality, down would go the calorific power from a cause that we could not prevent.

Then you tell me there is very little variation?—It is only because we have had trouble, as we have had lately, when the coal varies; and that is from a cause beyond our control.

Have you ever tried to test it?—I have made tests; but only so short a time ago as when your petition, in which you alleged it, was put in. The apparatus is not yet in fair working order; so that I cannot answer any question as to variation.

I may take it that until this Bill you never did test calorific power for your own satisfaction?—No.

In further cross-examination, witness said he tested for carbon monoxide twice daily. He aimed at making the percentage 12. If it went up to 13, orders were given to bring it back to 12. The highest he had ever known was 16. It did not matter to the consumers whether the percentage was high. So long as the gas was not misused, there was no danger in a high percentage.

Mr. VESSEY KNOX cross-examined witness at considerable length with regard to the circumstances and conditions in the outer and inner districts of the Company in support of the claim of the outer areas for a lower price of gas.

Mr. H. E. Jones, examined by Mr. HONORATUS LLOYD, said that, having regard to the special circumstances of the Company, it was desirable that there should be a capital redemption fund. The capital of the Company was above what it ought to be, having regard to all the circumstances of the case. It was in the interest both of the consumers and of the shareholders that the dead-capital should be got rid of. He approved of the proposed change of burner for testing purposes. The change would cause a saving in the cost of production; but the saving would be extremely minute. There would be a difference of  $\frac{3}{4}$  candle when testing 15-candle power gas. This  $\frac{3}{4}$  candle represented a little over  $\frac{1}{4}$ d. per 1000 cubic feet of gas. If there was a saving, four-fifths of it must, under the sliding-scale, go to the consumer. The change of burner was felt to be so serious that the Institution of Gas Engineers had approached the Board of Trade in regard to it; and the Gas Companies' Protection Association had also approached the Board of Trade to have it taken up as a public question, owing to the great disadvantage which at present existed of not comparing like things by like standards. The Company should be allowed to use water gas as they had done in the past. A limitation of the proportion of carburetted water gas might have a very large effect on the price. He was somewhat anxious owing to the eight-hour movement in the coal trade. There had been a tendency for coal to rise. Some gas companies had to pay, through hasty contracts made in the middle of last winter, very large prices for coal; and those companies which had no water-gas plant had to supply the whole of their extra requirements from this dear coal. It so happened, however, that at that time American oil was reduced in price. As an economic factor in the administration of gas supply, it was valuable to have something to countervail the coal-owner, who otherwise would have them quite at his mercy. But for the large amount of water gas which was made throughout the kingdom, he was satisfied the price of gas coal and the price of gas would rise considerably.

In cross-examination by Mr. RAM, witness said there was no precise precedent for putting on the consumer the necessity of finding any portion of the money which was to wipe off old capital. Compulsion was put on the Company to move their works from Hove, and also the smaller works of the old Brighton Gas Company from the Black Rock end of Brighton. The change was in the interest of both parties. The Company benefited by getting free access to the sea at Portslade, and the Local Authority by the removal of the works. Witness admitted that, in a sense, if the money was not expended in wiping off the old capital, it would be available for a reduction of the price of gas.

In cross-examination by Mr. TALBOT, witness said that in 1904, before Lord Rayleigh's Committee, he expressed the opinion that the proportion of water gas should not be more than one-third. It was an awkward thing for a witness to say he had changed his opinion. He would rather say he had modified his opinion about water gas. His experience was that it had not been found so injurious as it had threatened to be.

Mr. E. Herbert Stevenson, examined by Mr. HONORATUS LLOYD, gave evidence in support of the Bill. The capital redemption fund, having regard to the circumstances of the Company, was fair. It was to redeem dead-capital of the past, just as the special purposes fund could be used to redeem the dead-capital of to-day or in the future. It was not in the interest of either shareholder or consumer to carry forward the burden of dead-capital for all time, and to pay interest on it. It should be wiped out as a municipality wiped out its capital from ordinary revenue. He did not think any alteration in the standard price should be made if the test burner were altered. In 1893, an extra candle was put on the Company, in accordance with the practice of Parliament then, which was to put 15 candles on everyone without giving anything at the same time. When the cost of production was thus raised, the opponents did not suggest that there should be a corresponding increase in standard. It would be eminently unfair, as the Company obtained nothing then, to take off something now, when, by the alteration of burner, they were merely asking Parliament practically to place them in the position in which they were in 1893. The saving in cost to the Company, owing to the change of burner, would be about three-eighths of a penny, not more, per candle. The change would involve about one candle, perhaps a shade more, which, in money, meant less than  $\frac{1}{4}$ d.—a rather difficult sum to deal with in connection with standard price. Of this  $\frac{1}{4}$ d., four-fifths would go to the consumer. There should



be no limitation of the proportion of carburetted water gas. He was of opinion that a test for calorific power would come some day; but it would come, he hoped and trusted, generally. He did not think it would be fair to put two tests, with two penalties, on a company with regard to its gas. He hoped that, until the illuminating power test was done away with, the calorific test would not be put on the general run of companies.

In cross-examination by Mr. RAM, witness said he did not think the standard price should be altered unless a company received a large benefit. He objected to a calorific test, because it was practically a second test for the same thing. It was as important that the consumer should know that he was getting the right amount of heat as the right amount of light. But, generally speaking, with the present methods of gas manufacture, when they knew the composition of the gas and its illuminating power, they could tell very nearly what the calorific result was. Two tests were, practically, unnecessary. The calorific test would be better than the illuminating test.

Mr. RAM: Do you desire to have a calorific test?

Witness: Yes; and abolish the illuminating test, because so little gas is used for purely illuminating purposes.

Mr. BALFOUR BROWNE: Will that satisfy you?

Mr. RAM: I want to see how far Mr. Stevenson will go with me.

Witness: If you will strike out the illuminating power test, we will take a fair calorific test. Only there is this about it—up to the present we do not know what is a fair calorific test for this Company.

In cross-examination by Mr. VESEY KNOX, witness said he did not know of any other case in the United Kingdom in which there was a differential rate against the district where the manufacturing gas-works were situated.

Cross-examined by Mr. HUTCHINSON: He did not agree that, if the new test burner were adopted, the consumer who used a flat-flame burner would be in a worse position to the extent of 8d. per 1000 cubic feet, that the person who used a cooking-stove would pay 3d. per 1000 feet more, or that the man who used an incandescent burner would pay 2d. per 1000 feet more.

Re-examined by Mr. BALFOUR BROWNE: The gas, before being distributed, was carried from the works into Hove and back again.

This concluded the case for the Bill; and evidence was at once called in support of the petition of the Portslade, Southwick, and New Shoreham Urban District Councils.

Mr. William Newbigging, examined by Mr. TYLDESLEY JONES, stated that the Brighton Company, in the year 1908, spent on repairs, maintenance, and renewals 10'74d. per 1000 cubic feet; whereas the corresponding figure for all the companies and for all the provincial corporation gas supplies was 7'24d. From this he drew the inference that the Brighton Company were somewhat extravagant in their expenditure on repairs and maintenance, or, in other words, that they were really charging to revenue items which ought to be charged to capital. The standard price in the inner area was 3s. 3d., and in the outer area 4s. 2d.—a difference of 11d. It was proposed by the Bill to reduce the price in the outer area so that it would not exceed the price in the inner area by more than 6d.—the actual difference at present. Thus the consumer would be no better off after the Bill was passed than he was now. There were many other places in the South of England where the price of gas was lower than in Brighton. The differential charge of 6d. was excessive. It was not necessary to take the gas from the works to the holders at Hove and back again to the district. A holder could be erected at the manufacturing works at Portslade and gas distributed thence. If the Company chose to distribute from the Hove holders, that was no reason why the outer area should be penalized in the matter of price as they were at present. The extra cost of mains in the outer district was 1d. per 1000 cubic feet. Beyond this penny, he could see no additional cost in supplying in the outer areas; and he could see therefore no justification for charging 6d. more for gas supplied there. The effect of the Company using the "Metropolitan" No. 2 burner would be that they would be able to send out a poorer quality of gas than they had been doing, and would still satisfy the 15-candle condition. If the gas now being supplied, which, when tested in the No. 1 burner, showed an illuminating power of 15 candles, were tested in the No. 2 burner, it would probably give an illuminating power of about 17 candles. He had made tests to ascertain the calorific value of the lower quality gas. These showed that for every reduction of one candle the calorific value was reduced 3 per cent. This was of great importance to consumers, especially those who used gas for cooking and heating purposes and in incandescent burners. The substitution of one burner for the other, and the consequent supply of a lower-grade gas, represented a saving to the Company in the cost of manufacture which he put at about 1d. per candle. Assuming the penny were given to the consumer in the shape of reduction of price, the position of the consumer would be distinctly worse. He was very strongly of opinion that it was not a wise thing for any gas undertaking to send out gas of the quality that the Brighton Company could send out if the powers now sought were granted to them. It was a very praiseworthy object to endeavour to reduce capital; but it should be done at the shareholders' expense, not at the consumers'. The effect of the capital redemption clause would be to place on the consumer in the immediate future the burden of paying, for the benefit of posterity, for the excess of capital over £500 per million cubic feet. The burden would be equivalent to just under 1d. per 1000 cubic feet. The consumer would have to find the whole of the £56,000 in order to get his penny reduction in the price of gas. This would be of advantage to the shareholder, who, for the benefit of having his undertaking released from this debt, would simply go without the  $\frac{1}{2}$  per cent. dividend.

Thursday, March 17.

On the resumption of the proceedings to-day,

Mr. William Newbigging was cross-examined by Mr. BALFOUR BROWNE. He said the average expenditure of the London suburban gas companies on repairs, maintenance, and renewals should not be taken as an example for Brighton. These companies were spending a great deal more than they should do. The average of the provincial companies—namely, 5'68d.—was about the right figure. He did not allege that

the suburban companies were badly managed; but they were spending much more on repairs than they need. It was true that the figure of the Mitcham Company was 16'49d., as against Brighton's 10'74d.; but Mitcham must be grossly extravagant—there must be some special reason to explain so high a figure. With reference to the argand No. 2 burner, which he thought would mean increased gas consumption without better illumination, it might be perfectly true that, since the burner had been introduced into London, the consumption had not gone up; but bad trade and the increasing competition of electric light might account for this. He approved of the principle of writing-off dead-capital, but not at the expense of the customers.

Mr. BALFOUR BROWNE: You are laying away at Macclesfield a sinking fund to pay off the whole value of the works at a certain date. Who is paying that—the consumers, I take it?

Witness: Yes.

That is, the consumers of gas to-day for the benefit of the gas consumers at some distant future date?—Yes; but this is the difference. The gas consumers in Macclesfield are owners of the undertaking. They are in the position of the shareholders of the Brighton Company; and, as owners of the undertaking, they are paying off their capital.

But is not that an absolute fallacy? Don't you see that if I, being a consumer in Macclesfield, leave the town I cease to be an owner of the works; yet I have been contributing all along to the sinking fund?—Yes; but you cannot take a single consumer in that way.

For forty years the people go on paying off capital for the benefit of the people after forty years hence?—Well; the people of past years have done the same thing for us.

Dealing with the calorific power test, witness said that for every candle reduction in the illuminating power they lost 3 per cent. on the calorific test. He was aware of the elaborate tests that have been made by London Companies for years for calorific power. Asked if the results showed a variation of from  $\frac{3}{4}$  to  $1\frac{1}{2}$  per cent. instead of 3 per cent., witness said he found 3 per cent. in his own town. It depended on the constituents of the coal. With regard to differential rates, he admitted twenty cases put to him by Mr. Balfour Browne in which Parliament had granted such differentiation.

Re-examined: None of the twenty cases were those of differential rates in thickly-populated outside districts. He did not know any single case which had come before Parliament in recent years where there was a differential rate as against an urban population of 18,000 people.

Mr. J. E. Bell, solicitor, of Brighton, gave evidence on behalf of the outer districts in opposition to a differential rate, which, he contended, was unjustifiable in view of the increase in the population, rateable value, and number of consumers.

Mr. TALBOT, addressing the Committee on behalf of the Brighton Corporation, said the first thing they asked for was a reduction in the standard price from 3s. 3d. to 3s. The objection made, that they had no right to reduce the standard price, came too late. It had been done repeatedly. The Bill of the Lea Bridge Company formed a precedent; and since then the same thing had been done in the case of the three great London Companies. Their claim on this was that if the candle power was in fact reduced by the Bill, the consumer was entitled to a reduction in the standard price. As to the capital redemption fund, there was no precedent for this clause. The Company, of course, had a perfect right to redeem their capital; but it should be done by the shareholders and not by the consumers. There was only one case in which a clause of this kind had been authorized by Parliament, and in that case (the Gaslight and Coke Company, 1903) the capital redeemed was taken from the dividend, after it had had its effect under the sliding-scale in reducing the price—in other words, the fund was made up by the shareholders, not by the shareholders and consumers. This was a wholly reasonable basis. But it was a strong order that the consumers for the next six or twelve years should be penalized in this way without their consent. They had considered the question of the calorific test very carefully. They did not desire to press this point, because it was now admitted—what they had always contended for, but what certainly used to be denied—that the calorific value of gas did, in fact, vary roughly with the illuminating value. If they were successful in maintaining the present illuminating power, or in giving to the consumers the equivalent in the reduction of the standard price, they did not think they ought to press for a double test, the result of which would not, in their opinion, be financially worth all the expense and trouble. Then there was the question of carburetted water gas. There was no doubt that this gas was more poisonous than coal gas. The Home Office Committee of 1899, in their report, recommended that a limit should be fixed which the proportion of carbon monoxide in gas should not exceed. As the Government had not found time to legislate on this subject, what he desired was, not that the Committee should fix a limit, but that, if the Home Office thought fit to make regulations as to the quantity of carburetted water gas, the Company should be bound to conform to those regulations.

Mr. Stevens, the Borough Accountant of Brighton, said the annual amount which might be appropriated by the Company for the capital redemption fund was £3554. If this sum were applied in the purchase of ordinary stock for cancellation, the process of redemption would probably last for thirty years. Of this £3554, the portion which would be borne by the consumer was approximately £2900, and £654 would be paid by the shareholders. For every £3554 thus taken out of revenue and applied in the cancellation of stock, the annual saving in the amount of dividends would only be about £170; so that before the annual saving in dividends closed, something like 19 years would have elapsed. During that time the effect of the operation would be to tend to postpone the possibility of a reduction in price. It would be a hardship on consumers for the next 19 years to require them to provide this sum for redemption purposes.

Mr. Isaac Carr said he had made tests of the Brighton gas both with the old burner and the one which it was proposed to use, and he found a difference between them of 4 candles. The lowering of the illuminating power would reduce the cost of production to the extent of  $\frac{1}{2}$ d. per candle per 1000 cubic feet. This would give them a saving of 2d. in respect of the four candles. Whether in lighting or heating, the consumer would have to use a larger quantity of gas to procure the same effect, no matter what type of burner was used. He estimated that the consumer of gas by the flat-flame burner would be penalized



by this proposed alteration to the extent of about 25 per cent., which was based on the difference he found by his tests of the Brighton gas. This would amount to about 8d. per 1000 cubic feet. The consumer would have to burn 1250 feet of gas in place of 1000 feet. He had been unable to make a test for calorific value, so he had had to base his figures on the loss in calorific value from the results obtained in his own works. He found that a fair average to take in the falling off in calorific value for every candle was 3 per cent.; and, on the basis of a 4-candle fall, it would make 12 per cent. falling off in calorific value. This would amount to about 4d. per 1000 cubic feet. Asked to what extent the user of the incandescent burner would be damaged, he said he had based his figures upon the results obtained elsewhere (not in Brighton), both with coal gas and mixtures of carburetted water gas with coal gas; and he found that the falling off would be about 2 per cent. per candle, or about 8 per cent. as of total. To sum up the situation, it would be correct to say that the proposed change would give the Company the benefit of 2d. per 1000 cubic feet in the manufacture, and the consumers of gas would be affected to the extent of from 8d. down to 2d. With regard to the redemption fund, he did not see any reason of policy or otherwise why the consumers should be called upon to pay for the redemption of the old capital, and it would be unfair to put that additional tax upon them.

Dr. J. S. Haldane was the next witness. He said he was nominated by the Home Secretary in 1898 to serve on a Committee to inquire into and report upon the extent to which water gas and other gases containing a large portion of carbonic oxide was manufactured and used for various purposes, and the dangers attending such manufacture and use, and the means whereby they might be diminished. The report of the Committee was a unanimous one. Witness put in a table showing the statistics of death from gas poisoning in this country and America, which said:

From the table it is evident that by no possibility can the conclusion be avoided that the distribution of carburetted water gas without any special precautions, is enormously more dangerous, or, to speak more correctly, less safe, than the distribution of coal gas. Roughly speaking, the loss of life arising in one way or another—accident, suicide, or homicide—appears to be fully a hundred times greater with water gas in America than with coal gas in this country. While coal gas is an exceedingly safe, as well as cheap, good, and convenient illuminant, water gas as distributed in America is very far from being safe. Assuming that Boston has a death-rate equal to that of London, about one in every 300 deaths is due to accidental water-gas poisoning. This represents an annual death-rate about the same as that of "child-birth" or of "suicide" as returned in the official statistics for England and Wales for 1880 to 1890. The total death-rate for poisoning of every kind in this country, whether accidental or suicide, and whether by solids, liquids, or gases, is only about half the average death-rate from water-gas poisoning alone in Boston, New York, San Francisco, and Washington.

That Committee took *viva voce* evidence from America. He agreed to a further quotation from the blue book which stated: "It is clear that with coal gas of ordinary composition it is almost impossible to produce a poisonous atmosphere in a room by simply leaving the gas turned on during the night; whereas with water gas a poisonous atmosphere is easily produced even in very large rooms."

Mr. TALBOT: Will you give your opinion on the matters discussed here? The first is whether the danger arising from the unrestricted use of carburetted water gas is a serious matter, and the second is whether it is necessary, in your opinion, that some restriction should be put upon it. I may take it first that you agree with the report of the Committee which you signed?

Witness: Yes, I do.

Has there been anything that has happened since that which has altered your opinion?—I think there is one circumstance which would probably diminish the danger somewhat, and that is the fact that at present incandescent burners have largely taken the place of flat-flame burners, and that an incandescent burner as a rule burns less gas. Consequently, the danger from leaving the gas turned on at night is rather less. I think that these American deaths were due to people simply going to sleep with the gas turned on from a flat-flame burner. It is difficult to say how many were suicidal and how many were accidental. The danger would be appreciably less at present, because the amount of gas that would escape would be less.

The Committee, of course, reported that, in your opinion, it was essential, in the interests of public safety, that some restrictions should be introduced on the manufacture of carburetted water gas?—Yes; it was thought desirable. But no restrictions have been introduced; and I do not think the occasion for it has occurred, because, so far as I know, no English company has distributed undiluted water gas, and the proportion has been kept down to something quite reasonable.

We have had evidence before this Committee that, in fact, carburetted water gas is being manufactured to-day in Brighton to the same extent as it was at the date of your report; therefore no increase has occurred in fact. But I may ask you whether, in your opinion, a considerable increase in the supply of carburetted water gas ought to be restrained?—Yes; I think any very large increase on what has been distributed hitherto ought to be restrained. It is restrained voluntarily by the gas companies at present; but one would like to see it made perhaps a little more certain.

Replying further to Mr. TALBOT, witness said he thought it was a reasonable way of dealing with the matter in this case that if the Home Office should issue any regulations restricting the supply of water gas to any amount, the Company should be bound by them. The Committee to which he had referred mentioned a maximum of 20 per cent. of carbon monoxide. The way in which the Committee expressed themselves in 1899 was: "Limit the proportion of carbonic oxide in the public gas supplied at night to 12 per cent., or to such greater amount as the department may consider desirable."

Mr. BALFOUR BROWNE: You have said that in that report you have recommended that restrictions should be introduced. The report dealt specially with, and your evidence dealt specially with, carburetted water gas in America?

Witness: Yes.

I saw in one of the figures you gave that they were supplying 93 per cent. of water gas?—Yes; and 100 per cent., too.

Has that any bearing upon an English company who keep down the percentage to 30?—I think very little.

You said the occasion for restrictions had not occurred?—No; because the gas companies have been very sensible on the subject.

With regard to carbon monoxide, supposing you find a company who keep it down to 12 per cent. and complain whenever it goes up to 13 per cent., would you think that company were doing their duty? Supposing a company test twice a day for carbon monoxide and keep it down to 12 per cent.?—I should say that company was certainly doing its duty fully.

And you might go up to 16 or 17 per cent. without serious fault?—Yes; I think so.

Is there any reason why the people of Brighton should be put under restrictions any more than any other body in the country, and that the restrictions should not be general?—That was the recommendation of the Committee.

And if it is dangerous in Brighton not to have restrictions, it must be dangerous elsewhere?—Yes, certainly.

You know that there are a very large number of companies in the country who enrich their gas with carburetted water gas?—Yes.

And there is no restriction on one of them?—No; but one or two of them have been very rash.

You are one of the people who put upon London the No. 2 burner, or you assisted in doing it?—We are very limited as regards our choice of burners, and so on, by the Acts which control the matter; and we are not responsible for the Acts.

For testing gas with carburetted water gas in, the No. 2 burner is a good one?—Yes.

Have you made any tests to see what difference would be returned in 15-candle gas with the argand No. 1 and the "Metropolitan" No. 2?—We made very careful tests on this point some years ago.

Would it be absurd to say that it made a difference of 3 or 4 candles?—I think that would depend to a certain extent on the kind of gas tested. There would be a substantial difference in them all.

Am I right in saying that the argand No. 1 does destroy the illuminating power of gas with water gas in it?—You get better results from the gas by the other burner, I will put it in that way.

That is exactly the same thing, is it not?—I am afraid from the point of view of the public it is different.

Even from the point of view of the public, is not the idea of a burner to test gas to get a burner that will do justice to it?—I should say the public rather want to have some measure of the value of the gas as they use it. They may use it with a flat-flame burner, in fact.

I understood that the idea, when this was adopted, was to get a burner to be used by the public?—The public would not use the No. 2 burner.

You would not have gas tested with a flat-flame burner and an incandescent burner, would you?—I think the flat-flame test is the fairest.

Why did not the Referees prescribe that?—They could not, because they are entirely bound down by Parliament on the subject.

The burner that is prescribed is the No. 2 "Metropolitan"?—That is so. The public can if they like stand by their burner and screw it up or down so as to get the maximum amount of light from it; but they would not do that.

Then, apparently, Parliament puts on you the necessity of choosing the "Metropolitan" No. 2 burner?—Practically speaking.

And for the gas in London it is an excellent test-burner?—Everybody knows what the tests mean.

Re-examined by Mr. TALBOT, witness said that in the report it was stated: "If, then, the danger from water gas is considerable, it is important that in this country it should be dealt with before the causes of it reach unmanageable proportions." In America, in some places the companies scrapped entirely their coal-gas plant and manufactured only water gas. When that had happened, it was very difficult to restrain the use of carburetted water gas, because it would inflict very serious financial loss on the companies. When the report was issued, their view was that if restrictions were to be imposed it should be when the use of carburetted water gas was still comparatively moderate. He did not see any prospect now of anything like pure water gas being used in England. He did not think any company would do it in face of the report.

Mr. TALBOT: It is not that you object to the restriction; but you think the restriction ought to be put on by the voluntary action of the companies rather than by definite legislation?

Witness: I should not like to express any opinion upon that point so long as the amount of carbon monoxide is restricted.

So that if a restriction is to be put on at all, it must be at this stage and not at the American stage?—At the time the report was written, it appeared as if carburetted water gas might be distributed undiluted in this country; but at the present time I do not think there is much prospect of that.

The CHAIRMAN: You think the case for restriction by a Public Act is not now so necessary as it was at the time you made the report?—I do not think it is so necessary as it appeared to be then, for the reason that the companies have, on the whole, been very careful.

Mr. HENRY: If a restriction was not inserted in the Bill, what percentage would you suggest it should be generally?

Witness: I should suggest the maximum figure stated by this Committee, of 20 per cent. of carbon monoxide; and I should expect the restriction to work out in this way—that it would very seldom indeed happen that the percentage would go up to 20 per cent.

How much carburetted water gas would that restrict the company to?—It, I think, would work out to about 50 per cent.

Mr. Isaac Carr was recalled and cross-examined by Mr. BALFOUR BROWNE. He said that where it was a case of changing the burner and not the illuminating power, he did not know of an instance where the price had been reduced, excepting by agreement. Asked if he could give a case where this burner had been adopted and where there had been anything like the increase of 25 per cent. in the consumption of gas which he had stated, witness said his opinion was that there had been no marked increase for the reason that the introduction of the burner had been concurrent with the introduction of incandescent lighting; and while the consumer had had to use more gas to get his light by the incandescent burner, he had actually used less than he



did with the old flat-flame burner. So that while the poor gas and the incandescent burner had required more, it had not required as much as it had with the flat-flame burner.

Replying to Mr. TALBOT, witness said that if the use of the gas was the same, the quantity must be increased by 25 per cent. On the 10th inst., he tested the Brighton gas with the two burners; and the difference between them was 4 candles. Whether coal gas or carburetted water gas was used, he found practically the same difference, or the same relation of difference. It varied a little according to the composition of gases.

Mr. J. G. Newbigging said he had made a test of the Brighton gas and got the results which had been stated. Further than this, in order to guide his Committee in Manchester, since this burner was introduced he had carried out investigations to see what the effect of the test burner would be on the consumers. In consequence, his Committee had decided that it would be injurious to the consumer if, when using this burner, the illuminating powers were reduced below 17 candles. As a fact, they actually distributed gas showing about 18 candles with the No. 2 "Metropolitan" burner. Therefore the actual reduction in the case of the Brighton gas would be 4 candles; and this effect was not only confined to the illuminating power of the gas. The calorific value would go down about 3 per cent. per candle. In incandescent lighting, they did not get the full effect of the reduction in calorific value. The flame temperature entered into play; but from numerous experiments he had made of the gas, he found a loss of efficiency of about 8 per cent., which would be equivalent, on the present price of gas in Brighton, to 2·8d. Taking it all round, and the injury to the gas consumers generally, at least 3d. should be given in reduction of the standard price.

Friday, March 18.

On the hearing being resumed this morning,

Mr. RAM addressed the Committee on behalf of the Corporation of Hove. He said their case was very similar to that of the Brighton Corporation. He proposed to call no evidence other than that called by Brighton; but he would reserve himself for cross-examination, and that at a very moderate length. They were asking that the cost of gas in Hove should be lowered, and that there should be an alteration of the standard price. There was very often a common interest between the consumers and shareholders of the Company; but in this regard they did not wish to cripple the Company in any way at all. What the Hove Corporation wanted was not that the Company should be crippled, but that any advantage obtained by the Company should be fairly and proportionately shared between the shareholders and the consumers. It had been the practice of Parliament for years to see that this was done. According to the evidence of Mr. Stevenson, there was a saving to the Company of 1d.; and he agreed that they should get the benefit. Counsel contended that the benefit was to the extent of 2, 3, or perhaps 4 candles; and certain of the witnesses had not denied that there was damage to the consumer. The burner was not the only advantage they sought, which would enable them to supply gas at much less cost to themselves. With regard to the redemption of capital, they desired to assist the Company in every way; but the fund would put the shareholders in a much better position—it would enable them to borrow money much more easily, and put into their pockets a larger amount. What he asked was that the money should not come out of the pockets of the consumer. The capital redemption fund should be granted; but it should be put on the same basis as the special reserve fund—namely, out of the accretions of the shareholders' money. On the question of water gas, there had been no general legislation on the recommendations of the Parliamentary Committee. There was the expert evidence before the Committee that the danger to-day, if gas were to escape, was as great as ever; and it was admitted by everybody that if there were a coal crisis it might be to the advantage of the Company, in that they would almost be driven to use a very much larger amount of this poisonous compound. What he asked the Committee to say was that, in the event of the Home Office finding it necessary to make regulations with regard to the use of this gas, the Brighton Company should come under the regulations.

The CHAIRMAN at this juncture held a short conference with the members of the Committee, and remarked that they were in agreement on certain points. They would like Clause 10 to be brought as nearly as possible to the Model Clause. With regard to Clause 11—on the question of capital redemption—they were prepared to allow it so long as the amount (£57,000, or whatever it might be) was specified.

Mr. BALFOUR BROWNE indicated that these points should certainly be attended to.

The CHAIRMAN said the Committee would like something to be put in to show that it was in the nature of a special case, and not in the nature of a precedent.

Mr. BALFOUR BROWNE remarked that they were compelled to remove the works from one place to another; and in this way this was a special case, and should not be regarded as a precedent. They would bring up a clause which would satisfy both the Committee and the opposition on the point.

The CHAIRMAN said the Committee were prepared to allow Clause 12, with regard to the application of excess of profits over authorized rates of dividend, so long as it was a model clause. With regard to the question of water gas, the Committee felt that if this was dealt with at all, it ought to be by public legislation, which would affect all companies equally; and they were not prepared to put anything in the Bill with regard to this.

Mr. BALFOUR BROWNE then briefly referred to the points outstanding, which were: (1) That the outside authority should have the gas supplied in their district at the same rate as in Brighton; and (2) the demand on the part of Brighton and Hove to have the standard price for gas reduced from 3s. 3d. to 3s.

The CHAIRMAN: The question with regard to the reduction of price rests upon the burner?

Mr. BALFOUR BROWNE said if they were not going to have the "Metropolitan" No. 2 burner, all the argument would go. The principle was that the outlying districts should pay more. It was admitted that the cost of mains would be more in an outside district; and the Company were only asking that a maximum price should be fixed

beyond which they should not go. It was not by keeping up prices that a gas company succeeded, especially when it was competing in Brighton with the Corporation, and in the district of Hove with a Company; and there was also the point that in these outside areas there would be electricity. The opponents to the Bill contended that there was a difference of 3 candles between the burner they had been using and the one it was proposed to use. If this was true, and a candle meant ½d. as the opponents said and ¾d. as the promoters said, on 3 candles did the difference amount to 3d.? There was no evidence to warrant the reduction of the standard price from 3s. 3d. to 3s. The Company were not at all reducing the quality of the gas. They were bound to give 15-candle power gas; but they were asking that it should be tested by an efficient burner instead of an inefficient one—and this was the burner which was prescribed by the Board of Trade. The special purposes fund was to provide for insurance and renewal, which was of no advantage to them, and the other advantages would not count in money.

The decision of the Committee on the three remaining points was that the Company should have power to use the "Metropolitan" argand No. 2 burner; the standard price should be reduced from 3s. 3d. to 3s. 2d.; and in the outlying districts, instead of the differential price being 6d. per 1000 cubic feet, it should be 3d.

Mr. CHARTERIS, on behalf of the East Sussex County Council, brought forward a clause asking that the Company should be responsible for the extra cost to which the County Council might be put by reason of the improvement in the way of deviation or alteration of level of the pipes in the roads.

Mr. BALFOUR BROWNE contended that if the County Council were doing this for the benefit of the public, the public should pay.

The Committee decided that the cost should not be borne by the Company.

## BISHOP'S STORTFORD, HARLOW, AND EPPING GAS AND ELECTRICITY BILL.

House of Lords Committee.—Tuesday, March 15.

(Before Lord HYLTON, Chairman, Lord LILFORD, Lord SEATON, Lord CATHCART, and Lord TEMPLEMAN).

This is a Bill for amalgamating the Bishop's Stortford and District Gas Company, the Harlow and Sawbridgeworth Gas Company, and the Epping Gas Company, and for vesting in the amalgamated Company the undertakings of the Ongar Gas Company, Limited, the Newport (Essex) Gas Company, Limited, and the Much Hadham Gas Company; to purchase by agreement the undertaking of the Dunmow Gas Company, Limited; to empower the amalgamated Company to supply electricity; and for other purposes.

Mr. HONORATUS LLOYD, K.C., Mr. CLODE, and Mr. A. M. PADDON appeared for the promoters; and the Bishop's Stortford Urban District Council were represented by Mr. BARNARD LAILEY.

Mr. HONORATUS LLOYD, in opening the case for the promoters, explained that the Bishop's Stortford and District Gas Company, the Harlow and Sawbridgeworth Gas Company, and the Epping Gas Company had statutory powers adjoining each other. The Ongar Gas Company had no statutory limits, inasmuch as they had no statutory powers; but they were asking that the limits of the Company should be defined. The object of the Bill was to amalgamate the three first-named Companies into one, and to vest in the amalgamated Company the undertaking of the Ongar Company, bringing the whole district under statutory powers. There were two other Companies—the Newport (Essex) Gas Company, Limited, and the Much Hadham Gas Company—which were non-statutory concerns; and arrangements had been made to take these over and vest their undertaking in the amalgamated Company. The areas supplied by these two Companies were within the statutory area of the Bishop's Stortford Company. There was also a proposal to extend the limits so as to include a small portion on the east of Bishop's Stortford. The district which it was proposed to put into the amalgamated area was governed locally by some eight or nine different local authorities; but only one of them raised any objection to some of the proposals in the Bill. They desired to combine the whole of these six undertakings into one. The shareholders were all in accord with the proposal. As time went on, some of the existing works would be linked up, and it would not be necessary to carry on the manufacture of gas at all the works. The gas would be stored at different points. It might be desirable, however, to dispense with first one set of works and then another; and so secure more economical and convenient working. The Bishop's Stortford Company had at present a total authorized share capital of £65,000. Of this, £35,391 17s. 6d. had been issued; leaving £29,608 2s. 6d. unissued. The issued capital was so divided up that there was £22,000 of original stock, which bore a standard dividend of 7 per cent.; there was additional capital issued to the extent of £5620, also with 7 per cent. standard dividend; there was £4000 of 5 per cent. preference and £3000 of 4 per cent. preference stock all issued; and there had been realized upon the sale of stock by auction, premiums amounting to £771 17s. 6d. In the amalgamated Company, it was desirable, if possible, to have only one class of stock. The £22,000 which had been issued of 7 per cent. stock in the Bishop's Stortford Company was converted into 5 per cent. standard stock in the new Company. They merely altered the nominal value of the £22,000 of 7 per cent. stock into £30,800 of 5 per cent. stock. With regard to the additional capital, there was £5620 of 7 per cent. issued; and this was turned into 5 per cent. stock in the same way. Then there was left of the existing Bishop's Stortford Company's capital £4000 of 5 per cent. preference stock, which became £4000 of 5 per cent. in the new Company. There was also issued £3000 of 4 per cent. stock, which became £3000 of 4 per cent. stock in the new Company. With regard to the Harlow Company, the original capital issued was £21,000; and there was £12,000 additional 5 per cent. capital authorized, but none of this was



issued. Therefore the total issued in the Company was £21,000 of 5 per cent. capital, which was turned into £21,000 in the new Company. The Epping Company had original £10 shares bearing 5 per cent. interest, £21,000 issued, and £10 shares additional 5 per cent., £3500 issued, with a premium raised under the auction clauses of £698 9s. 9d., or a total of issued capital of £24,198 9s. 9d. There was unissued £15,801 10s. 3d., and that issued amounted, without premiums, to £33,500. This capital was turned into the same—£33,500 of 5 per cent.—in the new Company. The Ongar Company, which was a non-statutory concern, paid whatever they could make, and had been paying a 10 per cent. dividend. The total share capital of the Company was £6000; and this involved doubling the nominal capital to put it on the same basis. The Newport Company had £2400 issued; and they were given £2400 of 5 per cent. Therefore there would be a total original capital in the new Company of £104,568. The unexhausted capital powers of the Bishop's Stortford, Harlow, and Epping Companies amounted to £57,409 12s. 9d. They were asking by the Bill a further sum of additional capital of £135,432, and for £80,000 borrowing powers. There was provision in the Bill for what were called inner and outer areas, and for a differential price for gas according as the consumer was in the inner or outer area. Generally, the provision was that whereas the standard price in the inner area was fixed at 4s., it was sought to be able to charge not more than 1s. extra per 1000 cubic feet in the outer areas. If the amalgamation took place, it would be a little inconvenient to have three different sliding-scales; and therefore it was proposed to have a 4s. standard over the whole area, instead of 4s. in Bishop's Stortford, 3s. 11d. in Harlow, and 4s. 3d. in Epping. The Local Government report said: "The proposed limits of supply are very extensive; and it appears to the Board to be a matter for consideration whether it is for the interest of the parishes concerned that the powers as to the supply of gas within such a large area should be centred in one Company, especially having regard to the increasing tendency of local authorities to undertake the lighting of their districts." Counsel pointed out that there was not one of the eight or nine local authorities who desired to undertake its own lighting.

Mr. E. L. Burton, the Chairman of the Bishop's Stortford Company, in giving evidence, said he was confident that if the proposals in the Bill were approved they would result in a benefit to the consumers in the districts. There was no proposal to alter any of the enactments as regards standard price, dividends, illuminating power, &c., with the exception that with the Epping Company there would be a reduction in the standard price from 4s. 3d. to 4s.; in Harlow, from 3s. 11d. to 4s.; and with regard to Ongar, where there was no limitation, the price would be fixed at 4s. There was also the difference that in Sawbridgeworth the consumers might have to pay £2 10s. more per half year by way of a higher dividend, to which there was no objection. In course of time, the amalgamation would result in a cheaper supply; and there would be various economies by concentrating the manufacture of gas. Three-quarters of all the saving by the operation of the sliding-scale went to the consumers. In connecting up the districts, some eleven miles of mains would have to be laid. The Bishop's Stortford Company had been paying dividends of 5 and 6 per cent., the Epping Company had paid 5 and 5½ per cent., the Harlow and Sawbridgeworth Company 5 per cent., the Ongar Company 9 and 10 per cent., and the Newport Company 5 per cent.; and they had carried to reserve a sum equal to 2 per cent. per annum. The total share capital was £104,000, the loan capital £14,825, and the additional capital required for the development of the district (including electricity) was £135,432. With regard to the prices to be charged in the inner and outer areas, he said they were asking for power to reduce the price from 1s. to 6d. if it were found that the consumption in a particular quarter had risen to a sufficient extent. The practice of Parliament was against large differentials. They wished to bring the two prices together if it were expedient; and in doing so, Bishop's Stortford would not be prejudiced. It was the price in the inner area which regulated the sliding-scale. The standard price of 4s. was fixed with the Bishop's Stortford Council in 1904; and there were no circumstances now which called for an alteration of this. It was not the practice of Parliament to reduce the price when the public had subscribed capital on the strength of it. With regard to the area of supply, he said the greatest length was 28 miles and the greatest breadth 20 miles; but the district was somewhat irregular, and would be better described as 21 by 15. The population of the districts now supplied by gas at the last census (1901) was 23,500; but there were prospects of a development of the district.

Mr. H. E. Jones said that the proposals in the Bill offered the only way by which the little hamlets round the larger centres of population could hope to get gas at a reasonable price. Small, scattered gas undertakings could not pay; they could not employ the labour economically, and they could do nothing with the residual ammonia, which was of considerable value. The proposals in the Bill would ensure a well-managed supply in the district; and it would be at a cheaper rate. His experience was that this kind of amalgamation had generally shown a reduced price to the consumer. The prospect of the small companies, with the competition of cheap American oil, was not a very bright one. There was nothing in the Bill, so far as he could see, that the gas consumer in Bishop's Stortford need apprehend as prejudicing him.

Mr. E. H. Stevenson said he acted for the Council in 1904, when the standard price of 4s. was agreed between the Council and the Company. This was a fair price, and nothing had happened to make it now an unfair one. Even if it had been unfair, he thought it should not be altered upon the shareholders who had subscribed money upon the faith of the action of Parliament. It was the keystone of the financial position of the Company; and the effect of altering any standard price would be that intending investors throughout the kingdom would discount the value of stock in future very much, and the consumers would be injured by it. They would not give the same premiums; it would destroy all confidence in gas undertakings. The proposed amalgamation was in the interests of everybody; and it would be more in the interests of Bishop's Stortford than anybody. Upon an amalgamation, it would be necessary to spend some of the capital immediately in Bishop's Stortford. This would be money well

spent, because the saving in working expenses by shutting-down some of the other works would be considerably more than the dividend required to be paid upon the capital employed. It would be a great wrong, he thought, to the gas consumers in the outer district that they should always be compelled to pay 1s. more than those in the inner district. He doubted even whether there would be this difference of cost between gas supplied in the one district and the other. There were necessarily advantages in the hands of a gas company which would enable them to generate electricity upon more favourable terms than people who had not gas-works. One of the chief causes was that capital could be raised at a much less rate of interest by a gas company than by an independent company.

Wednesday, March 16.

When the hearing was resumed to-day, The CHAIRMAN asked Counsel for the promoters to confine their evidence to that from Bishop's Stortford.

Mr. J. S. Cooper, of Bishop's Stortford, said that generally there was no opposition there as to the amalgamation of the Companies.

This concluded the case for the Bill.

Mr. BARNARD LAILEY, in addressing the Committee, pointed out that the Local Authority would be seriously prejudiced by the proposals in the Bill. The Council had everything to lose and nothing to gain by the proposed amalgamation. At the present time the Bishop's Stortford consumers were enjoying a satisfactory and reliable supply. This was being given at a moderate price, and the conditions would become still more favourable. They had the strongest objection to being put at the mercy of speculation which might or might not be successful. The existing Company was a prosperous one. The general body of consumers were being supplied at the rate of 3s. 9d. per 1000 cubic feet; and the Council did not think that the new Company would be at all likely to do better than was being done by the Bishop's Stortford Company.

At this stage,

Mr. LAILEY announced that, as a result of negotiations outside the Committee-room, terms had been substantially agreed between the parties.

Mr. HONORATUS LLOYD, after a short interval, remarked that the whole of the opposition to the Bill had been withdrawn; and it had been agreed to insert a clause giving the Local Authority power to purchase the electrical undertaking at the expiration of 21 years from the date on which the supply was commenced, or any subsequent period of seven years upon terms which would be placed before the Committee. Under these circumstances, he asked the Committee to say that the measure should proceed.

The Bill was ordered to be reported.

## FARNHAM GAS BILL.

House of Lords Committee.—Wednesday, March 16.

(Before Lord HYLTON, Chairman, Lord LILFORD, Lord SEATON, Lord CATHCART, and Lord TEMPLEMAN.)

This is a Bill by which the Farnham Gas Company seek incorporation and additional powers in connection with their gas undertaking. Authority is also sought for the purpose of supplying electricity.

Mr. HONORATUS LLOYD, K.C., and Mr. CLEAVE appeared for the promoters; and Mr. G. J. TALBOT, K.C., and Mr. C. C. HUTCHINSON, represented the petitioners—the Farnham Urban District Council.

Mr. HONORATUS LLOYD, in opening, said the Company was formed under a Deed of Settlement in 1834, with a capital of £3000; the price charged for gas being 15s. per 1000 cubic feet. In 1876, the Company was incorporated as a Limited Company; and in 1899 they obtained a Provisional Order from the Board of Trade. The original capital was £19,200, with a 7 per cent. maximum dividend. The gas supplied was to be 15-candle power; and there was a maximum price of 3s. 9d. In 1900, the Council decided to apply to Parliament for power to purchase so much of the undertaking as was within their limits; but the rate-payers were against it. The Council then sought powers to supply electricity; but this was refused. The Gas Company were now asking for authority to supply electricity, because, among other reasons, they could generate more cheaply. The objects of the Bill were to incorporate the Company as a statutory concern, to prescribe the capital of the Company, to confer additional capital powers and borrowing powers, to sanction the utilization of additional lands for the Company's purposes to extend the limits of gas supply, to substitute the sliding-scale with a standard price and standard dividend in lieu of the maximum price under which they worked at present, to reduce the illuminating power from 15 to 14 candles, and other ordinary powers. For gas only, the total authorized share capital was £49,200, and loan capital £12,300. Of this £49,200 authorized, there was issued £29,200, and of the loan capital there was issued £6800. Of the share capital £20,000, and of the loan capital £5500 remained unissued. By the Bill, they were seeking, for gas and electricity, a total share capital of £60,000, and £20,000 loan capital. Deducting the share capital issued and the loan capital raised from the total amount to be authorized, it would leave for issue in the future £30,800 in respect of share capital and £13,200 in respect of loan capital. In 1899, when the Company obtained their Provisional Order, the Board of Trade preferred that they should have the old-fashioned system with regard to price and dividend; but it was provided in the Order that they might apply for the substitution of a sliding-scale. With regard to the reduction of the candle power from 15 to 14 candles, there was no doubt a saving of a fraction of a penny; but if the standard price were to be reduced by reason of this, it would be an injustice. The average price charged had been 3s. 6d.; and they had been able to pay a little more than 5 per cent. dividend. But if they had had a maximum dividend, they would have had to charge 3s. 8d.; and if there had been anything put to reserve, the charge must have been 3s. 10d. It was an extraordinary proposal that the Urban Council should come and ask for the price



to be fixed at 3s. 9d. They also asked for a calorific test. No one was satisfied that this could be done properly. The London County Council had been endeavouring to find some satisfactory method; and last session the Gaslight and Coke Company agreed that they would have the test inserted in their Bill. This was done because of the special experiments which had been carried on in respect to their particular gas; but it was ridiculous to suggest its application to a small Company like this. The Council also asked for the provision of a testing-station on their own premises; but there was the Company's station within a few yards of the Council's offices, and they had only made use of it three times in four years, and on each occasion the test was satisfactory.

Mr. E. Herbert Stevenson then gave evidence. He said that the Company were not asking for anything new for gas capital powers. The capital which they had for gas would not last for very many years, because the growth of the undertaking was so rapid. He did not think that the supplying of electricity would seriously affect the Company's output, as there would not be a very large consumption of electrical energy. In the next eight or nine years, the Company would have considerable expenditure; and the powers asked for in the Bill would not carry them on for more than eight or ten years. The standard price of 3s. 9d. was a fair and reasonable one. In fixing the price, they had to take into consideration what the price of gas had been in the past, and the dividends the Company had paid. The average dividend paid was 5½ per cent. The Company might have kept the price up at 3s. 9d. and paid the maximum dividends; but they entered into a contract with the Council for public lighting, under which the price charged was 2s. 3d. If the power were reduced from 15 to 14 candles, the saving would not be more than ⅓ths of a penny. With regard to the calorific test, it should not be put upon a company bearing a penalty while the company still had the illuminating power test, also bearing a penalty, because the illuminating power test and the calorific value test would practically be identical. Until it was known what different coal would do in calories, it ought not to be put upon the Farnham Company. He regarded the suggestion of a separate testing-station as absurd. There could be no complaint about the Company in any way whatever.

Replying to Mr. TALBOT, witness said he agreed that the Company were in a good financial position; but it was not such as to admit of a reduction in the price of gas. It had never been a practice to reduce the price of gas because of the reduction of 1-candle power. Asked if the test for illuminating power was of no value with regard to the calorific power of gas, he said that they now knew the calorific power of 15 and 14 candle power gas. A reduction of the illuminating power meant a reduction of calorific power. The effective proportion of gas used was so slight that a very large reduction of candle power did not very much affect the consumer. He had tested gas through the incandescent burner with 15-candle and with 10-candle gas, and could not tell any difference in the photometer. He thought the calorific power test would certainly come. He did not know of a single company being compelled by Parliament to reduce its price when the reduction had been only 1-candle power. The difference to the consumer in this case, whether from the point of view of illumination or heating, would be a negligible quantity.

Mr. Frank H. Jones gave similar evidence. He considered the works were in a good condition. If the Company were to be penalized for reducing the illuminating power from 15 to 14 candles, he would strongly advise them not to lower it. The setting-up of a testing-station at the Council offices would be most unreasonable.

Mr. Charles Hunt then gave evidence on behalf of the petitioners, with regard to the standard price. He agreed that the plant was in very good order, especially the carbonizing plant. All things considered, there was no doubt the Company could maintain the price and the dividend at their present figures, and there were reasonable prospects of reducing the price of gas.

Mr. TALBOT briefly addressed the Committee on the question of the standard price, and asked that it should be fixed at 3s. 4d.

Mr. HONORATUS LLOYD, in reply, dealt shortly with the matter of the standard price, contending that 3s. 9d. was a fair price.

The Committee, after a short consultation, found the preamble proved, subject to the substitution of 3s. 6d. for 3s. 9d. as the standard price.

### GOWERTON GAS BILL.

This Bill was last Thursday before a Select Committee of the House of Lords, presided over by Lord HYLTON, and composed as was that on the Farnham Gas Bill.

Mr. WEDDERBURN and Mr. F. N. KEEN appeared as Counsel for the Gas Company; and the petitioners, the Swansea Rural District Council, were represented by Mr. G. M. FREEMAN, K.C.

Mr. WEDDERBURN, in opening the case for the Bill, stated that it was to incorporate as a statutory Gas Company, a limited Company which might be described as just starting, and also to define the area of the statutory Company. The Gowerton Company was just emerging from a certain amount of difficulty. The limited Company was formed in 1907 with a capital of £15,000, of which half was to be in 7 per cent. preference shares of £5 each, and the rest in ordinary shares of £5 each with a limited dividend. The Company was formed by a Mr. Eaton, who was a company promoter; and he floated the Company with the assistance of Sir Charles Soames, three local men, and an engineer. The local Directors, owing to something which they ascertained was going on in a neighbouring Company, became suspicious of their fellow Directors and of the promoter, Mr. Eaton; and they were not content with a proposal that was made to sell certain gas plant to the Gowerton Company at what appeared to them to be a very high figure. In December, 1908, the local Directors consulted Messrs. Aaron Thomas and Co., Solicitors, pointing out that things were not as they should be, and it was desirable that an action should be brought. This action was settled on terms which were satisfactory to the local Directors. Mr. Eaton ceased to have anything to do with the Company; and Sir Charles Soames later retired from the directorate.

Instead of the Company buying plant for the fancy figure of £5,000, they bought it on valuation for £655. Now the Company was in an entirely satisfactory condition; and they had entered into an agreement with the Swansea Rural District Council—the district of supply being in that Council's area. The agreement was really one which the Rural District Council had no power to make, because although a non-statutory Company could not break up the roads without the assent of the Rural District Council, the assent of the Council was a very limited thing. They could give assent so far as it might be necessary for public lighting; but they had no power to license a non-statutory Company to break up the roads. When the agreement was scheduled to the Bill, the Lord Chairman objected to it; and it was struck out. The only petition against the Bill now was that of the Swansea Rural District Council, inasmuch as three other petitions had been agreed, and a fourth had been dropped. The contention of the Gas Company was that the Rural District Council did not represent the gas consumers. The Council strongly objected to the proposals in the Bill in regard to the capital and to the dividend the Company were to be at liberty to pay. The Company were asking for exactly the same capital (£15,000) as it was under the agreement which the Rural District Council had signed and agreed to. When the Company became a statutory Company, they proposed that there should be the limit, which the general law gave, of 10 per cent. dividend. But the Council were asking that it should not exceed 7 per cent.; and they also asked to have divided up the original capital to be spent in the first ten years, which was, of course, unheard of. They also asked to apply the auction clauses to some of the capital. There was a question, too, with regard to two districts, Cockett and Penderry, which the Company asked to have included in their limits of supply in accordance with the agreement arrived at with the Council in September last; but the Council were now asking that these districts should not be given to the Gowerton Company.

Mr. E. Herbert Stevenson was the first witness called in support of the Bill. He pointed out that this was a rapidly-growing district, and that a supply of gas would be a great advantage. The Company had already erected a small gas-works, and had about 200 consumers; and they were still receiving applications for a supply from many other people. The Company was in its infancy, so to speak; and was coming to Parliament now for the first time. The total manufacture of gas at present was only 10,000 cubic feet per day. It was the custom of Parliament where a company was just starting to give it a sufficiently reasonable capital to carry it on for ten or twelve years; but it was not the custom to divide up the original capital. Perhaps 75 per cent. of the consumers were under the prepayment-meter system—the population being purely a working-class one; so that the capital expenditure would necessarily be higher than in the case of the ordinary type of company. With his experience of the Swansea Gas Company, he would say that they did not propose to supply the districts of Penderry and Cockett. The promoting Company had expended £200 on the site, £3500 on works, £750 on mains, and £1200 for the installations in the houses. As to the auction clauses being applied, as was suggested, to part of the capital, there was no precedent for applying them in the case of a company which was just starting its career. He did not know any case of a company coming to Parliament to begin a gas undertaking that had not received power to raise its original capital at 10 per cent. As agreed with the District Council, the maximum price was fixed at 4s. 6d. per 1000 cubic feet for the first few years and afterwards at 4s. 3d.

The CHAIRMAN here pointed out that there was no report from the Board of Trade or the Local Government Board either with regard to the 10 per cent. dividend or the application of the auction clauses; and his experience was that these were matters which they never omitted to call attention to.

Mr. FREEMAN said that if the Committee had made up their minds with regard to these points, he would not pursue them further. Proceeding to address the Committee on behalf of the Rural District Council, he remarked that his objection was now reduced to one point—that of the apportioning of the district. The Council were there as the public authority to protect the public interests; and they considered that it would be more in the public interests and the interests of their consumers that the Swansea Gas Company should be allowed to supply the districts of Penderry and Cockett. The Swansea Gas Company were old-established and well-to-do; and they were quite prepared to spend money on a district of this kind.

Evidence was given in support of the petition by

Mr. Edward Harris, the Clerk to the Council, who pointed out that the question of these two districts was raised in the Swansea Gas Order when before the Board of Trade a few days before; and Mr. Pelham then decided that, as the point was raised in the present Bill, he would leave it to the Committee to decide whether these two areas should go to the Gowerton Company or not. According to the Committee's decision, the point in the Swansea Gas Order would be determined. The Swansea Company were charging 3s. to the private consumer and 2s. 10d. for public lighting, whereas the prices proposed in the Gowerton Bill were 4s. 6d. for the first few years and then 4s. 3d.

In reply to Mr. KEEN, witness agreed that the Swansea Company had power to charge 5s. maximum within certain limits.

Mr. KEEN having briefly addressed the Committee in reply,

After a consultation in private, it was decided that although the Committee passed the preamble of the Bill, the districts of Penderry and Cockett would be struck out of the limits.

**Monte Video Water-Works Company.**—The Directors report that for the year 1909 the gross receipts were £135,579, an increase of £12,255 on those in the preceding year, and the net receipts £93,247, or £11,857 more. They propose to pay a final dividend of 5 per cent., making 8 per cent. for the year, tax-free. They place to the depreciation fund £5,000 and to reserve fund £10,000; the balance to be carried forward being £34,103. The ratio of working expenses during the year was 31·22 per cent., against 34 per cent. in 1908. The Company's new works were formally inaugurated in September; the ceremony being attended by the President of the Republic, four of his Ministers, and a large number of prominent officials of the city.



## LEGAL INTELLIGENCE.

### INVESTMENT OF A GAS COMPANY'S RENEWAL FUND.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, March 16.

(Before Mr. Justice SWINFEN EADY.)

Schweder v. Gardner and Others.

This was an action by a shareholder in the Worthing Gas Company, on behalf of himself and all other stockholders, for an injunction ordering the Directors to invest in Government or other securities the moneys which had been appropriated, under section 32 of the Company's Act of 1907, to the renewal fund, and also for a declaration that they are bound to invest, and keep invested, all sums that are so appropriated.

Mr. MACNAGHTEN, K.C., and Mr. BRYAN FARRER (instructed by Messrs. Kekewich, Smith, and Kaye) appeared for the plaintiff; Mr. FRANK RUSSELL, K.C., and Mr. COZENS HARDY (instructed by Mr. John Hands, agent for Messrs. Verrall and Son, Worthing) represented the defendants.

Mr. MACNAGHTEN having stated the facts of the case, which will be found in the judgment, and read a good deal of the correspondence between the parties,

Mr. RUSSELL submitted there was no obligation on the Directors to invest the renewal fund at any particular moment. It must be in their discretion; and they must have time to select a suitable investment. He also pointed out that the declaration asked for—viz., that the Company were bound to "invest and keep invested" the fund—would entirely destroy the object with which it was formed.

Mr. William Cash, F.C.A., one of the defendants, said he was elected a Director of the Company in 1908, having previously advised the Board. He was connected with various gas companies, and was familiar with the preparation of gas accounts as provided by Statute. For the half year ending June, 1908, the Directors for the first time appropriated out of revenue £730 to the renewal fund; in the following half year they appropriated £365; and the same amount for the six months ended June last—making, with interest, £1506. They considered it advisable to create this fund, looking to the fact that they were authorized by their last Act to acquire a new site, to which they would ultimately have to transfer their works. The Company were under the sliding-scale. The sums appropriated were not invested, but remained in the general business of the undertaking. The policy of the Board, in which he concurred, had been to keep down the capital as much as they could, and sell gas as cheaply as possible for the benefit of both the Company and the public. This was the first reason why the sums appropriated were not invested. The second was that the Company had not funds available to purchase securities; the capital account being, in fact, overdrawn, and the revenue being used for capital purposes. The third was that they were engaged in a certain amount of exceptional renewals of mains, &c., which, under the terms of the Act, might have been charged to the fund, and they had no desire to invest money when it was possible they might have to sell out again almost immediately. A time came when the raising of further capital was necessary; but the Directors, acting in the best interests of the Company, deferred it as long as possible. Witness put in a statement showing the amount of cash available at the dates of various Board meetings, beginning with July, 1908, when, after deducting the dividend then recently declared, the balance was only £130. On some occasions they were actually overdrawn at the bank. On Aug. 21, 1909, the shareholders at the half-yearly meeting authorized the creation of further stock; and on Sept. 25, the Directors resolved to offer it for sale. On Nov. 23, £4085 of stock was sold, producing £4285, less expenses; and on the same day a resolution was passed for the investment of the renewal fund in India 3½ per cent. stock. This was one of the reasons for the issue of the stock.

Cross-examined: During the years in question, considerable sums were expended out of revenue on capital account. After raising the £4000 odd last November, the capital account was still overdrawn. If the Directors had thought fit, they could have borrowed money from their bankers, and invested the renewal fund, thus technically complying with the section; but this policy did not commend itself to them. It would have been borrowing money at 5 per cent., possibly on the security of the very investments themselves, which yielded a lower interest—which did not seem to him to be a satisfactory way of doing business. There was no danger now of having to resort to this fund for exceptional renewals, as the Company had just come to an end of a considerable expenditure on mains, which had been made out of revenue. Ultimately they would have to raise some £8000 further capital, but not at once. He told the plaintiff shortly after the annual meeting that further capital was going to be raised, out of which the investments would be made; but until then they were not in a position to make them. He could not say that the pressure brought by the plaintiff had caused the investment in November. Personally, he was disposed to wait until the action had been tried; but ultimately it was decided to adhere to what had previously been determined, and make the investment as soon as the funds were available.

This concluded the defendants' case.

Mr. MACNAGHTEN having addressed the Court briefly in reply,

Mr. Justice SWINFEN EADY said the action raised a short question as to the true construction of the Worthing Gas Act of 1907. Sections 30 and 31 provided for an insurance and a reserve fund, and section 32 for a renewal fund; and upon the true construction of the last section the question turned. This section empowered the Directors, if they thought fit, to accumulate, by a renewal fund, annual appropriations out of revenue. The amount so to be set aside each year was limited, as was also the maximum amount to be accumulated; and the fund might be used for the renewal and repair of the works, mains, and pipes. Until it was required for this purpose, however, it was to be

"invested in Government or other securities," and the dividends and interest arising from the securities were also to be "invested in the same or like securities and accumulated." In his opinion, it was incumbent upon the Company and the Directors to make a separate investment of this renewal fund, and not merely allow it to remain represented by some indefinite part of the general assets of the Company. In other words, the Statute required that it should be a separate fund actually available when required for the purpose of these renewals, and that it would not be a compliance with the Statute merely to have a nominal setting aside in the books of the Company, and say that this fund was represented by some indefinite part of the assets of the Company. The language of the section, in contrast with that of the two previous sections, made it quite clear that it was the duty of the Directors so to invest. It appeared that for three successive half years, beginning with June, 1908, certain sums were set aside each half year, apparently a sum intended to be the maximum amount, or almost the maximum amount—£730 for the first half year and a moiety of this sum for each of the succeeding periods. The sums so set aside had not been separately invested in August, 1909, and thereupon the correspondence material to the action began. A letter written just after the issue of the writ (in November) expressly stated that the Directors did not assent to the view that they were bound to invest the sum in question in Stock Exchange securities either then or at any other time. He (his Lordship) thought this meant that they were not bound to invest the fund separately, apart from its being represented by the general assets of the concern. The letters were rather in the form of putting the plaintiff off. Mr. Cash had given evidence as to the circumstances under which there was delay in making the investment; and he (his Lordship) quite accepted what had been said, and was satisfied that the Directors had been acting *bona fide* in what they thought were the best interests of the Company. He quite appreciated the witness's point, that it seemed inexpedient to borrow money or otherwise obtain it at a high rate of interest, and then invest it for the purposes of the renewal fund at a lower rate, as, from a commercial point of view, it would be looked upon as bad business. But the first answer to this was the Statute. The obligation upon the Directors was to set aside this renewal fund and to separately invest it. One could quite appreciate Mr. Cash's view, that it was expedient to keep the capital in a gas company as low as possible. But, on the other hand, capital was being expended, and the revenue was being used for the purpose; and if it was necessary to make capital expenditure, it became necessary to raise capital in order to provide for it. He thought the plaintiff was justified in bringing the action; and he proposed to make a declaration that the defendants were bound, pursuant to section 32 of their Act of 1907, "to invest in Government or other securities"—omitting the words "and keep invested"—"all moneys which might at any time be appropriated by them out of revenue for the purpose of the renewal fund mentioned in the section, and to accumulate the dividends and interest arising from such securities in accordance with the provisions of the said section, until occasion may require any portion of such fund to be appropriated and used for the purposes in the section mentioned." The Company were not bound to keep it when it was wanted for a statutory purpose; but until it was so wanted, it must be invested. It was not necessary to grant an injunction. He only determined the legal rights of the parties by making the declaration; and it followed that defendants must pay the costs of the action.

### DAMAGES FOR A GAS EXPLOSION.

In the Shoreditch County Court, last Thursday, his Honour Judge SMYLY, K.C., delivered his considered judgment in the case of *Medcalf v. Staines and Son*. The plaintiffs were Percy Medcalf and his wife Bertha, of Priory Avenue, Walthamstow; and they sued Messrs. Staines and Son, of Great Eastern Street, E.C., builders, to recover £31 9s. 10d. for personal injuries and damage done to furniture from an explosion through a workman having left a gas-pipe unsealed, which had caused a leak between the ground floor and the first floor.

The male plaintiff's case was that he had charge of a National Telephone Exchange at the address where he was now living; and it was decided to have the place redecorated for his convenience. The workmen of the defendants came in; and Medcalf and his wife then went away for a holiday. On the evening of their return, they went up to the bedroom, and struck a match, whereupon there was a terrific explosion. The windows were blown out, and the furniture was set on fire. Medcalf had the right side of his head and face badly burned, while his wife received such a serious shock to the system that it was alleged she had not recovered even now. At the time of the explosion, the men had left the premises, having completed their work. For the defence, it was suggested that during the progress of the work the plaintiff told a painter to remove a pipe that was sticking out of the wall, which he did, not knowing at the time that it had a cock on it, and was connected direct with the meter. The man forgot to tell the foreman; and the pipe was left open. It was contended that the explosion was therefore caused by the plaintiff's own carelessness in directing the man to remove the pipe.

His Honour, in giving judgment, said he found that the contract for the repairs of the house which the plaintiffs were about to occupy was between the defendant and the National Telephone Company. While the work was being done, the male plaintiff told one of the workmen to remove the pipe. This workman was not a foreman. The workman pulled down the pipe, which ran down the corner of the room. This pipe had a proper cock upon it; and, if it had been left in its place, there would have been no escape of gas. When the pipe was pulled down, a gas-pipe behind the plaster of the ceiling was left open; so that immediately the gas was turned on at the meter, there would be an escape. The repairs to the house were completed; and defendants' foreman and his men left the premises. Part of the work included in the defendants' contract with the Company was to connect all the gas-pipes in the house with one meter. Before the repairs were carried out, there had been two meters; and this particular pipe had been



attached to the meter taken away. When the plaintiff came to the house, the foreman had gone. There was no evidence given to prove who turned on the gas. Medcalf denied that he did; but as the full width of the gas-pipe was open, he (the Judge) thought that the meter could not have been turned on more than a few minutes or the house would have been full of gas, whereas the trouble was confined to a small part of the house. His finding would, however, have been the same, even if the plaintiff was proved to have turned the gas on, as that would be a most ordinary and reasonable thing for a man to do who required light. The workman was negligent in not telling his foreman what he had done; and the foreman was negligent in not testing whether the connections were right before leaving the job. If the foreman had turned the gas on at the meter, the escape was such a big one that it must have been discovered by watching the dial. The question on these findings was, Has defendant committed a breach of duty apart from his contract? If the negligence of his servants was only a breach of contract, he was liable to those only with whom he had contracted; but if he had been guilty of a breach of duty, he was not protected from liability by setting up a contract with another person in respect of the same matter. In *Parry v. Smith*, the late Lord Lopes, then Mr. Justice Lopes, held that a duty attached in every case when a person was using or dealing with a highly dangerous thing, which unless managed with the greatest care was calculated to cause injury. The subject-matter of that action was damage to a servant by a gas explosion caused by defendant's negligence in carrying out a contract with the master of the servant. It was the nature of the work which, being dangerous to others, distinguished this case from *Colles v. Sellars*. His verdict would therefore be for the plaintiffs, for £21 and costs.

### WATER SUPPLY FOR RAILWAY STATIONS.

In the "JOURNAL" for the 1st inst. (p. 598), we gave the arguments in an appeal, heard by Justices Phillimore and Bucknill, by the Metropolitan Water Board against a decision of his Honour Judge Woodfall, at the Westminster County Court, in a case in which the question raised was whether the supply of water to railway stations for the purpose of being used in water-closets and urinals was a "domestic" use within the meaning of the Act. At the close of the arguments, judgment was reserved; and it was delivered last Tuesday.

Justice PHILLIMORE said the action was brought to recover the sum of £12 as a water-rate levied upon the London, Brighton, and South Coast Railway Company in respect of water supplied to the urinals and closets at their station at West Norwood; the rate being calculated under section 8 of the Metropolitan Water Board (Charges) Act, 1907, at 5 per cent. on the rateable value of the "house or building, or part of a house or building," in respect of which the supply was required. The claim of the Water Board was made on the ground that the water was supplied for "domestic purposes;" and it was resisted by the Railway Company (who preferred to pay by meter), who contended that this was not a domestic purpose, but was, if anything, a railway purpose under section 25 of the Act. A number of decisions upon the words "domestic purpose" or "domestic use" (the latter being the expression in section 35 of the Water-Works Clauses Act, 1847) had determined that if the actual use to which the water was put was domestic, it did not matter whether the householder was providing the means of domesticity as part of a profitable business or as carrying out a public duty. The last decision—that of Mr. Justice Neville, in the South Suburban Gas Company's case\*—appeared to have carried the matter farther. He held that the Gas Company, in respect of buildings, offices, and works extending over 40 acres, where 400 people were employed, were not entitled to claim to pay by meter for water supplied to their workpeople for drinking, washing, and sanitary purposes, but must pay upon the annual value of the premises. It was not necessary for them to say whether, in a precisely similar case, they would follow this judgment. But he thought it went to the very verge of the law; and he would suggest that, if it were to be criticized, criticism would fasten upon the assumption that the purposes for which the water was used—for, at any rate, the water was used in the sanitary conveniences—was necessarily a domestic purpose. It should not be assumed that "domestic" meant civilized or domesticated, or something appertaining to man. It meant something to do with man, as occupying or using a house or dwelling. It did not seem to follow that the use of sanitary conveniences in some public place, or some place of temporary resort during a journey, was domestic. That the use of public sanitary conveniences was not to be paid for as for a domestic purpose, either generally or under this particular Act, was conceded by Counsel for the Water Board, who said that the flushing of these conveniences might come under section 25 as being either "cleansing sewers and drains" or "flushing drains by means of any apparatus discharging automatically." It might be so. But if the purpose was, to use the language in the Gas Company's case, *primâ facie* domestic, the fact that the use of the water also kept the drains clean seemed to be on a par with the fact that the owner of a boarding-house made his house convenient by providing suitable sanitary accommodation. To put it in another way, if the words be had quoted in section 25 overrode the provision as to domestic purposes in section 8, why should not the words "railway purposes" in the first-named section also override the words "domestic purposes" in the other? The expression "railway purposes" might override the words "domestic purposes," as the words as to flushing the drains might override them; and it might do so if every attention to the calls of Nature was a domestic purpose. He preferred to construe this expression as a statutory indication in both cases that domestic purposes meant only the use of sanitary conveniences as part of the house in which the person using them was residing. On the whole, therefore, he thought the appeal failed.

Justice BUCKNILL said the question was whether the County Court

Judge was right in holding that the water supplied by the appellants to the railway station in question, at which there were only the usual waiting-rooms, booking office, and conveniences, was not supplied for "domestic" but for "railway" purposes within the meaning of the Metropolitan Water Board (Charges) Act, 1907. Until the Act came into force, the water supplied to the station for flushing and cleansing purposes was always charged for by meter. The appellants' contention, however, was that the water was supplied for "domestic purposes," in which case the charge would be a percentage on the principle of rateable value. The figures were unimportant for the purpose of this case. Urinals and water-closets were as necessary a part of a railway station as they were of a dwelling-house; and it might be assumed that at this station only such arrangements had been made as were necessary for the convenience of the public using it in the way of the Company's business. The question, therefore, was whether the water was, in the circumstances, supplied for "domestic" or for "railway" purposes, or for a "business," within the meaning of the Act. If the only question for the decision of the Court was the use of water for the railway staff at the station, he should not be prepared to disagree with the language of Mr. Justice Neville in the Gas Company's case, even if he had not authority to support it, which he thought he had; but he thought there was a great difference between the use of water at a railway station by the staff and that by the public, who used the station either as the paying customers of the Company or as their licensees. Having referred to other cases relied upon by the appellants, his Lordship then proceeded to give his reasons for coming to the conclusion that the use of water for flushing the urinals and closets set aside for the public at the station in question was not a use of it for "domestic purposes." In the first place, he said it would be an exaggeration of the ordinary meaning of the word "domestic" to apply it to the mere act of washing hands or using the offices in question; and it could hardly be contended that the use of a street convenience would make the water employed there for flushing a use for "domestic purposes." In neither case could it be said that there was any element of domesticity; and in neither was there any abiding or staying in the place where the water was used. The Court were, no doubt, bound by the cases in which it had been decided that the proper test was the character of the purpose, and not that of the place. But this test begged the question here, because in all those cases—even in that of the Gas Company, which had, he ventured to think, gone a little farther than any other—there had been a daily stay on the premises by the persons using the water for the purposes mentioned. At a railway station, however, the passengers or the public lawfully using it did not remain longer than they were obliged. In his opinion, therefore, the water in this case was used for a railway purpose, just as much as that which washed the platform, or was employed for cleansing other parts of the station; and for these reasons he was of opinion that the appeal failed, and must be dismissed, with costs.

Leave to appeal was granted.

### ACTION TO RESTRAIN BREACH OF AN AGREEMENT.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Neville had before him a motion for an injunction to restrain a breach of agreement of service. The plaintiffs were the British, Foreign, and Colonial Automatic Lighting Company, Limited; and Mr. Patterson, who appeared on their behalf, said their principal business was the manufacture and supply of apparatus for automatically lighting and extinguishing street gas-lamps under Gunning's patent. In January, 1907, an agreement was made between the plaintiffs and Mr. Hutchinson, the defendant, under which he entered their service as a commercial traveller, and covenanted that he would not, without their written consent, be interested or concerned in the manufacture or sale, for or on behalf of any person or corporation other than the plaintiffs, of any automatic apparatus for lighting and extinguishing gas-lamps. The agreement contained a proviso that this restriction should continue in full force for two years from its expiration. The agreement was terminable by three months' notice on either side; and in August, 1908, the plaintiffs gave notice determining the defendant's engagement on Nov. 21. Shortly afterwards, however, they found they could not obtain a renewal of their contract with the Barnard Castle Corporation, who had taken over the gas-works, and also with the Gas Companies at Newcastle, Darlington, and Windsor. This was explained when it was found, in February of the present year, that the members of the Bournemouth Corporation had been bombarded with letters and circulars by the defendant, who not only solicited orders, and offered to put up, free of cost, an experimental installation of a pressure system of automatic lighting, which he asserted to be far superior to the clockwork arrangement of the plaintiffs then in use, but stated that he had installed such a system successfully at Barnard Castle, Newcastle, and elsewhere. Mr. Cecil Thompson, who appeared for the defendant, said he was not in a position to deny the foregoing facts (which were stated in an affidavit by Mr. Gunning), and must therefore submit to an injunction until Nov. 21 next, when the two years would expire, and pay the costs. Mr. Patterson said he must ask for damages. Mr. Thompson said his client was only a poor man, and an inquiry as to damages would not result in any benefit to the plaintiffs. Mr. Patterson said he was prepared to make an end of the matter if the defendant would submit to the injunction, agree to pay the costs, and to an inquiry as to damages, the costs of which would, of course, be reserved. If this order were made, an appeal *ad misericordiam* might be considered by the plaintiffs. Mr. Thompson having intimated that he could not consent to an order in this form, his Lordship said in that case there would be simply an interlocutory injunction.

In the report of the proceedings at the annual meeting of the Felixstowe Gas Company which appeared in the "JOURNAL" for the 1st inst. (p. 605), it was stated, with reference to the successful lighting of the Spa Pavilion by the Company, that it cost the Council less than it did the previous year to light "the band-stand alone" by electricity. The words should have been "band-stand and enclosure."

\* See "JOURNAL," Vol. CVIII., p. 191.



## MISCELLANEOUS NEWS.

### INCOME-TAX ALLOWANCE FOR DEPRECIATION.

The appeal on behalf of the Whitchurch and District (Hants) Gas Company for an allowance in respect of depreciation by way of decreased value of plant and machinery by reason of wear and tear, heard on the 12th of November last and adjourned, was further argued before the General Commissioners at Whitchurch last Wednesday.

Mr. W. A. Schultz, F.C.A., (50, Cannon Street, E.C.) appeared on behalf of the Company, and contended that as gas-works under the Revenue Act of 1866 were assessable according to the rules prescribed by Schedule D of the Income-Tax Act, 1842, they were entitled to claim the benefits of the provisions of section 12 of the Customs and Inland Revenue Act 1878, which provides:

The Commissioners for General or Special Purposes shall, in assessing the profits or gains of any trade, manufacture, adventure, or concern in the nature of trade, chargeable under Schedule D, or the profits of any concern chargeable by reference to the rules of that schedule, allow such deduction as they may think just and reasonable as representing the diminished value by reason of wear and tear during the year of any machinery or plant used for the purposes of the concern.

Mr. Schultz claimed that this provision was still further strengthened by the Finance Act of 1907, section 26, which provides:

For the purpose of enabling deductions for wear and tear to be allowed by the Additional Commissioners, claims in respect of those deductions shall be included in the annual statement required to be delivered under the Income-Tax Acts of the profits or gains of the concern for the purpose of which the machinery or plant is used; and the Additional Commissioners in assessing those profits and gains shall make such allowances in respect of those claims as they think just and reasonable.

Also that such allowances are defined in sub-section 4 of the same section, as follows:

In this section the expression "Deduction for Wear and Tear" means the deduction allowed, or which would be allowed, under section 12 of the Customs and Inland Revenue Act, 1878, as representing the diminished value, by reason of wear and tear during the year, of machinery or plant used for the purposes of any trade, manufacture, adventure, or concern.

Mr. Schultz contended that the only question for the Commissioners to decide was, not whether any allowance should be made, but what allowance was fair and reasonable.

The Surveyor on behalf of the Crown claimed that no allowance whatever should be made until the plant or machinery was renewed, when the whole of the cost of the original plant would be allowed as a deduction from revenue.

After consideration, the Commissioners decided that depreciation should be allowed on the same basis as last year—viz., 3 per cent. on the written-down value of the plant and machinery.

### SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of the Company was held on Monday last week—Mr. WILSON MAPPIN in the chair.

The report and accounts for the six months ended Dec. 31, which were noticed in the "JOURNAL" on the 22nd ult. (p. 519), having been presented, and the former taken as read,

The CHAIRMAN, in moving their adoption, said that for the first time since the half year ended June, 1907, the profit had been sufficient to cover the amount required for the dividend and leave a small surplus. This was regarded by the Board as being very satisfactory, as when they made the last reduction in the price of gas, which dated from April 1, 1907, it was fully anticipated that the surplus profits, which had from time to time accumulated, would be drawn upon to some considerable extent. He thought it as well that the shareholders should fully understand this, as remarks had sometimes been made regarding the fact that the Company were not earning the full dividend. When he told them that 1d. per 1000 cubic feet represented £14,500 per annum, it would be seen that a very slight variation in the price of gas materially affected the revenue derived therefrom. Owing to the inclement weather, the slight improvement in general trade, and the many additional purposes for which gas was being more and more used, there had been a very substantial increase in the Company's business during the past half year; the additional quantity of gas sold as compared with the corresponding period of 1908 being 107,415,000 cubic feet, or 6.35 per cent. Dealing with some of the principal items of expenditure, the Chairman said £209 less had been paid for coal, although 11,018 tons more had been carbonized. There had also been a saving of £858 in the cost of repairs of mains and services and of £214 in repairing and refixing meters. The following were items of increased expenditure: Purifying, £426; stokers' wages, £507; repairs of works, £268; and there was an increase in the amount required for interest on debenture stock of £336, due to the Company having sold by auction a further £16,500 of stock during last year. On the other side of the accounts, they had additional receipts from gas of £6596, the average price at which it was sold being 1s. 3.04d. per 1000 cubic feet; meter and stove rents, £180; sulphate of ammonia, £355; and earnings of the Company's railway waggons, £103. Coke and tar had, however, produced less by £809 and £529 respectively. The net result was that whereas twelve months ago the deficiency in the amount required for dividend was £5352, there was now a surplus of £208; leaving a total balance to carry forward of £74,976. Tests to the number of 1170 of the gas supplied during the half year had been made by the Corporation Chemist and the Company's officials, and they showed the average illuminating power to be

17.39 candles. That gas for heating, &c., continued to be fully appreciated was shown by the fact that the Company had sold during the six months 1358 gas-fires and 962 boiling and grilling stoves, 187 additional cooking-stoves had been sold and let on hire, and 34 more gas-engines, varying in size from  $\frac{1}{2}$  to 130 H.P., had been fixed. He was pleased to say that since the commencement of the year there were signs of improvement in the value of tar products and sulphate of ammonia. It was a great mystery that the latter material was not more largely used as a fertilizer by farmers. Out of an estimated production of 348,000 tons of sulphate of ammonia in the United Kingdom in 1909, no less than 264,000 tons were exported to foreign countries; leaving only 84,000 tons as being used at home. Efforts were being made by the Sulphate of Ammonia Committee, of which the Company's Managing-Director (Mr. Hanbury Thomas) was a member, to induce the Board of Agriculture to encourage its use by means of experiments by the agricultural colleges who work in connection with the Board. In Germany, the Government lent to manufactures every assistance in this direction, with the result that, whereas in 1896 the quantity of sulphate of ammonia used by German farmers was 80,000 tons, nearly four times this quantity—viz., 284,000 tons—was used in 1908. Another go-ahead country was Japan, to which place their exports in 1901 were only 1500 tons, while last year they reached 49,275 tons; showing how the value of sulphate of ammonia as a manure was appreciated.

Mr. B. G. WOOD seconded the motion; and it was adopted.

A dividend for the half year of 5 per cent. on the "A," "B," and "C" stocks having been declared,

Mr. H. FRASER moved a vote of thanks to the Chairman, Directors, and staff.

Mr. T. RICHARDSON, in seconding the motion, referred to the opposition of the Corporation to the Company's Provisional Order for the reduction of the illuminating power of the gas. He asked if it would lead to bitterness or ill-feeling between them and the Company.

The CHAIRMAN said the matter had been before the Board of Trade (see *ante*, p. 599), and the Directors had not yet heard their decision. But, whatever it was, there would be no friction. It would give perfect satisfaction to the Company.

### ROCHDALE GAS-WORKS EXTENSIONS.

#### Glover-West Retorts to be Installed.

At their Meeting last Wednesday, the Gas Committee of the Rochdale Corporation had under consideration a report presented by a Special Sub-Committee as to the equipment of the new retort-house at the gas-works, which forms part of a scheme of extension estimated to cost £25,500.

The Sub-Committee, which included the Chairman (Mr. Walker), after arriving at a decision in favour of vertical retorts, paid visits to London, Sunderland, and St. Helens, to inspect the systems in use there. They now recommended that the installation be on the Glover-West system, and this recommendation, after much discussion, was unanimously adopted by the full Committee. The installation decided upon will carbonize 100 tons of coal per 24 hours, and the cost is put down at £18,000. In addition to this, there will be the cost for the foundations, the construction of a high-level road, a coal-store, and a new chimney-stack, making the above-named total of £25,500.

It was submitted by the Sub-Committee that there were many advantages claimed for vertical as compared with horizontal or inclined retorts; the principal being continuous against intermittent carbonization of the coal, a larger make of gas per ton of coal carbonized, a higher calorific value of the gas, an increased yield of residual products, saving in labour costs and improved labour conditions, reduced wear and tear of retorts, and economy in ground area due to the small space required for the site. It was pointed out that the saving in labour costs and the improved labour conditions were very considerable when the cost of working was compared with the older systems, as most of the operations were either automatic or mechanical. Special attention was also called to the noiseless, smokeless, and dustless charging of the retorts. It was further stated that the retorts recommended prevented naphthalene difficulties such as were experienced in Rochdale last autumn, when deposits in the feed-pipes were responsible for numbers of complaints of insufficiency of light.

### GAS COMPANIES AND THE PORT OF LONDON RATES.

The inquiry—over which Lord ST. ALDWYN is presiding—into the rates proposed by the London Port Authority (*ante*, p. 746) was resumed on Thursday last.

Mr. FITZGERALD, K.C., for the Port Authority, announced that the result of the conferences that had been held between them and various deputations of traders had been eminently satisfactory. He thought that in 27 cases out of 28 agreements had been arrived at as to the rates in the schedule which would be laid before his Lordship.

The CHAIRMAN: Do you mean that in these 27 cases all the objectors have been satisfied?

Mr. FITZGERALD: In these 27 cases the objectors have been satisfied—all those who appeared at the conference.

The CHAIRMAN: I must reserve the objections of those who did not appear at the conference for consideration.

Mr. FITZGERALD said that Mr. Freeman, who represented Gas Companies, wanted him specially to state that, on the question of residuals, an agreement had been come to.

Mr. NEVILLE said he appeared for the Gaslight and Coke Company, and wished to make an observation with regard to the agreements. If the ultimate Order was approved by the Board of Trade in respect to these rates, there was no further question about it; but if the Board of Trade, in their ultimate decision upon the rates, should alter or increase them, he would like to reserve, on behalf of his clients, the full right



to oppose, if necessary, before Parliament when the Provisional Order came up. He desired that his clients should not be prejudiced in any way if the rates were altered or increased.

The CHAIRMAN: I suppose that applies to everybody?

The SECRETARY (Mr. Farrer) then read out the lists of the interests in whose cases the rates had been agreed; and the report of the conference was next dealt with.

Sir Hudson Kearley, the Chairman of the Port Authority, stated that the conference was attended by 28 groups, and their suggestions and contentions were considered by his colleagues and himself and dealt with. After going through the suggestions, they were able to arrive at, as he thought, a conclusion satisfactory to all parties. He considered they satisfied everybody, with the exception of the cement trade.

Mr. HONORATUS LLOYD: And it was stated that you hoped to arrive at a settlement which would be a final settlement between all parties.

Witness: Yes; I thought it my duty to make it clear that those who came to negotiate—assuming that they arrived at a decision—should not reappear before the inquiry nor as opponents before Parliament. The list represents accurately the rates agreed to, subject to his Lordship's recommendation.

Mr. NEVILLE said that, on behalf of the Gaslight and Coke Company, he understood that the question of coke did not appear in the schedule at all. It had been agreed to be treated by the Port Authority *pari passu* with coal.

Witness: That is so.

At the conclusion of Friday's sitting,

The CHAIRMAN having revised the whole of the schedule of rates proposed by the Port Authority—in many cases agreed upon in conference by the various trades and industries interested—and having himself fixed the charges for submission to the Board of Trade,

Mr. HONORATUS LLOYD, for the Port Authority, said he thought the only two his Lordship had not dealt with were coal and cement.

The CHAIRMAN: I think I must leave cement at 2d. per ton. Tell me how much per penny does coal produce.

Mr. HONORATUS LLOYD: £30,000.

The CHAIRMAN: I will put coal at a maximum of 2d. That will apply to coastwise and oversea.

Mr. FREEMAN: That leaves the question of coke.

The CHAIRMAN: Coal and coke were put together.

Mr. HONORATUS LLOYD: Mr. Neville yesterday asked Sir Hudson Kearley: "On behalf of the Gaslight and Coke Company, I understand that the question of coke, which does not appear in your schedule at all, has been agreed to be treated by the Port Authority *pari passu* with coal? A. That is so."

The CHAIRMAN: It stands so in the schedule.

Mr. HONORATUS LLOYD: Yes, it is in the schedule.

Mr. FREEMAN: The point was this. Sir Hudson Kearley at the conference stated that, although coke was *pari passu* with coal, it was also not to be higher than Liverpool; and at Liverpool the rate is 2d. for inwards and 1½d. for outwards. As far as the gas companies are concerned, it is all outwards.

The CHAIRMAN: Assuming the rule to be carried out that 2d. maximum would be rd. actual, and that, further, in the case of coal the export rate is only half the import, you have not much to complain about. Whether it be so or not, I do not know.

Mr. FREEMAN: I only draw your Lordship's attention to what was stated.

The CHAIRMAN: I don't quite understand what you have said. The Liverpool dues, according to this, are 3½d.

Mr. FREEMAN: No; I am told the due on coke is 2d. inwards and 1½d. outwards and coastwise.

Mr. HONORATUS LLOYD: On the Liverpool scale, coal and coke go together.

The CHAIRMAN: I understood so.

Mr. ERSKINE POLLOCK: They are both charged rd. on the actual payment. I have the table; and it is rd. for actual payment, coastwise.

The CHAIRMAN: Whatever coal is charged, coke will be charged, too, I gather.

Mr. HONORATUS LLOYD: They both go together.

Mr. POLLOCK: The maxima are different at Liverpool; but the charges are the same.

Mr. HONORATUS LLOYD: Nor is there any difference in the Tyne between coal and coke.

The CHAIRMAN: No; I think they must go together.

The inquiry was adjourned.

During yesterday's proceedings, the Draft Provisional Order as amended was gone through, and subsequently certain amendments proposed by the Port Authority were brought up for consideration to be inserted in the second schedule.

Among these were two concerning coal, which were agreed to.

The first was as follows:

Notwithstanding anything in this schedule contained, the maximum rates on coal, culm, patent fuel, coke, coal dust, and cinders imported or exported coastwise into or out of the Port of London, shall be the same as the maximum rate on coal, culm, patent fuel, coke, coal dust, and cinders respectively imported or exported from or to parts beyond the seas.

The second provided:

No port rates shall be charged on bunker coals for steamers' own use on board any steamer entering or leaving the port, and the Authority shall repay any port rates paid on coal imported which shall be used for the purpose of bunkering steamers proceeding beyond the limits of the port.

The inquiry was concluded; and the Chairman will report to the Board of Trade in due course.

As some of our readers may be aware, gas has been substituted for electricity for lighting the Central Railway Station at Brighton. The installation, which is expected to effect a saving of £2000 per annum, is attracting a considerable amount of attention.

## GAS FINANCE IN EDINBURGH.

The Finance and Law Committee of the Edinburgh and Leith Gas Commission on Thursday last announced that the following report had been submitted to them by the Convener—Judge Inches.

I have had occasion recently to look into the financial operations of the undertaking, and I have doubts as to whether the policy pursued in the past, particularly as far as the investment of the sinking funds is concerned, is in the best interests of the Commissioners. The present policy is to raise capital by borrowing on mortgages for three, five, and seven years, and to renew these as they fall due, at rates current at the time. The sinking fund moneys, together with the interest thereon, and now the contribution to the special reserve fund, are ear-marked for the liquidation of the capital debt, and are required to be invested in similar securities. The Commissioners may apply these funds at any time they are available for the repayment of the capital debt—that is, mortgages falling due to be renewed can be met by transferring from these funds the equivalent sum, instead of renewing the mortgages and paying an outside party interest. It may be true that we receive a higher rate of interest for money lent on mortgage than we pay for money borrowed on mortgage, but whether the difference is enough to pay the costs, &c., is a doubtful point. As far as I make it out, the interest upon money borrowed is taken from current revenue. The interest received for money lent does not come into current revenue, but goes to help the accumulation of the sinking fund. To this extent, therefore, it seems the present consumers are deprived of some benefit, to say nothing about the local and Imperial taxes which are necessarily assessed on such moneys. In my opinion, the present sinking fund contributions, together with the special reserve fund contribution to the sinking fund, and the fact that the annual amount spent on maintaining the plant is about £25,000 (which in thirty years represents the entire cost of plant and buildings), amply provide for the future, and anything that can be done to relieve the present revenue, and the present gas consumers, should be our object in view. The amount set aside, with interest, for the liquidation of capital in 1908 was £12,256, and for the year ending in May it will not be less than £46,000. In my opinion, it is this sum which falls to be dealt with by the Commissioners, wholly for the benefit of liquidating the capital, either by investment or by repayment of mortgages. If, therefore, any doubt is entertained about the efficiency of the present policy, I venture to suggest that it is a matter which might reasonably be brought before the Finance Committee at an early date.

The Finance and Law Committee remitted to a Sub-Committee to consider and report on the Commissioners' practice as to investing sinking fund moneys, and redemption of annuities and mortgages.

## COLONIAL GAS UNDERTAKINGS.

We have lately received the reports and accounts of several Colonial gas undertakings, and take from them the following particulars.

The Auckland Gas Company, Limited—one of the most important of the New Zealand Companies—had last year a revenue of £107,087 from the sale of gas, and a total revenue of £136,143. The expenditure having been £91,443, the balance carried to the profit and loss account was £44,700; and the Directors recommended a dividend for the second half of the year of 9s. per share on the fully-paid shares, and a proportionate dividend on those on which 5s. had been paid. These dividends added to those paid in July amounted to £34,208; and left a surplus of £10,492. At the meeting of the Company held on the 7th ult., the Chairman (Mr. J. H. Upton) stated that the output of gas now exceeded 500 million cubic feet annually; and he therefore took the opportunity of giving the shareholders a short summary of the progress of the Company during the past ten years. He said the total expenditure on capital account had increased from £232,227 to £507,310; the share or nominal capital from £130,855 to £195,482; the premium capital from £72,711 to £153,791; and the total capital paid up from £203,566 to £349,273. The mains had been extended from 134 to 255 miles; the number of consumers had increased from 8100 to 18,136; the quantity of gas sold from 222,639,000 to 500,926,000 cubic feet; and the dividend, from 7s. 6d. to 9s. per half year; while the price of gas had been reduced from 5s. to 4s. 3d. per 1000 cubic feet. The net result of the ten years' operations was to the shareholders an increase in dividend of £5865 per annum, and to the consumers a reduction in price of £18,785 per annum. This reduction being equal to the amount of a rate of 8½d. in the pound on the assessed value of the City of Auckland. The Chairman added that the Directors desired to acknowledge the devotion of the staff to the Company's interests.

The Brisbane Gas Company had a revenue of £30,019 from the sale of gas, &c., in the six months ended Dec. 31 last; and the amount available for distribution, including the balance brought forward, was £17,107. A dividend of 6 per cent. absorbed £9600; income-tax came to £480; and £7027 was left to be carried forward. The business of the Manly (N.S.W.) Gas Company, Limited, last year was satisfactory, though, of course, the expenditure was increased in consequence of the strike of coal miners; the coal used during the last three months of the year costing, on an average, upwards of 200 per cent. more than usual. There was, however, a sum of £1440 to be disposed of; and the Directors recommended the payment of a dividend of 5 per cent. (free of income-tax). During the past year, a new retort-house was built, and a three-lift spiral gasholder of 250,000 cubic feet capacity commenced, under the supervision of the Manager (Mr. J. A. M'Auliffe). The holder was expected to be ready early in the present year. The Napier (N.Z.) Gas Company, Limited, had a balance of £7010 for the past twelve months, after having paid the interim dividend to the 30th of June; and the Directors recommended a further dividend amounting to £5302, leaving £1708 to be carried forward. The gas sales came to £24,149. Another New Zealand Gas Company—the Wellington—had revenue amounting to £83,709, and a balance of £22,640 on the profit and loss account, for the past year.



PUBLIC LIGHTING AND GAS TESTING IN LIVERPOOL.

Annual Report of the Superintendent.

We have received from Mr. A. G. Smith, the Superintendent of Street Lighting, Gas Examiner, and Official Inspector of Gas and Electric Meters to the Corporation of Liverpool, his report for the past year, from which we extract the following particulars.

Prior to 1894, the lighting and maintenance of the public lamps were entirely in the hands of the Liverpool Gas Company, and the burner in use was of the flat-flame type; but on Jan. 1, 1894, the Corporation commenced to undertake the work themselves—first with the special high-power lamps, and later with the whole of the ordinary lamps. This reorganization realized a saving of £7000 per annum. At that time, the Company's charge to the Corporation was the same as to ordinary consumers; but as a result of an arrangement, following a reference to arbitration, the price was reduced by 10 per cent., resulting in a further reduction in the annual charge of £2500. The Corporation thereupon undertook an improvement in the lighting of the city, and schemes for the reduction of the distances between street-lamps, passage lighting, and incandescent gas lighting were adopted; and in a few years' time Liverpool became, to use Mr. Smith's words, "the best-lighted city in the United Kingdom."

PROGRESS OF AUTOMATIC LIGHTING AND EXTINGUISHING.

The lamplighters are engaged one hour on each operation, and the lamps are cleaned at least once each week. These arrangements during the past year have employed 14 foremen and 179 lighters; giving an average of lamps per man of 107 in the city, and 89 in the suburbs. The old method of lighting, however, is being superseded by the automatic lighting and extinguishing of the lamps at predetermined times. This system has recently been adopted in Liverpool, upwards of 1000 of these controllers being now fixed in different parts of the city; but, from remarks which have been made, it appears to the Superintendent that the progress of the work in Liverpool is not perfectly understood. He therefore briefly recapitulates the chief points of his report on this subject, submitted to the Lighting Committee on Dec. 17, 1908.

It is estimated that 95 lamp attendants will be required to deal with the 19,000 lamps; their duties being as follows: Inspection of lamps at lighting and extinguishing times, to see that they are duly lighted and extinguished; keeping the incandescent burners clean and renewing mantles, &c., as required; cleaning the lanterns, and winding and setting the clocks weekly. The repairs to the lanterns, &c., will, as heretofore, be carried out by the workshop staff. The new system is therefore only dependent on the controller, lamp attendant, and lamp repairer, whereas the old system is dependent on foreman, lighter, trimmer, lamp repairer, and lamp inspector; thus effecting an estimated saving in labour alone of £8400 per annum.

It is estimated that the capital expenditure will amount to £37,250, which provides for 19,000 controllers, 1500 new lamps, and the conversion of the existing lamps to those of the new storm-proof type; and it was recommended that the new system should be installed at the rate of about 4000 each year—thus taking approximately five years to complete. The Committee, however, considered it desirable to proceed at a slower rate, and about 1000 controllers only were fixed last year; and the same number has been provided for in this year's estimate. The expenditure last year on capital account amounted to £1740, of which £1684 was for material.

Since the fixing of the Gunning controller, the Superintendent has had a new type submitted to him by Messrs. D. Anderson and Co., of London, which appeared superior, as it works instantaneously instead of gradually. It was considered desirable to purchase a number of these; but though the order was placed early in January, deliveries were not commenced until the 7th of September, and it was only at the end of the year that the order was completed. It is therefore too early to form a definite opinion as to their merits; but up to the present they have worked fairly satisfactorily.

The first district to be completed was, Mr. Smith says, that between Lime Street and the Pier Head. It was thought desirable, therefore, that the new districts should be in different parts of the city, to test the controllers under all conditions. Districts have been formed in Old Swan, Aintree, Walton, and Fazakerley; and at the close of the year five of the 95 proposed districts were completed. The number of controllers purchased during the year was 928; bringing up to 1215 the total to date. The number of attendants appointed during the year was three, who took the place of at least six lamplighters previously employed; showing a saving in wages alone of £213 11s. 8d. None of these lamplighters have, however, been dismissed, as vacancies have occurred to which the men have been appointed; and, owing to the erection of new lamps during the year, additional labour was required, and supplied by that displaced in other parts of the city. In addition to the purchase of the controllers, it has been necessary during the year to convert the Bellamy lamps to those of the new storm-proof type; and this has been carried out to the extent of 386 lamps.

THE PUBLIC LIGHTING.

The city is lighted by 19,311 lamps—13,089 of them being in the old city and 6222 in the suburbs. The following table shows the number of lamps used in the lighting of streets, courts, and passages.

District.	Streets.			Courts.	Passages.		
	Flat Flame.	Incan- descent.	Electric.	Flat Flame.	Flat Flame.	Incan- descent.	
Old City	231	9,266	275	744	2,338	30	
Suburbs	33	5,102	..	..	1,064	1	
Total	264	14,368	275	744	3,402	31	

Compared with 1908, this is a net increase of 226 lamps; and the total maintenance amounted to £47,818 17s. 7d., compared with

£48,347 8s. 9d. during 1908. The lighting of 8½ miles of road was re-arranged during the year, involving the erection of 30 double and 45 single incandescent gas-lamps, and the removal of 154 existing lamps to new positions; while 131 lamps were removed to other places owing to the widening of roadways and side-walks, alterations to property, and other causes. Five columns were fixed in lieu of brackets, and 21 new columns in lieu of broken ones. The total length of roads lighted at the end of the year, irrespective of courts and passages, amounted to 463½ miles—5½ miles being by electricity, 449 by incandescent gas, and the remaining 9½ miles (principally back streets) by the ordinary flat-flame system. During the year, the department received 3077 reports of failures in the gas supply to public lamps due to the presence of naphthalene, against 3424 in 1908 and 4957 in 1907.

The entire maintenance of columns, brackets, lamps, and fittings is undertaken by the department; and the following among other work was carried out by a staff of 71 mechanics, &c. (the figures for 1908 being given for the sake of comparison).

	1908.	1909.
On district—		
Columns reinstated . . . . .	247	247
Lamps repaired . . . . .	8,426	12,216
„ reglazed . . . . .	27,207	30,236
„ changed . . . . .	1,989	1,600
Visits paid by trimmers to incandescent gas-lamps . . . . .	179,679	159,141
In stores—		
Incandescent gas-burners cleaned, re-paired and adjusted, &c. . . . .	3,624	4,299
New incandescent gas-burners adjusted . . . . .	957	973
Inc. gas-burner chimneys cleaned . . . . .	187,479	164,436
Regulators adjusted, &c. . . . .	9,540	7,370
New regulators adjusted only . . . . .	720	2,170

During the year there were 285 accidents to street-lamps caused by collision with vehicles. In 102 cases the police were able to ascertain the names and addresses of the owners of the vehicles, and accounts for the repairs to the value of £90 16s. 7d. were rendered.

QUALITY OF THE GAS.

The following particulars are furnished in connection with the work of testing the gas supplied to the city during the year. This is done daily at the office, and, by arrangement with the Gas Company, in any part of the city at any time without notice to them. The number of tests made for illuminating power was 422—viz., 318 in the office and 104 in the district; and the former showed an average of 20.19 candles and 20.57 candles, compared with 20.37 and 20.63 candles respectively in 1908. The Company are required by their Act of 1868 to supply gas of 20-candle power when tested with a batswing burner consuming 5 cubic feet per hour. On 130 occasions during the year the gas was below the standard, as compared with only 72 during 1908. The maximum and minimum results obtained were 22.69 and 17.36 candles respectively. In addition to the above tests, 318 were made with the "Metropolitan" argand burner No. 2, which the Company, in conjunction with other gas companies, are seeking power to adopt as the standard burner. Mr. Smith reports that the results of these tests show that the illuminating power of the gas is several candles higher than that obtained through the present standard burner. For testing the calorific power of the gas, a Simmance-Abady calorimeter has been in use; and a test has been made by it every day. During the past year, however, a Beasley patent calorimeter was installed, which records the calorific value of the gas each hour of the day and night. During the twelve months, 317 tests were made, showing an average of 640.77 B.Th.U. net per cubic foot of gas, against 660 B.Th.U. net in 1908, which Mr. Smith thinks may be considered satisfactory. There were 557 samples of gas tested for carbon monoxide; the average indicating the presence of 10.8 per cent. This represents an admixture of 18.2 per cent. of carburetted water gas with coal gas, which is in conformity with the Departmental Committee's recommendation on the subject. But as much as 18.4 per cent. of carbon monoxide, representing an admixture of 50.6 per cent. of carburetted water gas, was found at Garston; the average of the tests in this portion of the city being 16.8 per cent., representing an admixture of 43.8 per cent. of carburetted water gas. The Superintendent forwarded the results of all these tests to the Medical Officer of Health. The average results of 571 tests for purity, involving 816 visits to the various works, are tabulated. They show that the average of the sulphur compounds increased slightly last year.

GAS-METER TESTING.

With regard to gas-meter testing, the Superintendent reports that last year was a record one as regards the number of meters tested; the total being 11,829, against the previous record of 10,951 in 1906—the increase being in those of the prepayment type. The fees received, however, were not of a record character; amounting to only £434, compared with £441 in 1906. The following are the details of the year's work:—

	Company's.	Sundry.	Prepayment.
Meters certified . . . . .	7315	517	3504
„ rejected . . . . .	21	294	178
	7336	811	3682

The grand total is 11,829, compared with 10,276 in 1908.

TESTING OF CONSUMERS' PIPES AND FITTINGS.

This work has been undertaken by the department since 1907, as it is considered desirable that a test for ascertaining the soundness or otherwise of gas pipes and fittings in any establishment should be available, owing to the supply of carburetted water gas to the city. The work is undertaken at a nominal charge of 2s. 6d. per meter, and has proved useful. Mr. Smith expresses regret that the work was not appreciated during the past year to the extent he would have wished; only 134 tests having been made. These, however, were sufficient to demonstrate the usefulness of the work, for not 10 per cent. of the pipes and fittings tested could be certified as sound. In 60 of the tests, the gas was escaping at the rate of from 0.1 to 0.9 cubic foot per hour; in 37, from 1 to 4 feet; in 12, from 5 to 9 feet; in 6, from 10 to 15 feet; in 2, from







usual in the case of many great inventions and discoveries, Mr. Samuel Clegg, who did so much to perfect the discovery, died in complete obscurity, without any public recognition of his work. Those present would be interested in knowing that in St. Luke's parish the first gas-meters were made; and the business was still carried on in the same factory—now, of course, much larger. Reference to the bunsen burner led up to the subject of the use of gas for heating purposes; and Mr. Ede mentioned a visit paid by him last year to Woolwich Arsenal, where a gun 53 feet long, and weighing 24 tons, was being heated by gas. Electricity came into the field, as they all knew, some years ago, and the prospects for gas seemed less favourable than before; but the introduction of the incandescent mantle saved the situation. England's own manufacture of these articles and the importation of them, were immense, as shown by figures quoted by the lecturer; and again it was a proud thing to say that St. Luke's was once more to the fore—it being the first parish lit throughout by the incandescent mantle.

At the close of the lecture, several questions were put to Mr. Ede and answered by him; and he was accorded a hearty vote of thanks.

## HARROGATE CORPORATION AND ELECTRIC LIGHTING.

### Gas Company Protest against Unfair Municipal Trading.

In the "JOURNAL" a fortnight ago, reference was made to a proposal before the Harrogate Corporation to discontinue the use of gas and substitute electricity for the public lighting. The subject was dwelt upon at the annual meeting of the Gas Company by the Chairman (Mr. F. Barber), who showed a determination not to allow the change to be made without making a protest on behalf of the Company, not only as suppliers of gas but as large ratepayers, against the introduction of a competitive system of illumination by the municipal authority. At the meeting of the Lighting Committee of the Corporation on the 28th ult., a letter was read from the Secretary and General Manager of the Company (Mr. Harry Wilkinson) inquiring whether the Corporation would be prepared to receive from the Company an offer and terms for supplying gas and lighting and maintaining the whole of the public lamps in the borough; and the Committee resolved that their Chairman should have an interview with Mr. Wilkinson and report. It appears, from a long letter by Mr. Barber in the "Harrogate Herald" for last Wednesday, that the interview took place in his presence, at the Company's offices, on the 3rd inst.; and this is his account of it: "The Corporation representatives informed us that they had nothing to say, but had come to the interview to hear what the Company had to put forward; the Chairman saying that the letter from the Company's Manager had reached him when he was just on the point of putting the Electrical Engineer's scheme to the vote. I complained of the entire neglect of the courtesies due to the most ordinary business relations, and pointed out that, in view of the importance of the Company as a large ratepayer, and its obligations to supply gas for public lighting, and its long-continued connection with that public service, some intimation of the proposed change should have been given to the Company, and an opportunity extended to it to put in a tender for the public lighting by gas, which had never, in the opinion of the Company, been done in the most efficient and economical manner by the Corporation. On behalf of the Company, I offered, if the Electrical Department were prepared to do the same, to submit under seal to the whole Council of the Corporation an inclusive tender for the lighting of the whole of the borough by gas, or for lighting such part of it as was now so lighted. The Chairman of the Lighting Committee at once said that this could not be, as they had already had before them the details of the Electrical Engineer's scheme and cost. Nevertheless, I said that the Company would be prepared to stand or fall on any basis of fair competition between them and the Electricity Department, and said that if the Company could be furnished with the illuminating value and number of lamps proposed to be substituted for the present gas-lamps by the Electricity Department, we should be prepared to give an inclusive tender for supplying the same light by gas. To my surprise, the Chairman of the Lighting Committee said he could not give us such particulars, though I pointed out that it was impossible without them to give a tender on the same lines as the Electricity Department. The only gracious concession made to the Gas Company was that the Lighting Department would postpone the carrying out of the Electrical Engineer's scheme until the 4th of April, so that in the meantime the Company might have an opportunity of considering and submitting a proposal."

In another part of his letter, Mr. Barber explains the circumstances. He says in 1897 the Corporation, by authority of a Provisional Order, set up electricity works, which are outside the borough, and therefore no contribution is made to the rates in respect of the assessment for that part of their undertaking. The Gas Company pay in local rates a fraction under 2d. for every 1000 cubic feet of gas sold by them. This is mainly due to the high rates within the borough, which must enormously increase within the next few years. Without regard to the extra cost to the Lighting Department, a considerable length of the streets has since the institution of the electricity supply been lighted by electricity. The Electricity Department have offered special discounts to such of their customers as would use electricity to the exclusion of gas; thereby penalizing the consumer of electricity whose requirements could not be met without such use. Mr. Barber points out that the change proposed to be made in public lighting is one which may have very serious consequences to the ratepayers. If the question were open to discussion at a public inquiry by the Local Government Board on an application to borrow the money necessary for the cost of converting gas-lamps into electric lamps, there is little doubt, he says, that the increase in the cost of lighting by electricity would be shown to be so great that the Board would refuse the loan, as they have refused a similar loan elsewhere on this ground. He thinks this may be the reason why the Corporation propose to charge the cost of such conversion directly to the rates, spreading it over a number of years, instead of applying in the ordinary course for a loan to cover it. If the cost of public lighting will be considerably increased by the proposed change, the ratepayers will only have them-

selves to blame if they do not, before allowing it to pass, urge their representatives to obtain authentic information on the subject from other towns in which similar changes have been attempted and thoroughly investigated. He adds, in a postscript, that it would be interesting to find the case where the electric and gas undertakings being both in the hands of the corporation, or both in the hands of private companies, electricity has been adopted for the general lighting of the streets in preference to incandescent gas.

## PRICE OF GAS IN NEW YORK.

### Effect of the Eighty-Cent Law.

The report for the year ended Dec. 31 which was presented at the recent annual meeting of the Consolidated Gas Company of New York contains the following remarks on the decision of the Courts which fixed the price of gas in the city at 80 c. per 1000 cubic feet.

A comparison of the average sales of gas per meter in use in 1909, with gas at 80 c., with the average annual sales per meter in 1905, when gas was at \$1, shows that there was no increase in the average sales per meter. In other words, the additional sales of gas in 1909 over 1905 were due entirely to the installation of additional meters, as the percentage of increase in the number in use and the percentage of increase in sales were identical. Such increase in the business as the Company have realized during the past four years has required not only an additional investment in manufacturing plant, but also in mains, services, meters, and appliances, and has added almost rateably not only to the cost of manufacture but to the cost of distribution, including repairs to the additional distributing system, additional expenses for collecting, and other items of operating cost, together with additional taxes on the additional property and earnings. The comparison of the sales per meter also establishes the fact that consumers have received the full benefit of the reduction in the price of gas, and that the Company have failed to realize the advantage which it was alleged they would realize, in the more liberal use of gas at the lower price. The opinion was expressed by experts several years ago that in New York City the gas sales per capita had reached the point of saturation. This was equivalent to saying that the sales per meter had reached that point. Experience during the four years mentioned would seem to confirm this opinion, and, furthermore, to establish the fact that a large percentage of the Company's future growth will be due to increase of population, which, in turn, must be attended by a proportionate increase of investment in gas manufacturing and distributing plant and operating expenses. On Jan. 25, 1909, the date of the last annual report, the Supreme Court of the United States had made a decision in the so-called 80-cent gas suit, upholding the contention of the Company on several important points, but deciding that the Act could not at that time be considered confiscatory. It was, however, held that, as it was possible that practical experience of the effect of the Act by actual operation under it might establish the fact that the Company could not obtain a fair return on the value of the gas property, the Company should have an opportunity of again presenting their case to the Court. The decree based on this decision was not, however, entered until Feb. 13, 1909, and the Company have therefore had an experience of less than the necessary twelve months under its operation. In accordance with the decision of the United States Supreme Court, there has been refunded to consumers during the year \$10,417,121, involving the preparation and auditing of upwards of 1,360,000 vouchers, which necessitated the employment of over 750 men. This stupendous undertaking is now practically completed.

**St. Mary Church Gas-Works.**—Mr. F. Chalmers, the Manager of the St. Mary Church Gas-Works, has reported to the Torquay Town Council that during 1909 there was an increase of nearly 3,000,000 cubic feet in the quantity of gas manufactured at the works. In 1908, the amount made was 34,914,000 cubic feet, and in 1909 37,480,000 feet. The number of consumers at the end of the year was 1223, an increase of 82; while the cookers in use increased from 621 to 735.

**Richmond and the Standard Burner Bill.**—At the last monthly meeting of the Richmond Town Council, the General Purposes Committee reported that Messrs. Cooper and Sons, Parliamentary Agents for the Richmond Gas Company, had given a formal undertaking that, subject to the approval of Parliament, and in consideration of the abstention from opposition to the Gas Companies (Standard Burner) Bill, by the Corporation of Richmond, the following clause should be inserted in the Bill in Committee of the Second House: "Nothing in this Act contained shall, unless otherwise agreed between the Mayor, aldermen, and burgesses of the borough of Richmond (Surrey) and the Corporation of Richmond Gas Company, apply to or affect the borough of Richmond, in the county of Surrey." The Committee had accepted this undertaking.

**Gas Supply to Cakemore.**—At Old Hill, last Tuesday, Mr. Raymond Asquith held an inquiry, on behalf of the Board of Trade, into an application made by the Rowley Regis and Blackheath Gas Company for a Provisional Order to enable them to include the parish of Cakemore within their limits of supply for lighting purposes. Mr. H. Gibbon Pritchard, who supported the application on behalf of the Company, explained that objections were formally lodged to their proposals on behalf of the Rowley Regis and Halesowen District Councils, the Worcestershire County Council, the Great Western Railway Company, and the Dudley and Stourbridge Electric Traction Company. Provisions had been made in the Order which were satisfactory to four of the objectors; and the only opposition offered to the application now was from the Halesowen Rural Council. The chief grounds of opposition by the authority were that an application was before the Worcestershire County Council to obtain urban powers; and if this was sanctioned, the Rural Council would be vested with the lighting powers. The application of the Halesowen Council for urban powers had, however, been refused by the County Council.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their annual statutory meeting on Thursday. In the report of the Engineer it was stated that the increase in the output of gas since May 15 last amounted to over 92 million cubic feet. The Committee dealing with the reorganization of the staff reported that over a hundred formal applications had been received for the post of Treasurer, and it was remitted to a Sub-Committee to prepare a short list for the consideration of the full Committee. The Engineer reported that he had investigated, as far as circumstances permitted, the cause of public lamps failing to illuminate during frosty weather, and had come to the conclusion that the primary cause was the accumulation of hoar frost within the interior of the service-pipes which pass up the centre of the lamp-columns. It was not found difficult to render the lamp immediately efficient by pouring a small quantity of hydrocarbon spirit down the service-pipe. The secondary cause was brought about by the internal corrosion on the gas-pipe being liberated, due to the freezing of the pipe and the contraction of its parts, and the accumulated dust falling to the bottom of the upright pipe. Judge Pennell moved a remit to the Works Committee to consider and report as to whether the memorandum by the Clerk embodied in the minute of that Committee of the 14th ult. was in compliance with the Standing Orders of the Commissioners, and, if need be, to recommend such amendment of the Standing Orders as might seem fit. The memorandum, it will be remembered, was upon the subject of the appointment of a Committee to advise with the Engineer in the matter of the sale of sulphate of ammonia. After discussion, the motion was defeated by 13 votes to 3. Judge Douglas gave notice of motion to the effect that the Commissioners go back to their previous practice, and leave the sales of sulphate of ammonia and coke in the hands of Mr. Herring.

In the Glasgow Corporation on Thursday, Mr. M. W. Montgomery moved approval of the minutes by the Gas Committee, in which it was recommended that the Corporation should acquire the undertaking of the Baillieston Gas Company, Limited, at the price of £10,000. He explained that the Baillieston Gas Company were petitioners against the Glasgow Consolidation Order, and that it was in the course of discussion as to the best way to settle their differences that the question of purchase emerged. If the proposal had been the purchase of the Baillieston Gas-Works as a single item standing by itself, he would not have advocated it; but as it had a variety of considerations, and a great many associations and consequences to the future of the gas undertaking, he felt that the step now proposed was in the best interest of the Corporation and the Gas Committee. Bailie Guest moved that the subject be sent back to the Gas Committee for further consideration. The proposal was, he said, to pay £10,000 to enable them to supply gas to Baillieston—a right they had had for many years. Bailie

Wallace said they were all aware that the moment the gas-works were bought they would be immediately scrapped, and the £10,000 would be thrown away. Mr. John Macfarlane said that the Baillieston Gas Company had created a good business, and they offered the goodwill of it at a very small cost. Mr. Montgomery replied that the works were perfectly equipped and in very good condition. The Committee did not intend to scrap them, excepting the retorts and purifiers, which would not be necessary. They were going to utilize the major portion of the capital which had been expended. By 38 votes to 26, the subject was sent back to the Committee.

The Corporation of Dunfermline have contracted for 15,000 tons of coal for the forthcoming year, at a lower rate than the prices being paid in the current year.

In the Inverkeithing Town Council last night, a letter from the Secretary of the Inverkeithing Gaslight Company was read, in which it was intimated that the Company were proposing to increase their share capital from £1100 to £4200, and that they were giving shareholders the first offer, in proportion to their holdings. The Town Clerk stated that the Corporation held fifty shares in the Company, and that under the proposed arrangement they would be entitled to a further hundred £1 shares. The Council agreed to refuse the offer of the Company.

Gas supply is keeping abreast of the gigantic strides which are being taken in the development of the Fife coalfield. Within the past few years new gas-works have been erected in Keltie and Kennoway; while extensions have been made to the gas-works at Cowdenbeath, Burntisland, and other places. The new gas-works at Cardenden, which were formally opened on Monday, are another step in the direction of progress. Mr. W. Brown, the Manager, has certainly got works which it ought to be a pleasure to run. The district is rapidly growing; and it is anticipated that in a very few years the annual output of gas will be over 20 million cubic feet. It is interesting to note that men of such outstanding business capacity as Mr. R. A. Muir, the Chairman of the Company, after much consideration, deliberately adopted coal gas as the lighting medium for the district, in preference to electricity or any other illuminant.

In the Wishaw Town Council on Monday, Provost Thomson took exception to the part of the minutes of the Gas Committee which dealt with the amount written off for depreciation, and moved that it be taken back for further consideration. It was agreed, he said, at a previous meeting, that the Gas Manager should go over the whole concern, and make a fair valuation, with the view of ascertaining what the real amount of depreciation on the works should be. The Committee had fixed the sum of £305 without obtaining that report. Bailie Bell, the Convener of the Gas Committee, explained that the amount had been fixed on reports from other burghs. The Town Clerk considered that as the Manager had been instructed to prepare a statement as to the percentage, there would be no harm in waiting until this had been submitted. Mr. Nimmo said the matter had been very fully gone into by the Committee, and, on a comparison with other burghs, the sum fixed was a liberal amount to allow. They had, therefore, sufficient

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information to enable them to come to a decision; and he moved that the minute be adopted. This was agreed to by six votes to five.

In the Arbroath Town Council this week, it was reported that the valuation of the gas-works for income-tax purposes had been again increased, and it was remitted to the Town Clerk and the Manager to meet the Surveyor of Taxes with the view of having the valuation reduced.

In the Lerwick Town Council last week, Mr. Ratter brought up the subject of the laying of pipes by the Gas Company, and said he thought the Company should not be allowed to dig up the streets, as at present, without permission. The Burgh Surveyor suggested that the Company should be required to prepare a scale plan of every pipe which they proposed to lay. This was agreed to, and power was given to the Surveyor to allow the work to be gone on with if satisfied.

## CURRENT SALES OF GAS PRODUCTS.

### Sulphate of Ammonia.

LIVERPOOL, March 19.

During the week the market has continued buoyant, and, although the pace has been somewhat slower, a further increase in values has taken place. Further direct orders from consumers abroad, coupled with greatly improved demand for home consumption, have brought about keen competition for all available supplies, and the closing quotations are £12 7s. 6d. per ton f.o.b. Hull, £12 10s. per ton f.o.b. Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. For equal monthly quantities July-December f.o.b. Leith, makers have now advanced their prices from £11 17s. 6d. to £12 per ton; but so far buyers refuse to follow them, preferring to take their chance later on.

### Nitrate of Soda.

There continues to be a good inquiry for this article, and holders now ask 9s. 10½d. per cwt. for ordinary quality, and 10s. for refined, on spot.

### Tar Products.

LONDON, March 21.

The markets for tar products have been very firm indeed during the past week. Pitch remains steady, and prices are well maintained, though there does not appear to be any actual advance in values. Creosote remains steady; and the majority of makers still consider an improvement will take place directly the heavy make is finished. In certain parts of England, this article is undoubtedly scarce. Benzol 90 per cent. is very firm indeed, and the prices are improving all round for both prompt and forward delivery, though it is reported that the Germans are selling in Paris at low prices. Fifty-ninety per cent. benzol is in good demand owing to the scarcity of toluol. For the latter article, there are inquiries to the end of the present year; but at present makers are not at all anxious to sell, as the great demand for solvent naphtha is bound to have an impression on this article. Solvent naphtha is quite firm, and in London and Manchester is very scarce.

In London, some very good prices have been paid; and in Manchester it is reported that there is a difficulty in supplying the demand—as much as 1s. 6d. having been paid for special qualities. Crude carbolic acid is quiet. Continental consumers decline to offer more than 11½d. to 1s. per gallon on the east coast. Crystals are very neglected. Refined naphthalene is unchanged; but salts are fetching good figures. Tar maintains its price.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. ex works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, and 30s. to 31s. others. Benzol, 90 per cent., casks included, London, 8d.; North, 7½d. to 7¾d.; 50-90 per cent., casks included, London and North, 8½d. to 8¾d. Toluol, casks included, London, 10½d.; North, 9¾d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4½d.; North, 1s. 2½d. to 1s. 3½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10½d. to 11½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east and west coasts, 11½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

### Sulphate of Ammonia.

The market continues very firm, though buying has not been so heavy. The actual Beckton price for prompt delivery is £12 8s. 9d. to £12 10s. 6d. Outside makes on Beckton terms are £12 2s. 6d. In Hull, £12 3s. 9d. to £12 5s. is quoted; in Liverpool, £12 6s. 3d.; in Leith, £12 8s. 9d. to £12 10s.; and in Middlesbrough, £12 3s. 9d.

**New Joint Stock Companies.**—The Standard Oxygen Light and Power Company, Limited, has been registered with a capital of £25,000, in £1 shares, to take over as a going concern the interest of B. P. Maisel and the rights of a business of gas, electric, and general engineers, manufacturers of oxygen and other light and power machinery, &c. The Kern Syndicate, Limited, has been formed with a capital of £10,000 in £1 shares (9500 "A" and 500 "B"), to carry on the business of manufacturers, distillers, and refiners of, and dealers in, crude and refined oils, sulphate of ammonia, and bye-products of coal, shale, oil, petroleum, &c.

**Ottoman Gas Company, Limited.**—At the meeting of the Company to-day (Tuesday), the Directors will report that the gas-rental for the half year ended Dec. 31 amounted to £19,593, compared with £18,383, for the corresponding half of 1908; and that the net profit is £5266, against £5058. The amount standing at the credit of the profit and loss account is £14,659, out of which the Directors have transferred £4000 to the reserve fund (increasing it to £20,000); and they recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free—leaving a balance of £7765.



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## MAINTENANCE.

The Davis Gas Stove Co., Ltd.,  
Luton.



## COAL TRADE REPORTS.

## Northern Coal Trade.

There is a stronger inquiry in the coal trade; and, as usual before a general holiday, the shipments are fuller to allow stocks to be kept. In the steam coal trade, best Northumbrians are quoted from 11s. 4½d. per ton f.o.b. for prompt delivery, with a higher price for delivery over the season; and second-class steams are from 10s. to 10s. 4d. Steam smalls are more in request, and are quoted from 6s. to 7s. In the gas coal trade, the demand from the southern companies has now fallen off, as is usual at this season; but the exports are larger. Durham gas coals are now quoted from 10s. to 11s. per ton f.o.b. for the usual kinds, and up to 11s. 6d. for "Wear" specials—the better classes being firm. Sales have been made over the year—on the basis of about 10s. 4d. per ton for second-class Durhams, and 11s. to 11s. 3d. for bests. As to definite contracts, the St. Petersburg tenders for 85,000 tons are in close negotiation, and are likely to result in the allotment to the collieries that have for some time done a large part of this trade. Another contract (for Holland) is in the market for some 3300 tons for Baarne. Coke is steady; but gas coke seems now a little easier. Good gas coke is quoted at about 14s. per ton f.o.b. in the Tyne or Wear.

## Scotch Coal Trade.

Trade remains brisk, outputs moving off very well. The foreign trade is particularly satisfactory; buyers being disposed to enter into contracts to cover the year. Prices are firm. These are now quoted at: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 309,988 tons—an increase of 36,748 tons upon the previous week, and of 42,816 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,779,236 tons—an increase of 459,811 tons upon the corresponding period.

**Quality of the Gas at Pwllheli.**—The following is taken from last Wednesday's issue of the "Liverpool Daily Post": During the last few nights, the inhabitants of Pwllheli have been in a state of irritation owing to the poor illuminating quality of the gas supply, which is a source of general complaint. Trade has had to be carried on in the various business establishments by the aid of lamps, &c.; and at the Post Office the clerks at the counter had to resort to candles. On Monday night, a protest meeting was held by the Ratepayers' Association; but as they had no authority over the Gas Company, a resolution was passed pledging the Council their support to insert a penalty clause in an agreement which is about to be entered into between the Company and the Council. Several present expressed their willingness to resort to the old tallow candles in the event of the Company refusing to accept the Council's terms.

## Plymouth and the Standard Burner Bill.

By the failure of the Town Council to pass the statutory resolution by the necessary majority, the Plymouth Corporation are removed from the list of municipal opponents of the Standard Burner Bills. The meeting was held yesterday week; and the resolution authorizing the opposition was moved by the Mayor (Alderman J. Yeo), who expressed amazement that the gas companies should have proposed a change which meant a reduction in the lighting and heating power of the gas, and said it seemed to be exactly on a par with a proposal of a coal owner to a large number of contracts on hand to alter the standard of weighing from 20 cwt. to the ton to 18½ cwt., without any reduction in the price. Mr. Jacobs thought the Mayor had been misinformed as to the effect of the proposal. All that was intended was to change the standard burner used for testing purposes, not to interfere with the quality of the gas. Mr. Edgcombe said the quality of the gas supplied would depend upon the test-burner used; and he did not think the Company were making the change in the interest of the consumers. Mr. Munday believed that opposition to the Bill would not be in the interests of the consumers. On the face of it, it was surely to the advantage of everyone that the quality of the gas should be accurately tested. The interests of the consumers were bound up with those of the Company, because the consumers were indirectly shareholders, and anything financially injurious to the Company would affect their customers. If the terrible things apprehended by the Mayor were likely to occur in Plymouth from the adoption of the standard burner, why had not those towns in which it was used revolted? He considered the opposition to the Bill needless, because even if one admitted, which he did not, that the burner was not a success, the Bill empowered a corporation at any time to appeal to the Board of Trade against its continued use. On a vote being taken after further discussion, 26 were in favour of opposing the Bill and 8 against; while 9 (including the Mayor) were neutral. The Town Clerk explained that, though the resolution was carried, it would not be effective, as an absolute majority of the members of the Council had not voted in its favour.

On Monday afternoon of last week, an outbreak of fire occurred in the smoke-room at Easton Park, the residence of the Marquis of Graham; but fortunately it was extinguished before much damage had been done. The cause of the accident was the fusing of an electric wire; and when the fire was discovered, it had obtained a good hold of the structure surrounding the place where the wire fused.

For the £10,000 of new "B" stock of the Eastbourne Gas Company recently advertised in these columns, tenders were received for above £50,000. The average price of the whole of the tenders was £130 10s. per £100 of stock, which would have given the investor a return of £4 16s. 6d. per cent. The £10,000 allotted yielded, including premiums, £13,834, at an average of £138 6s. 8d. per £100 of stock—yielding to the investor a return of £4 10s. 4d. per cent.

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NOTE

ADDRESSES.

Head Offices: **EXETER.**

London Offices:

18, ADAM STREET, ADELPHI, W.C.

SHOW-ROOMS: LONDON, 18, Adam Street, Adelphi, W.C.; DEVONPORT, 93, Fore Street.



**Davis Gas-Stove Company, Limited.**

The report which was submitted at the tenth annual general meeting of the Davis Gas-Stove Company, Limited (which was held at the Cannon Street Hotel last Thursday), stated that the net profits for the year to Dec. 31 amounted to £13,602, to which must be added the amount brought forward, £4095, giving a total divisible profit of £17,697. Deducting from this the dividend on the 5½ per cent. preference shares for the year, amounting to £3244, and the interim dividend on the ordinary shares at the rate of 5 per cent. per annum for the half year ending June 30, 1909, amounting to £1478, in all £4722, there remained a balance of £12,975. It was proposed to distribute £2943 in paying a dividend on the ordinary shares at the rate of 10 per cent. per annum, less income-tax, for the half year to Dec. 31, making ½ per cent. for the year; to add £5149 to the reserve account, making it £24,000; and, after providing £503 for the proportion of the profits payable to the Directors, there would remain £4380 to carry forward. In moving the adoption of the report, Mr. H. J. Davis, the Chairman, expressed the hope that the balance-sheet had afforded as much gratification to shareholders as it had done to the Board. For 1908, the dividend paid on the ordinary shares was 5 per cent.; while for the past twelve months it would be 7½ per cent.—with a bigger carry forward, and the addition of £5149 to the reserve. The amount of profit brought into the balance-sheet from the profit and loss account for the year under consideration was £13,602, as against £8254 for 1908—being a net improvement of £5348. At previous meetings he had explained the position in regard to the two foundries which were on hand and could not then be disposed of, and had made it quite clear that in all probability sooner or later a loss would have to be made upon them, and that such loss would be written off from the reserve account. He was glad to say they had now been successful in letting upon lease almost the whole of these two freehold properties; and what had been disposed of was bringing in a yearly rental of close upon £800. This had enabled the Board to revalue them on a reasonable basis, having regard to their earning power and selling possibilities; and they had written off any excess over and above such valuation standing upon the books heretofore. The gross profits for 1908 were £44,284, as against £52,122 for the past year. This was an increase of nearly £8000, against which there was naturally an increase under the head of trade expenses, but only to the extent of £2944. The motion for the adoption of the report was seconded by Mr. Harold N. Davis, who referred to the progress made during the last three years—since the time of the transfer from the two old foundries to Luton. Apart from the obvious advantage to be gained from this centralization of the business, he said, the chief reason for building these works was that they might be in a position to increase their trade, which was impossible under the old conditions. The growth of business had exceeded their most sanguine expectations; and it had already been necessary, not only to add to all the departments, but also to create new ones. For some considerable time past, they had been actively engaged in gas-heating research work and the scientific side of manufacturing; and this depart-

ment was becoming so important that they had built and equipped a new suite of laboratories and experimental workshops for these operations. That the time occupied and expense incurred in this direction were fully justified, was proved by the enormous improvements they had been able to make in all their standard goods, as well as by the inventions they had brought out, which had been of great commercial value. The Directors looked forward to the future with every confidence; for the Company were in a position to meet any competition. The report was adopted; the retiring Director (Mr. C. S. Barber) was re-elected; and a hearty vote of thanks was passed to the Chairman, Directors, and staff—this being acknowledged by Mr. Cyril G. Davis.

**Improvements at Tiverton Gas-Works.**

A report by Mr. Clark Jeffery, the Gas Engineer and Manager of the Tiverton Corporation, recommending a number of improvements at the gas-works, was considered by the Town Council yesterday week. The recommendations included the re-erection of the second section of the retort-benches to complete the installation on the regenerative system, at an estimated cost of £1450; oxide and purifier sheds, £420; underground tar and liquor tank, £220; and a new 12-inch main, £360. Mr. Jeffery stated that 300 tons of coal had been saved since September owing to the use of the present retorts on the regenerative system, and there had been a much larger sale of coke. Consequent on leakage in the present underground tank, about 30,000 gallons of tar and liquor were wasted each year. If a new tank, having a capacity of about 10,000 gallons, were constructed, the Council could with advantage commence the manufacture of sulphate of ammonia. The Lighting Committee recommended that application be made to the Local Government Board for a loan of £3000 to cover the cost of the proposed works and of new mains during the ensuing three years. Alderman Heywood complained of the expenditure on the works, which he considered excessive. Alderman J. Thorne, the Chairman of the Committee, said the original loan of £22,000 would be paid off in seven years; and they would then probably owe about £12,000 on the gas undertaking. He hoped that in a few years the gas-works would be in a position to contribute to the reduction of the rates. Mr. Amory pointed out that the expenses of the loan would be only £180 a year, and said they had already saved £500 by the adoption of the new retorts. The recommendations were agreed to.

The British Mannesmann Tube Company point out, with reference to the paragraph in our issue of the 15th inst. as to the Lichfield Gas Company, that the 3½ miles of main therein mentioned will be composed entirely of Mannesmann weldless steel spigot-and-faucet tubes.

The tenders for the issue of 2019 "B" shares of £10 each in the Bournemouth Gas and Water Company were opened last Thursday. The minimum price of issue was £15 per share; and the whole of the shares were allotted at an average price of £15 19s. 2d. per share—the applications amounting to over three times the number offered.

# THE BRADDOCK PATENT "SLOT" METER

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### Sales of Gas and Water Shares.

The sale conducted by Messrs A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday included two new issues of capital. A parcel of 600 "B" shares (£5) in the Romford Gas Company, Limited, ranking for a standard dividend of 7 per cent., subject to the sliding-scale (the existing "B" shares carrying 10 per cent.), were readily purchased at from £10 5s. to £10 7s. 6d. each; yielding the buyer £4 17s. 6d. per cent. Some 4 per cent. debenture bonds of the same Company were sold at par. The other new issue was by the Wandsworth and Putney Gas Company, who offered some 3 per cent. debenture stock, at a reserve price below par; and it fetched from £78 to £78 10s. per £100. Some ordinary stock of the Gaslight and Coke Company, sold by order of executors, realized from £104 to £104 10s. per £100; £900 of consolidated stock of the Mitcham and Wimbledon Gas Company fetched £120 and £121 per £100; and £370 consolidated stock in the Sevenoaks Water Company, now carrying the maximum dividend of 10 per cent., with occasional payments on account of back-dividends, sold for £256 per £100. At a recent sale at Great Budworth, seven 4 per cent. preference shares in the Northwich Gas Company fetched £11 5s. each.

**Tar-Spraying of Roads.**—The Devon County Council decided at their meeting last week that a sum not exceeding £1000 should be spent during the present financial year on further experiments in the tar-spraying of main roads. The reports of the surveyors on last year's experiments were, on the whole, favourable. One of the surveyors said that tarring paid for doing, especially upon a good, sound surface. It saved the road from wear, and prevented water soaking into the foundation. Mr. Hurrell, the Chairman of the Main Roads Committee, said that they began experimenting rather too late in the year, and the tar came up again. Where there was heavy motor traffic, the roads would have to be tarred several times before they could get a sound surface. Dr. Mackenzie stated that in the Tiverton district tar-spraying had been a marked success. It had tended to the life of the road, as well as to the comfort of the people living by the roadsides and the benefit of the users of the road. Mr. Willcocks recommended the Committee to experiment in tar binding, which he said made an excellent road.

**Proposed Additional Water Scheme for Nuneaton.**—At the last monthly meeting of the Nuneaton Town Council, the Water-Works Committee reported having considered a proposal to acquire a site at Griff for the purpose of a new pumping-station, and had received a report from Mr. W. Whitaker, F.R.S., whom they had consulted in regard to the matter, confirming the opinion of their Engineer as to the suitability of the site. The Committee were of opinion that, having regard to the rapid growth of the population and the corresponding increase in the consumption of water, the new works should be put in hand as early as possible; and they recommended that application should be made to the Local Government Board for sanction to a loan of £5000 for the purpose of sinking the shaft. Alderman Johnson said the matter had been before the Committee for some months. With the permission of Mr. F. A. Newdegate, M.P., a borehole had been put down in order to test the proposed supply, which had been favourably reported upon by Dr. Bostock Hill. The Committee considered the site was the most suitable one in the borough. The report was adopted.

### APPLICATIONS FOR LETTERS PATENT.

- 5596.—MORGAN, J. H., "Clips for securing pipes." March 7.  
 5623.—LAMONT, D., "Gas globes and chimneys." March 7.  
 5634.—DEAN, H., "Boxes for mantles." March 7.  
 5718.—LAMKIN, A. E., and HUNTER, L., "Gas-burners." March 7.  
 5735.—DOCKING, A., "Gas-pendants." March 8.  
 5776.—HIBBERD, C. E., "Gas-meters." March 8.  
 5798.—COWPER-COLES, S. O., "Smokeless fuel." March 8.  
 5817.—HANCOCK, E. E., and ARNOLD, C. F., "Gas-generators." March 8.  
 5824-5-6.—GLOVER, T., "Water-beaters." March 8.  
 5840.—CLARK, H. N., "Cock for controlling the supply of gas from the main to the meter." March 8.  
 5844.—FREISINGER, A., "Incandescent gas-lamps." March 8.  
 5845.—HIBBERD, F. C., "Cocks or valves." March 8.  
 5891.—THORP, T. F., and H. T., "Proportional valve for the mixture of two or more fluids." March 9.  
 5912.—PARKINSON STOVE COMPANY, LTD., and CHESHIRE, W., "Street-lamps." March 9.  
 5945.—DAWSON, Sir A. T., and BUCKHAM, G. T., "Fluid-pressure valves." March 9.  
 5946.—BLAU, H., "Inverted lamps." March 9.  
 5950.—HANWELL, H. W., "Gas-pendants." March 9.  
 5951.—HANWELL, H. W., "Gas-fittings having an adjustable drop." March 9.  
 5967.—KERRILL, H., CONYNTHAM, F. E. S. (MARCHIONESS CONYNTHAM), and MOLEYS, F. R. W. E. DE, "Producing gas from petrol or other volatile spirit." March 10.  
 5974.—BIGGART, A. S., "Charging and discharging gas-retorts." March 10.  
 6008.—KNORR, L., "Heating apparatus for gasholders." March 10.  
 6067.—WEST, J., and GLOVER, S., "Vertical retort discharging apparatus." March 10.  
 6071.—MILBOURNE, R. J., "Fastening india-rubber pads to the covers of gas-purifiers." March 10.  
 6073.—POTTER, W. G., "Rotary pumps and meters." March 11.  
 6136.—FRANCE, A. G., and CUNNINGHAM, C., "Gas-stoves." March 11.  
 6138.—FRANCE, A. G., "Joints for pipes." March 11.  
 6154.—DELAGE, M., and WOOG, P., "Electrically lighting gas-burners." March 11.  
 6177.—ROWNTREE, B. S., and FRYER, F. G., "Removing solid impurities from gas." March 11.



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**Unsatisfactory Electric Lighting.**—Complaint is again being made by the Redruth District Council as to the unsatisfactory lighting of the town, which is carried out under contract by an Electric Lighting Company. At the last meeting of the Council, Mr. Hooper remarked that a portion of the town had been in total darkness on recent nights. Mr. Rodda said something had apparently gone wrong; and in the efforts of the Company to find the cause, matters had got worse. The lighting of the town was abominable; and the lamps could not be depended upon for a single night. In reply to a question as to the Council's remedy, the Clerk said they could sue the Company for damages if the lamps continued to be unlighted, and after 48 hours' notice. Mr. Bowden remarked that one part of the town had been in darkness for three weeks; the village of St. Day, with oil-lamps, was better lighted than Redruth. It was suggested that the Company should be written to again; but a majority of the members thought this useless, and it was decided that the penalty clause of the contract should be enforced.

**New Water-Works for Lincoln.**—The new works for supplying Lincoln with water are being rapidly pushed forward. All four bore-holes at Elkersley are completed, together with the approach road, and six miles of rising main have been laid and tested. The ironwork for the reservoir at Bracebridge is in position, and the concrete is being moulded on it. This reservoir is circular in form, and measures about 260 feet across; the outside wall being vertical on the outer face but battered inside from a thickness of nearly 7 feet at the bottom to 3 feet at the top. The roof is of ferro-concrete, supported upon numerous columns, and is practically flat, only a slight rise being given in the middle for drainage purposes. The floor has a fall of 6 inches from the wall to the centre, where the water will reach a depth of 20 feet. Upon arriving at Lincoln, the water will be delivered into a tank mounted upon a tower. The overflow from the tank will pass along 3½ miles of main, ranging from 21 to 18 inches in diameter, and will be delivered into a 10,000-gallon tank mounted upon a tower at Bracebridge for supplying the local demand.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SUPERINTENDENT OF PUBLIC LIGHTING. Calcutta Corporation. Applications by May 3.  
REPRESENTATIVE FOR INDIA. Tylor and Co., York Road, N.  
REPRESENTATIVE. Voelker Lighting Corporation. TRAVELLER. No. 5208.  
METER MAKERS AND REPAIRERS. Portsea Island Gas-light Company.

Situations Wanted.

MANAGER, SUPERINTENDENT, &c. No. 5204.  
SUPERINTENDENT OF DISTRIBUTION, &c. No. 5206.

Plant, &c. (Second Hand), for Sale.

AIR GAS PLANT. Charrington and Co., Mile End.

Gas-Works for Disposal.

LAINDON GAS-WORKS. By Auction, April 12.

Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. April 5.  
HORLEY GAS COMPANY.  
LOWESTOFT WATER AND GAS COMPANY. April 5.  
SEVENOAKS WATER COMPANY. April 2.  
TENDING HUNDRED WATER COMPANY. April 6.  
WORTHING GAS COMPANY. April 5.

TENDERS FOR

Coal and Cannel.

ASHEFORD (KENT) GAS DEPARTMENT. Tenders by April 4.  
EDINBURGH AND LEITH GAS DEPARTMENT. Tenders by March 24.  
NEWPORT (FIFE) GAS DEPARTMENT. Tenders by April 1.  
STOCKPORT GAS DEPARTMENT. Tenders by April 6.  
STOURBRIDGE GAS DEPARTMENT. Tenders by April 12.

Condensers, &c.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by April 2.  
MIDDLETON CORPORATION. Tenders by March 30.

Conveyor.

PETERBOROUGH GAS COMPANY. Tenders by April 8.

Fire-Clay Goods.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.  
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.  
LOUGHBOROUGH GAS DEPARTMENT.

General Stores—

(Bolts and Nuts, Oils and Paints, Lime, Compo. Pipe, Iron and Steel Tools, Buckets, Gloves Ironmongery, Brass Fittings, &c., Cocks, Taps, Valves, Castings, &c.)  
COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.  
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.  
ROCHDALE GAS DEPARTMENT. Tenders by March 30.

Governors (Retort-House).

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by April 2.

Incandescent Goods.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

Meters.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.  
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.

Oil for Gas Manufacture.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.

Oxide (Spent).

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.

Pipes.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.  
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 24.  
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by April 5.  
ROCHDALE GAS DEPARTMENT. Tenders by March 30.

Retorts, &c.

LOUGHBOROUGH GAS DEPARTMENT.

Tar Extractor.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by April 2.

Tar and Liquor.

DEVONPORT GAS DEPARTMENT. Tenders by March 29.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 786.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	86-88	..	5 13 8	£	Stk.	Nov. 11	p.c.	Imperial Continental	177-179	+1	4 9 5
1,474,000	Stk.	Jan. 13	5	Do. 4 p.c. Deb.	98-100	..	4 0 0	4,940,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	93-95	+1	3 13 8
310,000	5	Oct. 28	7½	Bombay, Ltd.	68-68½	+8	5 5 8	1,235,000	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	120-122	+3	4 18 4
200,000	5	"	7½	Do. New, £4 paid.	5-5½	+8	5 6 8	561,000	Stk.	Feb. 25	10	Liverpool United A.	222-224	..	4 9 3
40,000	5	"	7½	Bourne- ) 10 p.c.	29-30	..	5 0 0	718,100	"	"	7	Do. B.	163½-165½	..	4 4 7
50,000	10	Feb. 25	15	mouth Gas ) 7 p.c.	162-163	..	4 3 7	306,083	"	Dec. 29	4	Do. Deb. Stk.	103-105	..	3 16 2
311,810	10	"	7	and Water ) Pref. 6 p.c.	15-15½	..	3 17 5	75,000	5	Nov. 26	6	Malta & Mediterranean.	43-5	..	6 0 0
75,000	10	"	12½	Brentford Consolidated	250-253	..	4 18 10	560,000	100	Oct. 1	5	Met. of 15 p.c. Deb.	99-102	..	4 18 0
380,000	Stk.	"	9½	Do. New	187-189	..	5 0 6	250,000	100	"	4½	Melbourne ) 4½ p.c. Deb.	100-102	..	4 8 3
300,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	Nov. 11	3½	Monte Video, Ltd.	123-134	..	5 5 8
50,000	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	1,775,892	Stk.	Feb. 25	4½	Newcastle & G'tesh'd Con	104-105	..	4 3 4
206,250	Stk.	Mar. 16	11	Brighton & Hove Orig.	213-216	+½	5 1 10	529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
220,000	"	"	10	Do. A Ord. Stk.	150-153	..	5 4 7	55,940	10	Nov. 25	7	North Middlesex 7 p.c.	123-124	..	5 5 8
246,320	"	Oct. 14	10½	British	44½-45½	..	4 13 6	300,000	Stk.	Nov. 26	8	Oriental, Ltd.	139-141	..	5 13 6
460,000	20	Oct. 14	10½	Bromley, A 5 p.c.	116-118	..	5 1 8	60,000	5	Sep. 10	8	Ottoman, Ltd.	68-68½	..	6 5 6
109,000	Stk.	Feb. 25	6	Do. B 3½ p.c.	87-89	..	5 1 2	31,800	53	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
165,700	"	"	4½	Do. C 5 p.c.	103-105	..	5 4 9	60,000	50	"	13	Do. B.	126-128	..	5 1 7
82,278	"	Dec. 29	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8	100,000	50	"	12	Do. C.	119-121	..	4 19 2
55,000	"	Oct. 14	7	Buenos Ayres (New) Ltd.	142-154	..	4 11 10	114,800	50	"	10	Do. D and E.	100-102	..	4 18 0
500,000	10	Oct. 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	Oct. 28	7	Primitiva Ord.	78-78½	..	4 8 11
250,000	Stk.	Dec. 19	—	Cape Town & Dis., Ltd.	4-5	..	—	796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	58-58½	..	4 8 11
100,000	10	"	—	Do. 4½ p.c. Pref.	6-7	..	—	488,903	100	Dec. 1	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
100,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	49-50	+½	6 0 0	1,000,000	10	Oct. 14	8	River Plate Ord.	173-184	..	4 7 8
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	86-88	..	5 2 3	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99-101	..	3 19 3
157,153	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	105-108	..	4 12 7	250,000	10	Sep. 29	9½	San Paulo, Ltd.	153-164	..	5 10 9
3,799,735	Stk.	Feb. 25	5½	Commercial 4 p.c. Stk.	105-108	..	4 16 4	62,500	10	"	6	Do. 6 p.c. Pref.	113-122	..	4 18 0
4,193,975	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50-51	..	4 18 0
475,000	"	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	135,000	Stk.	Sep. 10	10	Sheffield A	233-235	..	4 5 1
800,000	Stk.	Dec. 10	5	Continental Union, Ltd.	97-99	..	5 1 0	209,984	"	"	10	Do. B	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	138-140	..	5 0 0	523,500	"	"	10	Do. C	233-235	..	4 5 1
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	70,000	10	Oct. 14	10	South African	124-124½	..	7 16 11
55,000	"	"	8	Do. Deb. Stk.	103-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120-122	..	4 9 7
146,995	"	Oct. 2	5	East Hull 5 p.c. Ord.	98-100	..	5 0 0	1,895,445	Stk.	Jan. 13	3	Do. 3 p.c. Deb.	81-83	-1	3 12 3
486,090	10	Jan. 27	12	European, Ltd.	242-244	..	4 17 0	209,822	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158	..	5 1 3
354,060	10	"	12	Do. £7 10s. paid.	183-191	..	4 14 9	605,000	Stk.	Feb. 25	5	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 12 9
15,141,545	Stk.	Feb. 10	4½	Gas 4 p.c. Ord.	103-104	-½	4 9 8	60,000	"	"	5	Do. 5 p.c. Pref.	119-121	..	4 2 8
2,600,000	"	"	3½	light 3½ p.c. max.	88-90	..	3 17 9	117,058	Stk.	Jan. 13	11	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
3,799,735	"	"	4	and 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	Nov. 11	5	Southampton Ord.	110-112	..	4 9 3
4,193,975	"	Dec. 29	3	Coke 3 p.c. Con. Deb.	81-83	..	3 12 3	120,000	Stk.	Feb. 10	6½	Tottenham ) A 5 p.c.	133-135	..	5 1 9
295,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	+½	5 5 3	453,940	"	"	5½	and B 3½ p.c.	112-114	..	4 14 4
62,500	"	"	6½	Do. do. 5 p.c.	117-119	+½	5 9 3	149,470	"	Dec. 29	4	Edmonton ) 4 p.c. Deb.	99-101	+1	3 19 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	173-18	..	6 2 3	182,380	10	Dec. 29	8	Tuscan, Ltd.	91-91½	..	8 4 2
134,070	Stk.	Mar. 16	7	Ilford A and C	142-144	+½	4 17 3	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,780	"	"	5½	Do. B	105-105½	..	5 10	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	112-114	..	4 7 9
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	255,636	Stk.	Feb. 25	6½	Wands- ) B 3½ p.c.	139-141	..	4 14 0
								79,416	"	Dec. 29	3	worth ) 3 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



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accurately Testing Pressures in, and outside of, the  
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city of Burner Nipples, as this will be the measure of  
the amount of Gas to be paid for in the lighting contract  
about to be entered into. The Corporation have proper  
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4. One Month's leave on full pay may be granted  
every Year, and longer leave out of India at intervals.  
The pay of the Post is Rs. 500 per Month, rising to  
Rs. 750 per month by equal annual increments; but  
the Corporation are prepared to give the maximum  
pay of the post—viz., Rs. 750 per month—to a well-  
qualified and otherwise specially suitable Candidate.  
The exchange value of the Rupee may be taken as  
equivalent to One Shilling and Four pence.  
5. Applications, stating Experience, Age, and Quali-  
fications, and accompanied by Copies of Testimonials,  
should be addressed to the Secretary, Calcutta Cor-  
poration (not by name), Calcutta, India, and should  
reach him on or before the 3rd of May, 1910.  
P. N. MOOKERJEE,  
Secretary to the Corporation.

Municipal Office,  
March 3, 1910.

**AMMONIA Waste Liquor Disposal.**  
Purification Plant.  
Results Guaranteed. No Working Costs.  
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

**FOR SALE—A Quantity of Hurdle**  
GRIDS, 3 ft. 6 in. high, in good Condition. Cheap  
for immediate Sale.  
Apply to FIRTH BLAKELEY, SONS, AND CO., LTD.,  
Thornhill, DEWSBURY.

**FOR SALE—One 150-Burner Complete**  
Plant made by the National Air Gas Company,  
Limited. Nearly new and in Good Order.  
Can be seen, by Appointment, at MESSRS. CHARRINGTON  
AND CO., LTD., Anchor Brewery, MILE END, E.

**GASHOLDERS—Splendid 45 feet dia-**  
meter and new STEEL TANK, fixed Complete  
to Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can  
be seen temporarily erected. Re-erected Cheap for  
immediate Sale.  
FIRTH BLAKELEY, Thornhill, DEWSBURY.

**THE Corporation of Middleton invite**  
TENDERS for the Erection of a New CON-  
DENSER at the Gas-Works.  
Further Particulars and Form of Tender, which will  
contain a Fair Wages Clause, may be obtained on Ap-  
plication to Mr. C. F. Broadhead, Gas Engineer, Gas-  
Works, Middleton.  
Tenders, addressed to the Chairman of the Gas Com-  
mittee, endorsed "Condenser," must be delivered at  
my Office not later than March 30, 1910.  
The Corporation do not bind themselves to accept the  
lowest or any Tender.

FREDERICK ENTWISTLE,  
Town Clerk.  
Town Clerk's Office,  
March 14, 1910.

**BOROUGH OF ROCHDALE.**  
(GAS DEPARTMENT.)

**THE Gas and Electricity Committee of**  
the above Corporation invite TENDERS for the  
Supply and Delivery of such Quantities of the under-  
mentioned GOODS as they may require during a period  
of Twelve Months from April 1, 1910.  
1—Cast-Iron Main Pipes and Specials.  
2—Wrought-Iron Tubes and Fittings.  
3—Lime for Gas Purification Purposes.  
4—Engine and Cylinder Oils.  
5—Bar and Sheet Iron.  
6—Steel Charging Shovels.  
7—Galvanized Iron Buckets (7 lbs., 12 in.)  
8—Stokers' Gloves.  
Forms of Tender for Items 1, 2, and 4 may be had on  
Application to Mr. T. Banbury Ball, the Manager, at  
the Gas-Works, Dane Street, from whom any further  
Information may be obtained.  
Tenders, properly endorsed and addressed to the  
Chairman of the Gas and Electricity Committee, must  
be sent in to me not later than noon on Wednesday,  
March 30, 1910.  
By order,  
WM. HENRY HICKSON,  
Town Hall, Rochdale,  
March 18, 1910. Town Clerk.

TENDERS FOR COAL.

**THE Town Council of Newport, Fife**  
(Gas Department), invite TENDERS for the  
Supply of CANNEL, GAS COAL, Single, Double, and  
Treble NUTS, per Ton delivered at their Railway  
Siding, for Twelve Months as from May 15, 1910.  
Tenders, marked "Tender for Coal," to be addressed  
to John Scrimgeour, Esq., Town Clerk, not later than  
Friday, April 1.  
The Council do not bind themselves to accept the  
lowest or any Tender.  
JOHN F. BLACK,  
Manager.

Gas-Works, Newport,  
March 14, 1910.

**URBAN DISTRICT COUNCIL OF COLWYN BAY  
AND COLWYN.**

GENERAL GAS STORES.

**TENDERS are invited for the Supply**  
of the following STORES and MATERIALS, in  
such Quantities as may be required in the Gas Depart-  
ment of the above Council, for the Year ending the  
31st of March, 1911—viz:—  
Fire-Clay Goods, Lime, &c.  
Iron Tubes and Fittings.  
Lead and Compo.  
Iron and Steel.  
Oils and Paints.  
Brass Fittings and Sundries.  
Slot Fittings.  
Dry Meters.  
Main Taps.  
Steam Valves.  
Castings.  
Incandescent Lighting Goods.  
Ironmongery.  
Form of Tender and any Information may be had  
from the undersigned, to whom sealed Tenders, endorsed  
"Tenders for Gas Stores," addressed to the Council  
Offices, Colwyn Bay, must be delivered not later than  
Saturday, the 9th of April next.  
The Tender of any person who, personally or through  
an Agent, canvasses any of the Officers or Members of  
the Council will be rejected.  
The Committee do not bind themselves to accept the  
lowest or any Tender.

By order,  
JAMES AMPHLETT,  
Clerk to the Council.

Council Offices, Colwyn Bay,  
March 17, 1910.

**EDINBURGH AND LEITH CORPORATIONS'  
GAS COMMISSIONERS.**

GENERAL STORES.

**THE Commissioners invite Tenders for**  
the Supply of GENERAL STORES for the Year  
ending the 15th of May 1911, comprising, among others,  
the following:—  
Cast-Iron Pipes and Connections.  
Iron Castings.  
Tubes and Fittings.  
Merchant Iron and Steel.  
Bolts, Nuts, and Rivets.  
Tools, Implements, and Ironmongery.  
Brass Cock Fittings and Meters.  
Timber, Yarn, Waste, &c.  
Oils and Paints.  
Gas Oil, Fireclay Materials.  
Causeway Repairs.  
Removal of Spent Oxide of Iron.  
The Contractors will be required to Guarantee that  
in the execution of their Contracts they pay the  
Standard Rate of Wages or such Rates as are generally  
recognized as fair in their Localities.  
Schedules and Forms of Tender and Samples may be  
seen, and further Information obtained upon Ap-  
plication to Mr. W. R. Herring, the Commissioners' Engineer  
and General Manager, at his Office, Calton Hill,  
Edinburgh.  
Offers must be lodged not later than Ten o'clock on  
Thursday forenoon, the 24th day of March, 1910, in  
Sealed Envelope, addressed to the undersigned, and  
marked "Tender for ———," as the case may be.  
The Commissioners are not to be bound to accept  
the lowest or any Tender.

JAMES M'G. JACK,  
Clerk.

25, Waterloo Place, Edinburgh,  
March 14, 1910.

**EDINBURGH AND LEITH CORPORATIONS'  
GAS COMMISSIONERS.**

GAS COAL.

**THE Commissioners are prepared to re-**  
ceive TENDERS for the Supply of GAS COAL,  
yielding a satisfactory quality of Coke, for Delivery at  
their Granton Works over a period of about Twelve  
Months from June 10 next.  
The monthly requirements during the period approxi-  
mate the following percentages; but the Commissioners  
do not guarantee these percentages:—  
July . . . 4 per cent.      January . . 15 per cent.  
August . . 5 " "      February . . 10 " "  
September . 6 " "      March . . 8 " "  
October . . 10 " "      April . . 6 " "  
November . 12 " "      May . . 5 " "  
December . 15 " "      June . . 4 " "  
The Contractors must Guarantee that in the execution  
of their Contracts they Pay the Standard Rates of  
Wages, or such Rate as is generally recognized in their  
Localities.  
Further Particulars with Schedule and Form of  
Tender, may be obtained on Application to Mr. W. R.  
Herring, the Engineer and General Manager of the  
Commissioners at his Office, Calton Hill, Edinburgh.  
The Tenders to be lodged not later than Ten o'clock  
on Thursday forenoon, the 24th day of March, 1910, in  
Sealed Envelope, addressed to the undersigned, and  
marked "Tender for Coal."  
The Commissioners are not to be bound to accept  
the lowest or any Tender.  
JAMES M'G. JACK,  
Clerk,  
25, Waterloo Place, Edinburgh,  
March 14, 1910.



### LOUGHBOROUGH CORPORATION. (GAS DEPARTMENT.)

#### RENEWAL OF RETORTS.

**TENDERS** are invited by the Gas Committee for the RENEWAL of RETORTS. Further Particulars to be obtained from  
EDWARD ONIONS,  
Engineer and Manager.  
Gas-Works, Loughborough,  
March 16, 1910.

### COUNTY BOROUGH OF DEVONPORT. (GAS DEPARTMENT.)

**THE Gas Committee** invite Tenders for the Purchase of the Surplus COAL-GAS TAR and WATER-GAS TAR produced at their Works during the Year ending March 31, 1911. Tenders to state Price per Ton for—  
(a) Coal-Gas Tar,  
(b) Water-Gas Tar,  
at the Gas-Works, Devonport, and must be received by the undersigned on or before Tuesday, March 29, 1910.  
WILLIAM P. TERYET,  
Engineer and Manager.

### PETERBOROUGH GAS COMPANY.

**THE Directors** of the above Company invite TENDERS for a HOT COKE CONVEYOR. Tenders, addressed to the Chairman of the Company, Gas-Works, Peterborough, and endorsed "Conveyor," to be delivered not later than the 8th of April, 1910. The Directors do not bind themselves to accept the lowest or any Tender. Further Particulars from  
JOHN BARTON,  
Secretary.  
Gas-Works, Peterborough,  
March 11, 1910.

### RADCLIFFE AND PILKINGTON GAS COMPANY.

#### TENDERS FOR PIPES.

**TENDERS** are invited for the Supply of 12-inch CAST-IRON GAS MAINS, in 12 feet Lengths. Further Particulars may be obtained from the undersigned, by whom Tenders will be received until Tuesday, the 5th of April.  
JAMES BRADDOCK,  
Manager and Secretary.  
Gas-Works, Radcliffe,  
March 14, 1910.

### URBAN DISTRICT COUNCIL OF STOURBRIDGE. (GAS DEPARTMENT.)

**THE Gas Committee** invite Tenders for the Supply of about 20,000 Tons of Good Screened GAS COAL, delivered on their Gas-Works. Forms of Tender may be had on Application to the undersigned, and only Offers on our own Form will be considered. Tenders, endorsed "Gas Coal," addressed to the Chairman of the Gas Committee, to be sent to me at the Gas-Works, Stourbridge, on or before Tuesday, April 12, 1910. The Contract will contain a Fair Wages, &c., clause. The lowest or any Tender not necessarily accepted. By order of the Committee,  
CHARLES H. WEBB,  
Engineer and Manager.  
Gas-Works, Stourbridge,  
March 18, 1910.

### TO GAS PLANT MANUFACTURERS AND OTHERS.

**THE Llandudno Urban District Council** invite TENDERS for the Supply and Erection at their Gas-Works of the following PLANT—namely, RETORT-HOUSE GOVERNORS, TAR-EXTRACTOR, CONDENSER, and SUNDRY CONNECTIONS. A Specification and Form of Tender may be obtained, and Plans be inspected, on Application to Mr. Shadbolt, the Gas Manager, and, if required, copies of the Plans may be had on payment of the sum of 10/- (Ten Shillings). Tenders must be sent in to the undersigned not later than Saturday, the 2nd of April, endorsed "Gas-Works Extensions." The Council do not undertake to accept the lowest or any Tender.  
A. CONOLLY,  
Clerk to the Council.  
Town Hall, Llandudno,  
March 18, 1910.

### COUNTY BOROUGH OF STOCKPORT. (GAS DEPARTMENT.)

**THE Gas Committee** are prepared to receive TENDERS for a Supply of CANNEL and COAL. Forms of Tender, Specifications, and Conditions of Contract, together with any further Information, may be obtained from the Engineer, Mr. S. Meunier. No Form of Tender other than that issued by the Committee will be considered. Sealed Tenders, endorsed "Coal," must be addressed to the Chairman of the Gas Committee, Town Clerk's Office, Stockport, and must be sent in before Twelve o'clock Noon on Wednesday, April 6, 1910. No Tender will be accepted without satisfactory proof that the Firm tendering pays the Trade Union Rate of Wages and observes the Trade Union Number of Hours as are usually paid and observed in the district where the Goods are made or produced. The Committee reserve the right to accept for the whole or any portion of the quantity offered, but do not bind themselves to accept the lowest or any Tender. By order,  
ROBERT HYDE,  
Town Clerk.  
March 19, 1910.

### ASHFORD, KENT, URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

**THE above Council** are prepared to receive TENDERS for the Supply of 6000 Tons of GAS COAL in accordance with the Conditions of Contract which can be obtained from the undersigned. Sealed endorsed Tenders must be delivered to the Clerk to the Council, 11, Bank Street, Ashford, Kent, not later than Nine a.m. on April 4, 1910. The lowest or any Tender not necessarily accepted.  
H. R. TURNER,  
Engineer and Manager.  
Gas-Works, Ashford,  
Kent, March 21, 1910.

### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C. Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

### By order of the Directors of the LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY  
£10 SHARES,  
AND  
£1000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

### By order of the Directors of the ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

NEW ISSUE OF £32,000 FOUR PER CENT.  
PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

### By order of the Directors of the WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £3473 CONSOLIDATED  
ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS** will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 5, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

In the High Court of Justice, Chancery Division,  
Mr. Justice Joyce. 1909, L. No. 1586.

### THE FREEHOLD GAS-WORKS

OF THE  
LAINDON AND DISTRICT GASLIGHT, COKE, AND WATER COMPANY, LIMITED,  
Situate about 23 miles from London, within a short distance of the Laindon Station on the London, Tilbury, and Southend Railway. The Works comprise: Retort House with Eight Retorts, Vertical Condenser, Cast-Iron Scrubber, Tar-Tank and Pump, Two Purifiers, with Lifting and Traversing Apparatus, Gasholder, 400-Light Station Meter, together with the Mains, Services, Meters, and Tools, the whole to be sold as a Going Concern and with Possession on completion of the purchase.

**MR. WILLIAM RICHARDS**, of the Firm of MESSRS. A. & W. RICHARDS (the person appointed by the said Judge), will SELL THE ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, April 12th., at One o'clock, precisely in One Lot. The Works may be viewed, and Particulars with Conditions of Sale obtained, of J. MONTAGUE HASLIP, Esq., Solicitor, 6, Martin's Lane, CANNON STREET, E.C.; of HARRY BARKEP, Esq., Chartered Accountant, 6, OLD JEWRY, E.C.; and of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

### HORLEY DISTRICT GAS COMPANY.

SALE BY TENDER OF £3000 ADDITIONAL  
"B" CAPITAL STOCK.  
MINIMUM PRICE, PAR.

In pursuance of the Horley District Gas Act, 1901,  
**NOTICE** is Hereby Given, that it is the intention of the Directors of this Company to OFFER FOR SALE, by TENDER, £3000 of the above Stock, to be paid up in full on or before the 30th day of April next, such Stock being a portion of the Additional Capital Authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 12th day of September, 1901, under powers of the above mentioned Act. Particulars and Conditions may be obtained on Application to the undersigned.

By order of the Board,  
R. SEYMOUR TONEY,  
Secretary.  
Offices: Station Road, Horley,  
Surrey, March 2, 1910.

### By Order of Executors, to close an Estate. TENDRING HUNDRED WATER-WORKS COMPANY.

TWENTY £10 "A" SHARES;  
DIVIDEND FOUR-AND-A-HALF PER CENT.

**MESSRS. EDWIN FOX, BOUSFIELD, BARNETTS, and BODDELEY** will include in their next STOCK and SHARE AUCTION, at the Mart, E.C., on Wednesday, April 6, at Two o'clock, the above Shares, in Lots. Particulars at the AUCTIONEERS' OFFICE, 99, Gresham Street, LONDON, E.C.

### SEVENOAKS WATER-WORKS COMPANY.

**NOTICE** is Hereby Given, that the Sevenoaks Water-Works Company, in pursuance of their Provisional Order of 1908, as confirmed by Act of Parliament, being desirous of increasing their Capital, have resolved to issue Three Hundred 4 PER CENT. PREFERENCE SHARES of TEN POUNDS each. Tenders are hereby invited from the Public for the same at not less than par value.

The present issue of Capital is made to provide for the Extension of Mains and other works, and also for the Repayment of Sums over-expended on Capital Account.

The Company are paying the Maximum Dividend on their Stock and Ordinary Share Capital. Tenders are to be addressed to the Company at their Offices, Oak Lane, Sevenoaks, on or before Saturday, the 2nd day of April, 1910, and endorsed "Tender for Shares."

The Shares are Payable as under—viz.:  
£2 on Application,  
£3 on Allotment,

and the Balance on the 1st day of July, 1910. Where no Allotment is made, the Deposit will be returned in full.

Forms of Tender on Application at the Company's Offices.

By order of the Board,  
ALFRED GRAINGER,  
Secretary.

Offices: Oak Lane, Sevenoaks,  
March 9, 1910.

### THE SECOND EDITION OF GAS COMPANIES' BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

By  
JOHN HENRY BREARLEY, and  
BENJAMIN TAYLOR.

Price Net: Complete, Cloth Bound, 12s. 6d.;  
Morocco Gilt, 18s.

LONDON:  
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

### JOHN HALL & CO. OF STOURBRIDGE, LIMITED,

**STOURBRIDGE,**  
Manufacturers of  
**FIRE-BRICKS, LUMPS, TILES,  
GAS RETORTS,**  
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED  
FOR SHIPMENT.

### LUX'S Gas Purifying Material

is now used in many Gas-  
Works throughout Scotland  
with gratifying success.

### FRIEDRICH LUX Ludwigshafen-am-Rhein

Sole Agent for Scotland:

**DANIEL MACFIE**

1, North Saint Andrew Street, EDINBURGH

Telegrams: "GASLUX, EDINBURGH"

Descriptive Pamphlet on Application.



## TROTTER, HAINES, & CORBETT, BRETTLELL'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

## MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 87.8-85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,  
RAYENSTHORPE, NEAR DEWSBURY.  
LONDON: 16, Park Village East, N.W.

## JAMES OAKES & CO., ALFRETON IRON-WORKS, DERBYSHIRE,

AND  
Wenlock Iron Wharf, 21 & 22, Wharf Road,  
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches  
in diameter, and make and erect to order  
RETORTS, PURIFIERS, and TANKS, with  
or without planed joints, COLUMNS,  
GIRDERS, SPECIAL CASTINGS, &c., re-  
quired by Gas, Water, Railway, Telegraph,  
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.  
These are cast in one piece, without Chap-  
lets; doing away with Bolts, Nuts, and Covers,  
and rendering Leakage impossible.

## \* BRASS AND STEEL \* PINION WIRE any lengths.

John Rigby & Sons, Ltd.

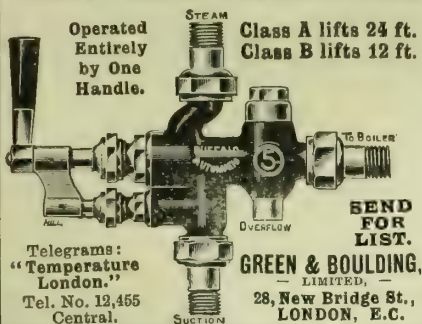
Rawfolds Wire Mills,  
CLECKHEATON.

Head Office & Works:

Adelphi Wire Mills,  
Salford, MANCHESTER.

Also IRON and STEEL WIRE of all descriptions.

## 'BUFFALO' INJECTOR



## NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO  
THE LOTHIAN COAL COMPANY,  
LIMITED,  
NEWBATTLE COLLIERIES,  
NEWTONGRANGE, MIDLOTHIAN.

THOMAS DUXBURY & CO.,  
16, DEANSGATE, MANCHESTER.  
Best Gas Coal and Cannel, giving High Illu-  
minating Power, Large Yield per ton, and  
reasonable in Price.  
Telegrams: "DARWINIAN, MANCHESTER."  
Telephone 1808.

## HEATHCOTE GAS COAL from the GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.  
Above the Average in Weight and Quality  
of Coke.

Maintains a High Standard in Residuals.

## THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,  
MANUFACTURERS OF  
FILES OF BEST QUALITY  
FOR ENGINEERS.

## STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,  
SPANNERS, RATCHET BRACES, LIFTING JACKS,  
ANVILS, VICES,  
AND ENGINEERS' TOOLS GENERALLY.

London Office:  
90, CANNON STREET, E.C.

## HARRIS & PEARSON, STOURBRIDGE, ENGLAND. MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.  
GLAZED BRICKS AND PORCELAIN BATHS.

## THE WIGAN COAL & IRON CO., LIM<sup>TD.</sup>.

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES,  
Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known  
Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER,  
Telegraphic Address: "WIGAN, BIRMINGHAM."

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telephone: No. 200.

Telegraphic Address:  
"PARKER, LONDON."

## Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

## Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings      New Coke Ovens  
(Patent),      (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia  
Works, and Cyanogen Extraction Plants.



**ADDITIONAL REVENUE FOR GAS-WORKS.**

COKE SELLING . . AT 11/6 A TON  
COALEXLD SELLING AT 20/- A TON  
**IN THE SAME TOWN.**

**X**

COALEXLD, LIMITED.  
LANCASTER.

**WATER SUPPLIES.****ARTESIAN BORED TUBE WELLS,**

Norton's Patent "Abyssinian" Tube Wells.  
Deep Well Pumps and Patent Air Lift Pumps.

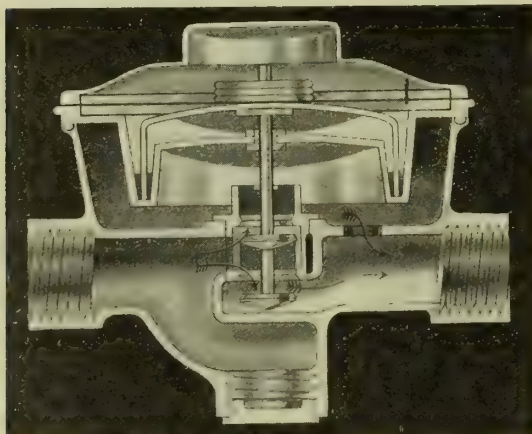
**LE GRAND & SUTCLIFF,**

Artesian Well and Waterworks Engineers,  
MAGDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.

**AN EPOCH IN GAS MANUFACTURE.**  
**THE VERTICAL GAS RETORT SYNDICATE, LIMITED,**  
(DESSAU SYSTEM)  
17, VICTORIA STREET, WESTMINSTER, S.W. (See Full Page Advertisement,  
p. 1., Nov. 30.)

Workmanship and Materials  
of the Highest  
Quality.

**PECKETT'S LOCOMOTIVES.**  
Built to any  
Specification or Gauge.  
**PECKETT & SONS,**  
ATLAS LOCOMOTIVE WORKS, BRISTOL



2  
MERCURIAL PRESSURE GOVERNOR for fixing at Gas Meter.  
Inlet may be at 1 or 2.

PEEBLES' MERCURIAL  
**GAS GOVERNORS**

Ensure a Steady Outlet Pressure  
and Improve the Lighting.

**PEEBLES & CO., LTD.,**

Tay Works, Bonnington, EDINBURGH.

The Outcome of a Practical Gas Engineer's Life Experience.

**THE CENTENARY PETROL GAS TURBINE GENERATOR.**

FOR  
Lighting, Cooking, Heating

FOR  
Villages,  
Mansions,  
Farm Steadings,  
Churches, Schools,  
Railway Stations,  
County Lighting Districts.

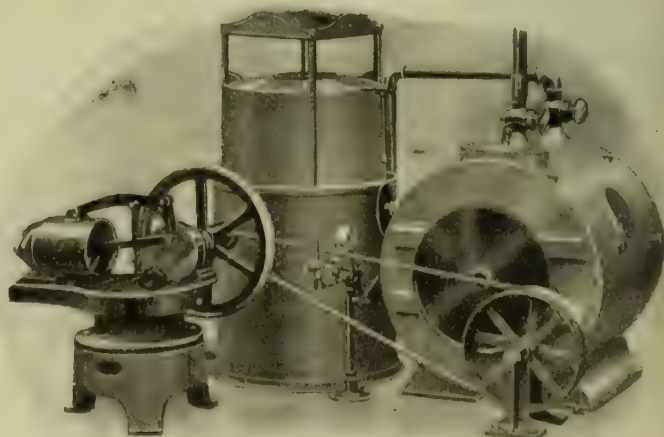
Plants from 100 cub. ft. per hour up to  
50,000 cub. ft. per hour for Gas Works.

**THE CENTENARY GAS CO. (Dept. M.)**

WILLIAM KEY, Engineer.

109, HOPE STREET,  
GLASGOW.

11, QUEEN VICTORIA STREET,  
LONDON.



**NON-EXPLOSIVE and ECONOMICAL.**



# GRAETZIN LIGHT

## Important Improvements.



### BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

### LAMPS.

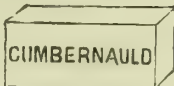
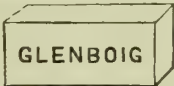
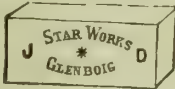
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

# THE GLENBOIG UNION FIRE-CLAY CO., LTD.

## GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices. The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

## GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

### ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

Works : GLENBOIG, LANARKSHIRE.  
Offices : 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

#### CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free .. .. .	3.03	3.49
Silica, combined .. .. .	43.20	49.77
Alumina .. .. .	36.55	42.10
Ferric oxide .. .. .	1.80	2.08
Titanic oxide .. .. .	1.30	1.50
Lime .. .. .	trace	trace
Magnesia .. .. .	trace	trace
Alkaline oxides .. .. .	trace	trace
Sulphates as trioxides .. .. .	0.92	1.06
Loss on Ignition .. .. .	13.20	—
	100.00	100.00

#### PHYSICAL RESULTS.

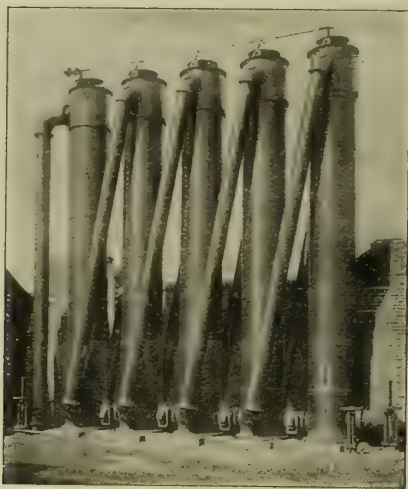
Density .. .. .	2.65
Volume weight .. .. .	1.90
Porosity .. .. .	15.4 %
Linear shrinkage at 100° C. .. .. .	3.70%
"    "    1050° C. .. .. .	4.76%
"    "    Total .. .. .	8.46%
Volume shrinkage at 100° C. .. .. .	10.7 %
"    "    1050° C. .. .. .	12.6 %
"    "    Total .. .. .	23.3 %
Plasticity .. .. .	20.0 %
Fire Stability .. .. .	1850° C. equiv. to 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)  
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. - I am, yours faithfully,

JOHN T. NORMAN.





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WITH GUIDE FRAMING OR COLUMNLESS.

**LUTED PURIFIERS LUTELESS**

**WATER** **Condensers** **AIR**

**GAS PLANT OF EVERY DESCRIPTION  
DESIGNED AND ERECTED.**

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DONNINGTON, SALOP.  
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Gas Engineers of the most important Works are high in  
their praises of the Fire-Clay Goods supplied by

**MOBBERLEY & PERRY OF STOURBRIDGE.**  
LIMITED,

**GAS-RETORTS A SPECIALITÉ.**

**S. CUTLER & SONS,** MILLWALL,  
LONDON.

And at 39, Victoria St., Westminster, S.W.

**GASHOLDERS & STEEL TANKS**

**Carburetted Water Gas Plant.**

**DESSAU VERTICAL RETORTS.**

Messrs. S. CUTLER & SONS are Contractors to the Vertical Gas Retort Syndicate, Ltd.,  
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The DESSAU System has been adopted at over 60 Gas-Works and up to the  
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**OIL TANKS. ROOFS. GIRDERS.**

**Every Requirement for Gas-Works Supplied.**



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Contractors to the Vertical Gas Retort Syndicate,  
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See Certified Results of the first Installation on this System  
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COMPLETE WITH

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IMMEDIATE DELIVERY FROM STOCK.  
UNBREAKABLE.  
EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls.

Size, 16 x 12 x 8 ft. deep.

**PATENT PRESSED STEEL TANKS.**

MADE FROM FLANGED PLATES 4 FT. SQUARE.  
ANY CAPACITY IN MULTIPLES  
OF 4 FT. LENGTH, WIDTH, OR DEPTH.

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WATER-GAS PLANTS.

Aggregate capacity of Plants supplied,  
231,600,000 cubic feet daily.

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## GAS METER

## MAKERS.

# STATION

# METERS

IN

**Ornamental**  
**Square & Round**  
**Cast-Iron Cases.**

**ALL SIZES.**

Drawings, Specifications, and  
Prices on Application.

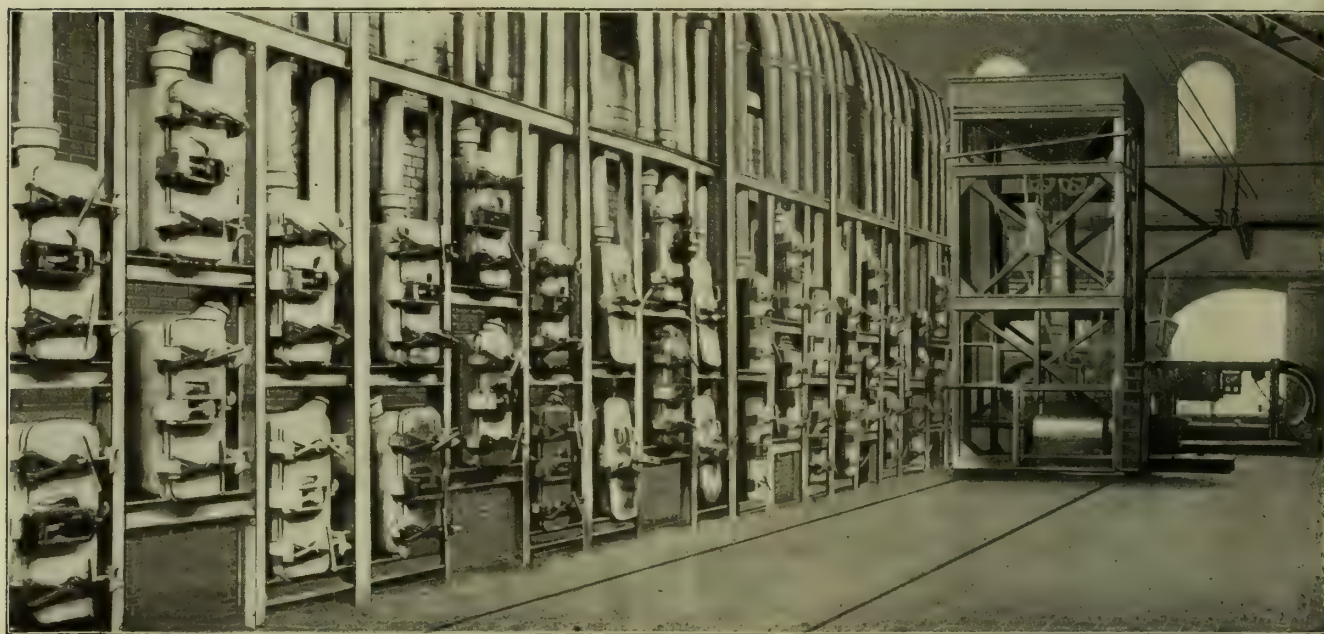
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AND  
6, LITTLE BUSH LANE,  
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LATEST DESIGN.



**GLOVER'S PATENT**  
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**RETORT SETTINGS.**



**SPECIAL ADVANTAGES:—**

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**GAS RESULTS,** 13,600 cub. ft. of 14.5 c.p. gas per Ton of coal carbonized.

**COKE,** GREY, DENSE, and MASSIVE, suitable for many metallurgical purposes and for malting.

**OPERATING COSTS** considerably lowered owing to greatly reduced number of operations.

**ADAPTABLE TO EXISTING REGENERATORS.**

The work of **CHARGING AND DISCHARGING** these Chamber Retorts is performed by the "**D.B.**" **STOKING MACHINES** with the same **SMOOTHNESS** and **RELIABILITY** that characterizes the working of the "**D.B. MACHINES**" with ordinary Retorts.

**THE ONLY MACHINES THAT WILL COMPLETELY FILL CHAMBERS OR RETORTS.**

Write for full Particulars to

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**Engineers, RETFORD, NOTTS.**



# Welsbach

## LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

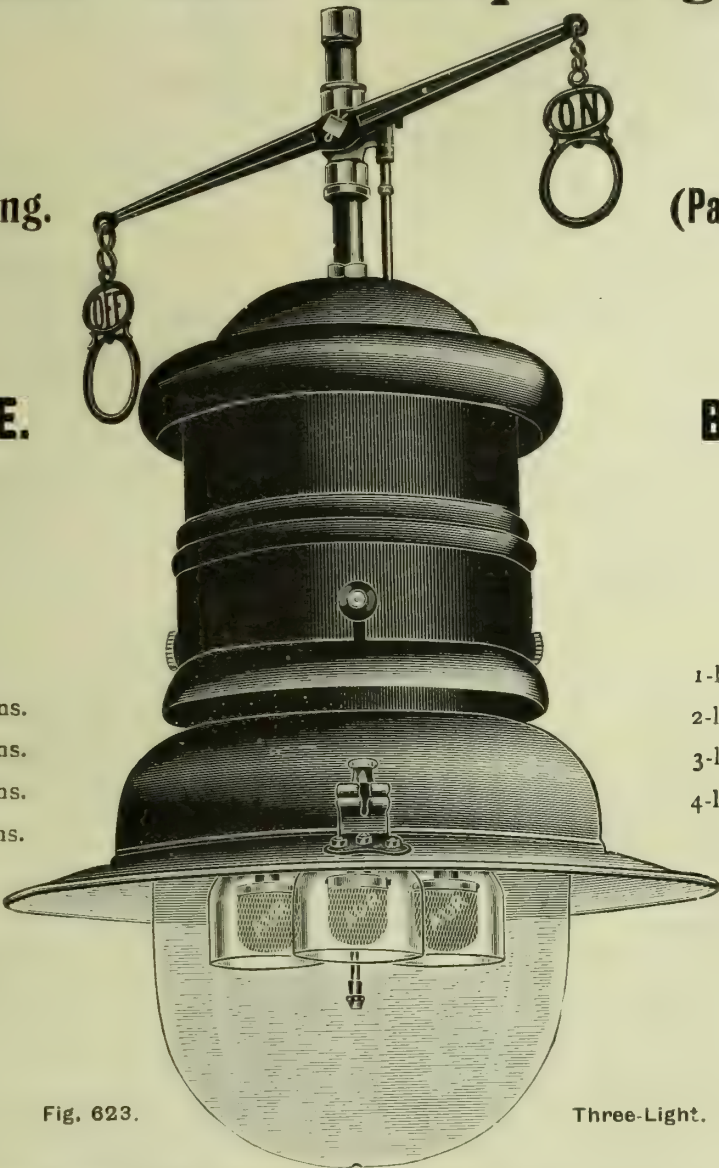


Fig. 623.

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.									
	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,  
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Telephone 2410 NORTH.





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For Coke Oven Gas.  
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For **FOUL GAS.**

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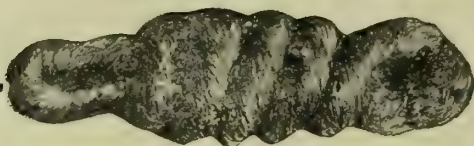
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Every Skein of equal weight and length.  
The Lead Wool Joint is built up evenly all the way through.  
Lead Wool requires no melting and can be used in water without risk.

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POSSESS ALL THE PROPERTIES WHICH CHEAP PAINTS LACK.

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MILTON HOUSE WORKS

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If you use them in such a position, where their durability is tried most severely, why not for your ordinary Mains and services? They are far cheaper and more reliable under all conditions if they are

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Hundreds of Gas and Water Authorities have already adopted them; why hesitate? If you have any doubts on any point connected with their use, write us, as we feel sure we can clear them up. A trial will be even more convincing.

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# CONTINUOUS CARBONIZATION

\*  
**GLOVER-WEST**  
**PATENTS.**  
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\*  
*Description and  
 Particulars of Tests  
 will be forwarded  
 on request.*  
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## COST OF LABOUR

REDUCED TO

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See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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# THE JOURNAL OF GAS LIGHTING

## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2446.]

LONDON, MARCH 29, 1910.

[62ND YEAR. PRICE 6d.

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**GAS-LEAK INDICATORS,** With all Latest Improvements. Short's Improved and Ansell Clock Form.

For GROUND USE, FLUSH BOXES, &c. For PURIFIER BLOW-OFF VALVES.

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For Ammonia Joints.

**GAS PLANT CEMENT**

For Tar Joints.

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Gas Purifying Material**

is now used in many Gas-Works throughout Scotland with gratifying success.

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ANY PATTERN MADE INTERCHANGEABLE WITH THE PART NOW IN USE.

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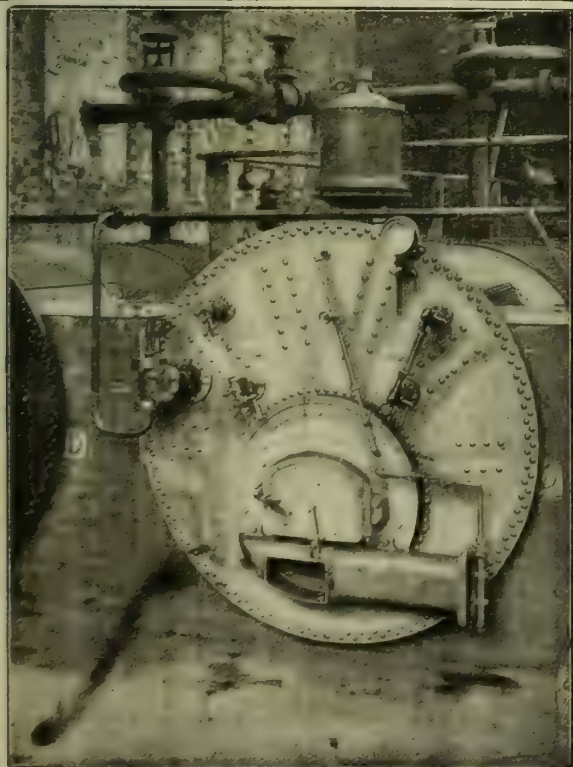
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**GAS STOVE RENEWAL PLANT.**  
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Make them into **NEW ONES** with the  
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After the Grease is removed, Stoves can be Cleaned and Polished  
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**COCKEY'S PATENT**  
**WASHER SCRUBBER & TAR EXTRACTOR.**

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"I am pleased to be able to state that the Scrubber Washer you erected at Harpenden has given every satisfaction. It has Five Chambers, and the Gas is divided into small streams, at each of these Chambers; water flows in at the top and all the Ammonia is eliminated without the aid of any other Plant. . . . The Liquor can be worked up to almost any desired strength. And the Plant has not been cleaned out since you fixed it, and has given us no trouble."

December 2nd, 1908.

"I cannot speak too highly of Cockey's Washers, they are simply invaluable. I gave full Information at the Meeting of an Association of Gas Managers, when President, at Southampton.

If you have plenty of room, I should have an Horizontal one, if short—why then a Vertical one.

The action of the Washer removes every trace of Ammonia."

December 23rd, 1908.

"You asked some time ago as to the working of Tar Extractor. I am pleased to report that it has been working for about six weeks, and is giving great satisfaction.

The whole of the Gas was passed through it for over a month, *without the aid of any other Washing Plant* (whilst the old Plant was being moved) and I was surprised at its being able to cope with the Gas so well, at this time of the year."

December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

December 2nd, 1908.

"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO<sub>2</sub> and H<sub>2</sub>S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH<sub>3</sub>, intending at a later date to erect a supplementary Scrubber. *At the present time the 'Cockey's' Washer is doing the whole of the work, and we have not found any difficulty in removing the last trace of NH<sub>3</sub>. We have passed equal to 300,000 cubic feet per diem.*

The only trouble we find in working, is a stopping up of the teeth of the Washing Hoods with Naphthalene, but these are easily cleaned by removing a Hand Cover and applying a stiff Brush. The Overflows work well, and a little attention occasionally is all that is required."

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Should you desire any further Information, please do not hesitate to ask me for it, and I should be very pleased to show you the Washer at any time you might care to pay me a Visit."

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**MAXIMUM EFFICIENCY GUARANTEED.**

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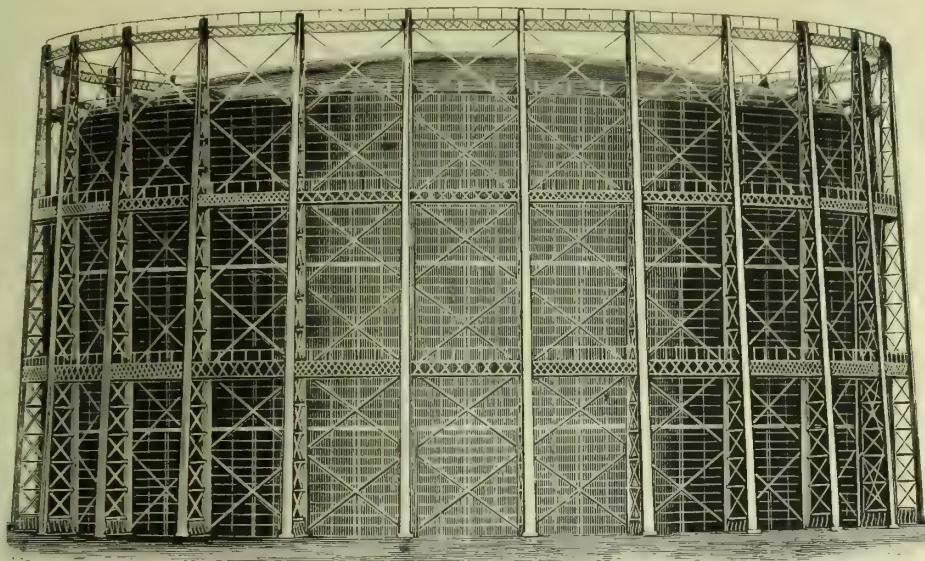
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SCRUBBERS,  
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AND  
TANKS.

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Three-Lift Gasholder. Capacity, Six Million cubic feet.  
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ENSURES ABSOLUTE SECURITY AGAINST THEFT.

Particulars on Application.



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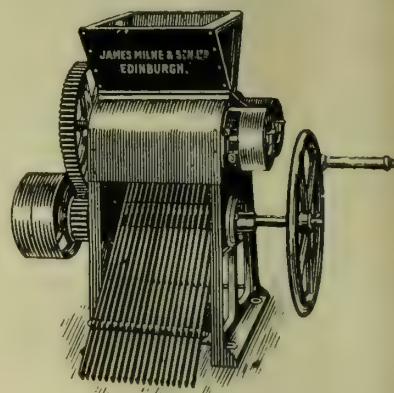
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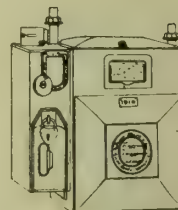
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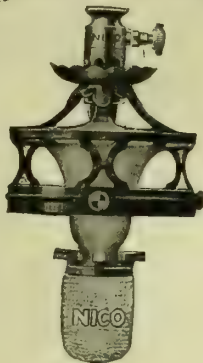
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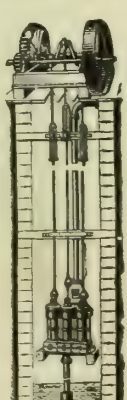
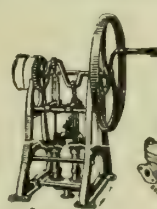
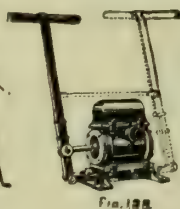
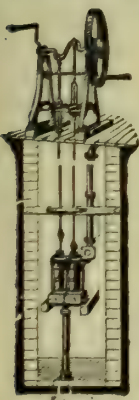
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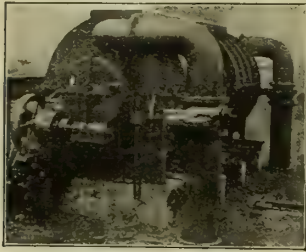
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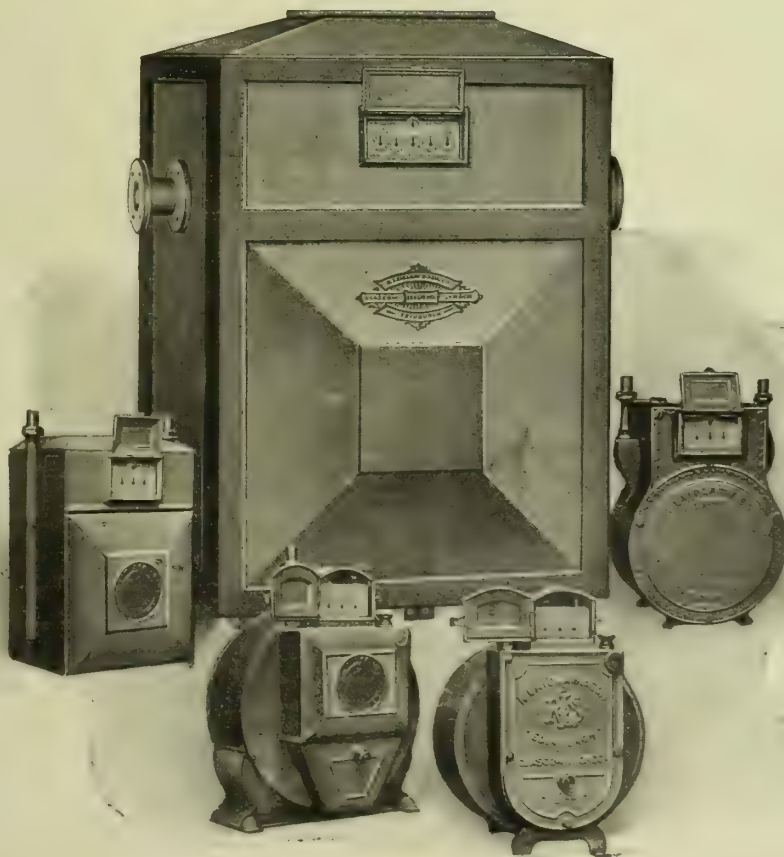
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Allenstein, Germany . . .	200,000	Frankenthal, Germany . . .	175,000	Portsmouth . . . .	1,000,000
Antwerp, Belgium . . .	1,500,000	G. L. & C. Co. Beckton . . .	2,250,000	Posen, Germany . . .	450,000
Antwerp (2nd) . . .	1,000,000	G. L. & C. Co., „ (2nd) . . .	10,750,000	Posen (2nd) . . . .	700,000
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Augsburg, Bavaria . . .	425,000	G. L. & C. Co., Fulham . . .	1,750,000	Preston . . . . .	1,400,000
Aylesbury . . . . .	150,000	G. L. & C. Co., „ (2nd) . . .	750,000	Reading . . . . .	1,000,000
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Belfast . . . . .	1,700,000	Gablonz, Austria . . .	140,000	Reichenberg (2nd) . . .	200,000
Belfast (2nd) . . . .	4,500,000	Gelsenkirchen, Westphalia . . .	175,000	Revel, Russia . . . .	350,000
Benrath, Germany . . .	125,000	Gelsenkirchen (2nd) . . .	350,000	Rhymney Valley . . . .	175,000
Berlin-Charlottenburg . . .	2,500,000	Geneva, Switz. . . .	500,000	Romford . . . . .	300,000
Berlin-Rixdorf . . . .	650,000	Gosport . . . . .	200,000	Romford (2nd) . . . .	350,000
Berlin-Rixdorf (2nd) . . .	700,000	Göteborg, Sweden . . .	300,000	Rotterdam, Holland . . .	850,000
Berlin-Tegel . . . .	3,500,000	Göteborg (2nd) . . .	600,000	Rotterdam (2nd) . . .	1,500,000
Berlin-Tegel (2nd) . . .	6,350,000	Graudenz, Prussia . . .	200,000	Rotterdam (3rd) . . .	750,000
Bilston . . . . .	375,000	Guildford . . . . .	350,000	Rotterdam (4th) . . .	750,000
Birmingham . . . .	1,500,000	Guildford (2nd) . . .	200,000	Rotterdam (5th) . . .	600,000
Bishop's Stortford . . .	200,000	Haarlem, Holland . . .	850,000	St. Albans . . . . .	700,000
Bochum, Westphalia . . .	530,000	Hamburg, Germany . . .	1,750,000	St. Gallen, Switz. . . .	225,000
Bognor . . . . .	100,000	Hampton Court . . .	500,000	St. Gallen (2nd) . . . .	225,000
Bordentown, N.J. . . .	125,000	Hampton Court (2nd) . . .	600,000	St. Joseph, Mo. . . . .	750,000
Bournemouth . . . .	1,000,000	Hartlepool . . . . .	750,000	San Paulo, Brazil . . . .	700,000
Bournemouth (2nd) . . .	500,000	Hebden Bridge . . . .	200,000	Santiago de Cuba . . . .	400,000
Bremen, Germany . . .	550,000	Heidelberg, Germany . . .	200,000	Scarborough . . . . .	800,000
Bremen (2nd) . . . .	950,000	Holyoke, Mass. . . .	600,000	Schwelm, Westphalia . . .	100,000
Bremen (3rd) . . . .	850,000	Hong Kong . . . . .	450,000	Shanghai . . . . .	225,000
Brentford . . . . .	1,200,000	Hull . . . . .	1,500,000	Shanghai (2nd) . . . .	225,000
Brentford (2nd) . . . .	850,000	Ilford . . . . .	650,000	Shanghai (3rd) . . . .	1,600,000
Bridgwater . . . . .	200,000	Innsbruck, Austria . . .	200,000	Southampton . . . . .	800,000
Bridlington . . . . .	150,000	Ipswich . . . . .	750,000	Southampton (2nd) . . .	500,000
Bridlington (2nd) . . .	200,000	Kampen, Holland . . .	350,000	Southampton (3rd) . . .	600,000
Brieg, Silesia . . . .	100,000	Kiel, Sleswig . . . .	1,000,000	Southgate . . . . .	400,000
Brighton . . . . .	1,750,000	Kiel (2nd) . . . . .	880,000	Southport . . . . .	750,000
Brighton (2nd) . . . .	1,850,000	L. & N.W. Rly., Crewe . . .	700,000	Southport (2nd) . . . .	900,000
Bromley . . . . .	1,500,000	Lausanne, Switz. . . .	250,000	South Shields . . . . .	650,000
Bruges, Belgium . . .	200,000	Lawrence, Mass. . . .	400,000	Stafford . . . . .	500,000
Brussels-Anderlecht . . .	350,000	Lea Bridge . . . . .	350,000	Staines . . . . .	600,000
Brussels-Anderlecht (2nd) . .	350,000	Lea Bridge (2nd) . . .	350,000	Stettin, Germany . . . .	880,000
Brussels-Forest . . . .	1,000,000	Lea Bridge (3rd) . . .	400,000	Stockholm . . . . .	1,500,000
Brussels-Koekelberg . . .	1,000,000	Lea Bridge (4th) . . .	1,000,000	Stockholm (2nd) . . . .	1,750,000
Brussels-St. Gilles . . .	1,000,000	Leeuwarden, Holland . . .	400,000	Stockport . . . . .	600,000
Brussels-St. Josse . . .	1,000,000	Leiden, Holland . . .	500,000	Stockport (2nd) . . . .	600,000
Brussels-St. Josse (2nd) . .	600,000	Leiden (2nd) . . . .	575,000	Stockport (3rd) . . . .	400,000
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Brussels-Ville . . . .	750,000	Lemberg, Galicia . . .	260,000	Swansea . . . . .	750,000
Brussels-Ville (2nd) . . .	750,000	Liège, Belgium . . . .	1,000,000	Swansea (2nd) . . . .	1,000,000
Brussels-Ville (3rd) . . .	1,500,000	Liège (2nd) . . . . .	750,000	Swansea (3rd) . . . .	450,000
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Bucarest, Roumania . . .	1,100,000	Liverpool . . . . .	3,500,000	Sydney-Harbour . . . . .	500,000
Budapest, Hungary . . .	50,000	Liverpool (2nd) . . .	4,500,000	Sydney-Harbour (2nd) . . .	500,000
Budapest (2nd) . . . .	1,750,000	Liverpool (3rd) . . .	750,000	Sydney-Mortlake . . . .	500,000
Carlisle . . . . .	600,000	Longton . . . . .	600,000	Sydney-Mortlake (2nd) . .	500,000
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Commercial, London . . .	850,000	Magdeburg, Germany . . .	1,400,000	The Hague Holland . . . .	1,000,000
Commercial (2nd) . . . .	850,000	Maidenhead . . . . .	225,000	The Hague (2nd) . . . .	500,000
Commercial (3rd) . . . .	1,250,000	Maidenhead (2nd) . . .	225,000	Tilburg, Holland . . . .	400,000
Commercial (4th) . . . .	2,000,000	Maidstone . . . . .	500,000	Torquay . . . . .	350,000
Copenhagen . . . . .	700,000	Malines, Belgium . . .	500,000	Tottenham . . . . .	750,000
Copenhagen (2nd) . . .	2,500,000	Malmö, Sweden . . . .	350,000	Tottenham (2nd) . . . .	750,000
Courtrai, Belgium . . .	250,000	Malta . . . . .	400,000	Tottenham (3rd) . . . .	350,000
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Edinburgh . . . . .	2,000,000	Oldenburg, Germany . . .	200,000	Winchester (2nd) . . . .	125,000
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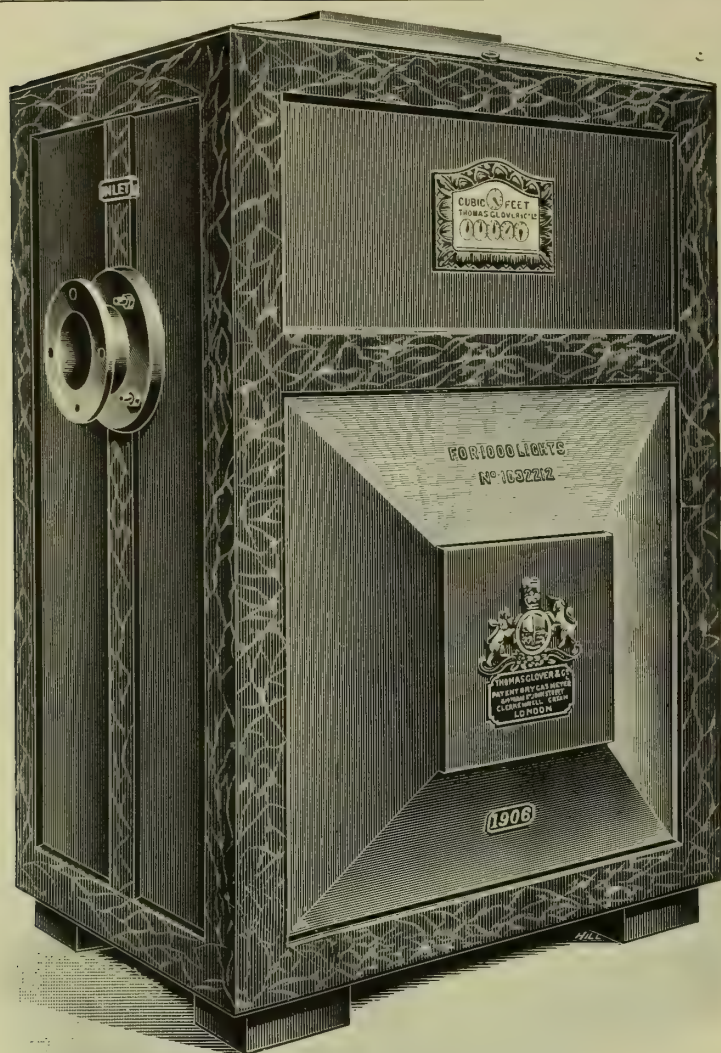
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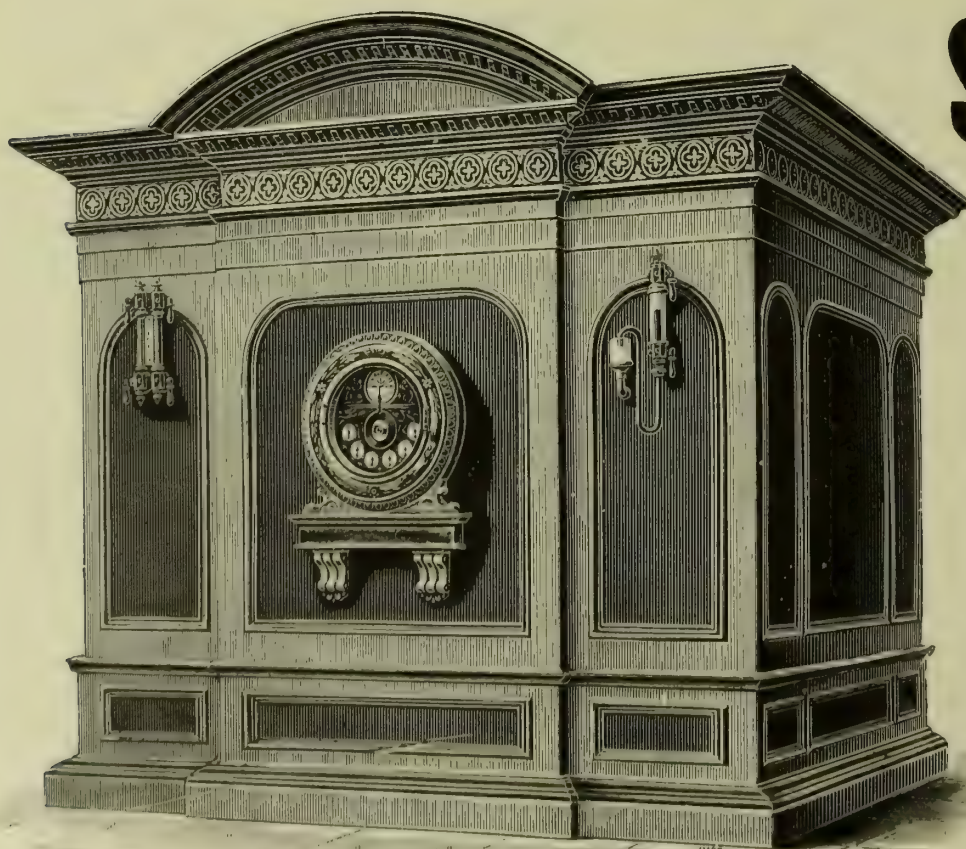
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING.

OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CIX., No. 2446.—TUESDAY, MARCH 29, 1910.

## EDITORIAL NOTES—GAS, &c.

### London Gas Companies' Accounts for Last Year.

IN another part of the "JOURNAL" will be found our tabular statement of the accounts of the three London Gas Companies for the past year. It differs somewhat from its predecessors, inasmuch as items in the accounts which were formerly grouped have been separated, and the table of increases and decreases is dispensed with. It will be seen that the total capital, including premiums, engaged in the supply of gas on Dec. 31 last amounted to £38,424,921, compared with £38,436,874 at the close of 1908—a reduction of about £12,000. The total income was £6,733,207, against £6,848,146; and the expenditure £4,928,033, against £5,122,076. The gross profit was £1,805,174; being at the rate of £4 14s. per cent. on the capital, and £37 12s. 5d. per cent. on the total gas-rental. The figures for 1908 were £1,726,070, £4 9s. 10d., and £35 18s. 6d. The second table, giving the results of working out the items in the preceding one on the basis of each 1000 cubic feet of gas sold shows that the Gaslight and Coke Company stand the highest, and the South Metropolitan Gas Company the lowest, in the matter of capital outlay, income, expenditure, and gross profit; but, with the one exception of the capital, the figures are very close. Taking the mean of the three Companies, they are: Capital, 20s. 0'84d.; income, 3s. 6'2d.; expenditure, 2s. 6'89d.; and profit, 11'31d.; the figures for 1908 being respectively 20s. 6'84d., 3s. 7'98d., 2s. 8'89d., and 11'09d.

The following table shows the carbonizing results of the three Companies, so far as they relate to the manufacture of gas from solid raw material only; and a noteworthy feature is the further increase in the quantity of gas produced in the case of each Company. The mean make per ton last year was 11,405 cubic feet, compared with 10,939 and 10,885 cubic feet in the two preceding years.

TABLE showing the Residuals Produced and the Gas Made per Ton of Coal by the Metropolitan Gas Companies in the Year 1909.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
GASLIGHT AND COKE .	12'65	4'86	10'09	31'82	11,329
SOUTH METROPOLITAN .	12'36	4'69	9'86	38'25	11,499
COMMERCIAL . . . .	12'25	5'72	12'03	37'05	11,493
Mean per Ton . .	12'52	4'86	10'13	34'61	11,405

### Lighting and Extinguishing Interior Burners.

WE hear in these days much regarding the greater convenience of electric lighting than of incandescent gas lighting—the alleged greater convenience resting solely in the fact that the light can be produced and extinguished by merely operating a switch. If the allegation were true, it is, as Mr. T. J. Little, jun., points out in an article in our American contemporary the "Illuminating Engineer," more than counterbalanced by the weaknesses of the electric light. But that the allegation is untrue is seen by the synopsis that Mr. Little gives of the various systems of lighting and extinguishing gas for interior gas illumination. There are the several forms of catalytic lighters, which render gas self-igniting—the small spongy platinum pills caught in the mantle mesh in the direct path of the gas, or used for igniting a pilot jet, or the modification whereby a small electric current is employed to activate the material up to a point, and then let the gas do the rest. This last-named system is not generally known in this country; but Mr. Little regards it as the most promising among the catalytic igniters. Then there is the pyrophoric igniter invented by Baron Welsbach. But while Mr. Little does not at the present time consider this system commercially successful, there is no doubt from

what he says subsequently—inasmuch as it has the advantage of not requiring any special wiring or pneumatic tubing—that he looks hopefully upon it as becoming eventually a practicable system. Then there are the pneumatic, the Norwich, and other methods, in which a pilot light has to be maintained at each burner. The constantly burning pilot light, except in certain situations, though only a modest amount of gas is consumed, is no doubt, in a minor degree, wasteful; but, on the other hand, there is the question of reliability of ignition to be considered. The various forms of electrical ignition and extinction have their attractions; but there has had to be considerable work upon them to secure reliability. The systems that will continue the most successful are those in which the sparking or incandescing points are removed from the direct path of the upward current of heat and products of combustion. This rapid survey of the means for internal lighting on the self-lighting and switch principles shows that the special convenience claimed for the electric light is not a peculiar attribute that has not its equals in connection with incandescent gas lighting. But we are faced with this fact, that although these systems for the automatic lighting and extinguishing of gas are offered to the public, and at a comparatively inexpensive rate, the public largely ignores them, and continues to apply the same means of ignition to the incandescent gas-burner that their parents did to flat-flame burners. The strength of custom is peculiarly great. The cost of fitting up these systems is only moderate. Nevertheless householders who rent their dwellings will think twice before they incur the expense; and certain it is that the poorer householder will stick to the match as the preferable means of ignition. In the better class houses, one or other of the systems stands a better chance; but even in these houses, custom retards application. If the tenants of more of such houses could be induced to have trial installations, extension would follow. There are people who like novelty; and must have it if they find the demonstration of its utility at a friend's house. In these matters, however, it is the start that is the greatest difficulty.

### Works Transformation.

IT is interesting to reflect on how advances made in gas-works plant have not only been progressive in producing economy and other results, but have assisted in altering, in a remarkable manner, the facial appearance of works. The gas-works of to-day are altogether more imposing than the works of a bygone time; and this is not due so much to the accretion of business, as to the changes in plant and method. Had there been no change in the latter, the extension of business would merely have meant an augmented aggregation of old types. The plain, squat, unpretentious buildings in which carbonizing plant used to be housed, have given place to buildings of greater height and improved architectural features; and the character of latter-day plant has given scope (without wasteful capital expenditure) for imparting an additional air of importance to works, and has also afforded the engineer greater latitude in designing and planning his works. When carbonizing plant was on the old direct-fired and hand-worked system, and the transport of material was mainly by barrow, the engineer's limitations were such that he could not put into his works much that was attractive, and there was a monotonous similarity between one works and another. This has been changed. The antithesis of the old order exists in all but the smallest of gas-works. And the engineer is gratified in having works under his charge that afford him greater opportunity and room for the exercise of his designing, constructional, and mechanical faculties, and works of which he may be justly proud both in respect of their structural and mechanical features.

In another column, we conclude the description of some extensions that have been made at the Bromley and Crays Gas Company's works, from plans by Mr. W. Woodward,



the Chief Engineer. The descriptive article induces the thoughts already expressed. Look at the photograph of the ugly little house that was formerly tenanted by direct-fired retort-settings, and then at the same house with its side walls raised, and a little more architectural feature introduced into the design. An important building has been raised from that which was unimposing; and this has been occasioned and necessitated by the adoption of carburetted water-gas plant. Then we may take the coke plant to show how existing conditions may influence plant and method. The engineer has to, as it were, dovetail new conditions into the old. A feature of the Bromley works is the circular gantry in the yard, by means of which coke is lifted and lowered by crane and skips—a method that is found to be economical, and keeps the production of breeze down to a low point. To utilize this gantry in connection with the coke requirements of the carburetted water-gas plant, and to fit some system for the latter purpose to the facilities offered by the gantry, was a matter that gave the engineer play in design; and the results are economical handling of the coke for the generators, and an additional feature in yard equipment that increases both interest in the works and appearance as an establishment conducted on an engineering base. We pass into the house, and find an effective arrangement of coke storage bin with screening bottom, through which breeze and dust fall to a bin beneath, from which they are discharged, as required, into carts below. An opening to the lower bin also enables the generating-floor to be kept clean without trouble to the plant operatives; and in this again waste is avoided. An advantage of this separation of dirt and dust from the coke is that clean fuel is introduced into the generator, with the result that less clinkering is required, and the blowing of dust into and through the plant is reduced. In the whole of the coke-supply arrangements, simplicity, ingenuity, and economy are combined.

In the house we are further faced by a great change. On the ground space that formerly accommodated plant of low productive power stands to-day carburetted water-gas plant (in two sets) equal to a production per twenty-four hours of not much less than 2 million cubic feet; and yet there is space for a further set of equal, if not larger, size. It is, we believe, the first new installation in this country of Messrs. Humphreys and Glasgow's twin-generator plant, in which are found novel features, and a productive capability and elasticity that will be found very serviceable in these days of lower illuminating power gas. The results exceed the nominal and guaranteed capacities. The plant is compact; and in every conceivable way safety and precision in operation have been assured. There is much that is technically interesting about the plant; and not the least so is the theory to which practical effect is given in it. On all these matters, however, there is more extended information in the descriptive article. With this plant, again, there is associated a Venturi meter. The measurement of town gas is an entirely new application of the principle; and the services of the meter are of a varied order. It takes account of the rate of flow, the pressure, and the temperature, at intervals of approximately one minute, and adds the results to the counter readings. Beyond this a high-pressure system has been established for the supply of the Crays territory from the Bromley works; and in this connection are found a pair of compressors that are models of mechanical design, high efficiency, and good workmanship. So the times and requirements change; and with them the production of plant which gives the engineer scope, and adds to the technical and economic attractions of his works, and to their appearance. In all respects, gas-works are *en rapport* with the progressive tendencies of the age.

### Illuminating Views on Photometry.

THE meeting of the Illuminating Engineering Society on the 15th inst. (reported last week) clashed, as usual, with a meeting of the Institution of Civil Engineers, for which clashing the Council of the latter body can hardly be blamed. Seeing that the proceedings at the meeting of the Illuminating Engineering Society consisted of a discussion of a series of queries covering practically the whole range of the art of photometry, it is scarcely surprising that there was little coherence in the debate. Each speaker had come to the meeting prepared to air his views on a particular branch of the subject; and what he said had for the most part no reference to the subject-matter of the remarks of the pre-

vious or subsequent speakers. What benefit will accrue to anyone from such discursive proceedings, we are somewhat at a loss to understand.

The President of the Society (Professor Silvanus Thompson) spoke disparagingly of the Bunsen or grease-spot type of photometer; whereas Professor J. T. Morris praised the simple grease spot, and stated that he could obtain with it quite as accurate results as with the relatively costly and complicated Lummer-Brodhun photometer head. We may remark that this is the conclusion at which the Dutch Committee on Photometry arrived, after careful research, so long ago as 1894 (see "JOURNAL," Vol. LXIV., pp. 1161, 1209). One point on which there seemed last week to be a fairly general consensus of opinion was that there is considerable difficulty in obtaining an accurate measurement of the mean spherical illuminating power of electric arc lamps, because of the flickering and rapid variations in intensity to which these lamps are subject. Professor Sumpner went so far as to say with regard to the testing of arc lamps that something was being tested which was not constant; and unless a method could be devised for ascertaining the mean spherical candle power at one measurement, he did not think it would ever be measured. This means that the polar curves of the illumination afforded by arc lamps are entirely unreliable, since they may merely portray variations in the illuminating power of the lamp from minute to minute, instead of the differences in the light radiated in different directions. Where a source of light is steady, there is no insuperable difficulty in obtaining measurements from which the mean spherical or hemispherical illuminating power of the light may be accurately deduced. Professor Morris demonstrated that this was the case by the exhibition of a diagram showing the illumination curve of the Keith high-pressure inverted gas-lamp, the intensity of the beam of which was, he said, considerably steadier than that of an electric arc lamp. It follows from these considerations that figures purporting to give the mean illumination of street surfaces by electric arc lamps should be received with the greatest suspicion, since they may indicate merely the maximum illumination which is momentarily afforded, but which is not maintained for more than a second in many minutes. The photometry of sources of light of rapidly varying intensity must always be of such an inexact and unsatisfactory character, that it is practically futile to discuss the question of the accuracy of illumination photometers in connection with arc lamps.

In regard to other speakers at the meeting, Dr. A. Vernon Harcourt was reminiscent as to the advantages of the Leeson or star disc for comparing the intensity of lights differing in colour, which disc he had found useful many years ago for determining the amount of light from lighthouses at the South Foreland, one of which lighthouses was illuminated with an arc lamp. He had found that different observers obtained concordant results when comparing the arc light in the lighthouse with a pentane standard flame by the use of a bar photometer with a star disc. Professor J. A. Fleming was aggrieved because the National Physical Laboratory had not discarded a flame standard of light in favour of large bulb incandescent lamps such as those which he had devised as secondary standards, or of the Violle platinum incandescent standard as a primary unit. It was easy for Mr. Paterson to defend the National Physical Laboratory on this score. He pointed out that the Violle standard gave such a red light that it was impracticable for general photometry, and that any electric lamp sub-standards must be rated in terms of some other standard, of which the pentane lamp—representing as it does exactly ten times the mean value of the historic English standard candle—is the best to choose. The colour difficulty, however, becomes, as was pointed out last week in connection with this work of reproducing sub-standards, very serious when the modern metallic filament lamps are under comparison with recognized standards (*ante*, p. 789). Mr. A. P. Trotter was amused at the antiquated and limited apparatus he found in technical colleges for imparting instruction in the art of photometry. There was, he said, apparatus 20, 30, or 40 years old that was all right in its time of long ago for testing gas. We are not aware that apparatus for testing gas should be any less accurate or less well-devised from a physical standpoint than apparatus for testing electric lights. We have heard that the greatest of modern physicists—viz., the late Lord Kelvin—stated that he could do better photometry with a piece of notepaper and an up-turned lead pencil used to form a shadow photometer than with complex optical devices of the Lummer-Brodhun type.



We commend to the physicists and electricians who are apt to disparage the simple forms of photometrical apparatus a careful consideration of this pronouncement by one whose authority they cannot affect to despise.

### Coalite Castles.

WE are getting quite accustomed to the castles in the air that are periodically erected by Coalite Limited and its offspring the British Coalite Company. The usual supply of prophecy and promise was forthcoming at the adjourned meeting of Coalite Limited last Wednesday; and the stock and share market evinced its appreciation by promptly setting-back the Syndicate shares to 5½-6 and the British shares to 12s.-13s. This was unkind; but there comes a time when people get tired of being treated to this jack-in-the-box procedure on the part of Directors, and when they set to work to draw for themselves deductions from plain facts. Any man of commonsense, after reading the speech of Mr. J. H. Smith at the meeting of Coalite Limited, can see that the concern's obligations are still so heavy that the shareholders stand a very poor chance this side of a remote period of tangible reward from their speculation, and any such man can also see that all the projects of the Company are still projects, and that they may never arrive at successful maturity. Coalite Limited is indebted to a considerable amount to the British Coalite Company; and the expenditure of the concern over receipts amounts to £7007. These financial debts have assuredly to be discharged before the shareholders can obtain any pecuniary result from their faith in the grandiose prognostications of three or four years ago. There is not much room for hope. In December, 1908, Coalite Limited had patents in 33 countries; patents for half-a-dozen other countries have now been roped-in. But what advantage are these new ones, when the Directors have not yet succeeded in disposing of the patents for France and Germany—the two countries in the best position of any to keep an eye on the trend of coalite events in England? The meandering of that trend has been one of its distinguishing features. There has never yet been a year since the Syndicate came upon the scene when the coalite plant has not had to undergo conversion in some shape or particular, until there is not the shadow of its original self standing. There has been a continual shifting of ground from the very beginning. And the financial position for the shareholders is anything but a recommendation to others, if shrewd, to essay a flotation elsewhere, though one is promised for India shortly. The opinion may be hazarded that among those who will not take shares in the Indian Company are the shareholders in the British Company. The Directors are also looking hopefully (or rather so, we gather) to the completion of negotiations for the sale of the French and German patents; and they are encouraged in this by the fact that the plant at Wednesfield has undergone further improvement, which is expected to have a persuasive influence. Change in plant has been a perennial condition; so that faith in the latest contribution to transformation has not a very sure foundation.

If anyone has been taught that there is truth in the old adage as to there being many a slip 'twixt cup and lip, it is the coalite shareholder. It was noised abroad that by last autumn the contract for the gas supply of St. Petersburg would be snugly in the hands of the coalite people; but the spring is upon us, and yet no contract. In fact, the Chairman of Coalite Limited has to confess that the chuckle was a little premature; for a fresh Commission to visit the works in this country has been appointed in St. Petersburg. Now what has caused this desire for further investigation on the part of the St. Petersburg authorities, if the coalite system was previously so near getting home? The delay, and the appointment of the fresh Commission, look ominous for the coalite people. Something must have happened, some knowledge must have reached the ears of the St. Petersburg authorities, in order to cause some hesitancy on their part; and there is reason to expect that they will now scrutinize very carefully the measure of success attained in this country in the past three-and-a-half years by the coalite concerns before they will commit the City of St. Petersburg to this, we claim, uneconomic system of gas production and supply. The Directors say they feel confident—why they should do so under present circumstances we cannot divine—that the Commission will decide upon the desirability of adopting the coalite process. The visit of the Commission to this country we do not suppose will be either secretly made or

to view the coalite process alone. We have no doubt that those of our readers interested in other processes of carbonization and gas manufacture will see to it that the Commission have, at all events, the opportunity offered them of seeing the latest work of the gas industry in this country, and are put in possession of proper information as to why the industry does not now prefer low-temperature carbonization on much the same lines as were followed in the early history of gas supply.

Passing from this, however, there is one other "castle in the air" to refer to. The Chairman grew quite eloquent as to the generation of electricity by utilizing the gas produced at the Barking plant. It is one thing to generate electricity; it is another thing to profitably dispose of it. This gas, we learn, "unfriendly critics" (it is hoped we are not so classed) have described as the Company's weakest factor; but it is going to prove itself (so it is said) "the strongest financial link in the chain." In fact, it is going to effect "a complete revolution in the cost of electricity." And there was applause from the hungry shareholders! In their fascination and happiness let them continue for a space; for they have had enough disappointment to cause them to despair completely of their speculation in coalite.

### Value of the Amman Valley Works.

Mr. Charles Carpenter, the Arbitrator appointed by the Board of Trade, to determine the sum to be paid by the Ammanford Gas Company for the derelict works of the Amman Valley Gas Company—one of the Eaton stock—has issued his award; and it amounts to £4195. The total amount of the claim was £5365. From the evidence laid before the Arbitrator, in turn, by Mr. A. E. Broadberry, Mr. Hubert Russell, and Mr. E. H. Stevenson, it was seen that much of the plant was of a second-hand order, and that portions of it were in a bad structural condition. Now that we have Mr. Carpenter's award, it is interesting to compare it with the financial statement concerning the Amman Valley Company that we were enabled to publish through the courtesy of Mr. Stevenson in our issue for Sept. 21 last (p. 752). Eaton and his promoting and contracting machinery had been able to raise from the public £13,977—just on £14,000—or nearly £10,000 more than the value the Arbitrator has fixed as the purchase price to be paid for the plant. The vendors themselves only subscribed £500 for shares, and lent the Company £950, apparently out of the plunder. The works were executed through the Eatonian concern, the Gas and Water Works Supplies and Construction Company. The payments during the life of the Amman Valley Company amounted in all to £15,095. Of this, the "contractors" took £7450; and, in addition, on buildings account £1000 was paid; for mains purchased and laid £915; and for mains purchased but not laid, £570. The issue expenses (prospectuses, &c.) are entered for £3410. On meters and stoves (though gas was not distributed) £430 was spent. Now that the shareholders of the defunct Company see the value placed upon the works by responsible Engineers, they will the better understand how they were fleeced by Eaton and his confederates.

### The Crisis in South Wales.

With holidays intervening before these remarks will appear in print, it would be rash to express too strong an opinion as to what is going to happen in the matter of the acute crisis which has now arisen in connection with the South Wales coal trade. At the time of writing on Saturday, the latest information to hand was that the Board of Trade, recognizing the gravity of the outlook, had definitely intervened; and that a conference on Thursday between the representatives of the parties and Mr. Sydney Buxton, the President of the Board of Trade, was to be followed by a meeting of the parties at Cardiff on Saturday. Endeavours by Ministers to avert industrial catastrophes are always to be commended; but there is something peculiarly appropriate in the fact of the present Government striving to patch up the serious differences which have arisen through the operation of an Act for the passing of which they themselves were responsible. Time is running short; for the notices, of course, expire next Thursday. So far as the owners are concerned, there would even now be ample opportunity for a settlement of the dispute, as they have given their representatives full power to complete an agreement. But with the miners' representatives, the case is



somewhat different, as any agreement come to would have to be submitted to a ballot of the 150,000 miners affected. Meanwhile, it is said that the dispute has now virtually been narrowed down to the one question of the minimum wage and the equivalent selling price of coal. On this point, the demands of the owners are firmly resisted by the men, who, reports state, contend that they have yielded on the other two main points—the pay for work in abnormal places and the number of shifts to be worked—and that the next concession must therefore come from the owners. In view of the pass to which affairs had come, the miners' representatives asked that a special conference of the Miners' Federation of Great Britain should be held, to consider the question of taking joint action in the event of a stoppage occurring at the collieries in South Wales. Accordingly, such a conference has been arranged; and—unless in the interim anything should happen to render it unnecessary—it will have taken place by the time this note comes under the eyes of most "JOURNAL" readers. Such an intimation seems to suggest the raising once more of the old bogey "a national strike"—an eventuality which need not be taken into account, at any rate, just at the moment. A strike in South Wales would be quite bad enough to go on with. Mr. A. J. Griffiths, the Chairman of the Cardiff Chamber of Commerce, has expressed the opinion that, if there is a war in the field, it will be a long one; and he gives a good piece of advice in the remark that whatever settlement may be made should be for a long term, so that there may not be a recurrence in the coalfield of the uncertainty that has been experienced the last few years. The export figures for the district are highly unsatisfactory; and this is a state of affairs it is idle to hope will be changed while masters and men are so continually at variance. Even a strike might in the long run prove no more disastrous to trade (though it would to the miners) than an indefinite prolongation of recent disturbed conditions.

#### Valuation of Gas-Works for Purchase.

In another part of the "JOURNAL" will be found the report of an appeal to the Judicial Committee of the Privy Council from a decision of the Supreme Court of New Zealand on the question of the price to be paid by the Corporation of Hamilton to the Hamilton Gas Company, Limited, for their undertaking. By section 46 of the Act under which the Company carry on their operations, the Corporation were entitled, after the expiration of twelve years from the passing of it (in 1895), to purchase the "gas-works and plant" at a price to be determined by arbitration. The desire of the Corporation to acquire the Company's property having been notified, Arbitrators were appointed, who, of course, did not agree; and consequently the services of an Umpire had to be called in. He was exercised on the question of the basis on which the price of the property was to be ascertained—whether on the commercial or the structural value of the undertaking; the former being rather more than £30,000, the latter about £13,000. He accordingly stated a case for the opinion of the Supreme Court of New Zealand, whose decision was in favour of the lower amount. The Company—very properly, as we venture to think—appealed to the House of Lords, and were successful. It seems to us that their contention was perfectly reasonable—that the price to be paid to them for their undertaking should be its commercial value as a going concern, and not merely the value of a collection of apparatus *in situ* and land and buildings; or, as Lord Shaw put it in delivering their Lordships' judgment, not merely the material thing, but "the undertaking for which that thing existed." The "old iron" view of the value of the works taken by the Corporation and their advisers has been set aside; and they have been ordered to pay the Company such a price for their property as their Arbitrator considered it was worth, and, in addition, the cost of having his view confirmed by the highest tribunal in the land. It will be a lesson to other local authorities.

#### Meunier's Hydraulic Main Floats.

Mr. S. Meunier, the Engineer and Manager of the Stockport Corporation Gas-Works, writes in regard to the Blackburn charts shown in the "JOURNAL" of the 22nd inst., that the explanation given of them was incorrect. The chart was not taken from the hydraulic main but from the retort itself—a more difficult place to obtain such a level chart as the one shown. Mr. Meunier adds: It might also be as well to say that the retort is a through one, with no block in the centre; so that it is quite possible the good effect of the floats in one hydraulic main would minimize trouble in the other.

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 890.)

THOUGH it was to be expected that, after the strain and high pressure of the preceding week with its heavy settlement and with the imminence of the Easter Holidays, the Stock Markets would lapse last week into a restful state of inactivity, these anticipations were far from realization. On the contrary, the animation and cheerfulness were almost unimpaired, and brisk business lasted right up to the close. True, the opening was quiet and somewhat languid, the general tendency was dullish, and many lines showed prices a little weaker. Railways notably were oppressed by visions of labour troubles, gilt-edged were stagnant, and Americans weak. But the Rubber hunters were in full cry. Tuesday was a little doubtful at first; but the attractions of the speculative gamble were irresistible, and, after a time, imparted a widespread contagious cheerfulness. On Wednesday, the bright tone and activity were well maintained. Government issues were steady, Railways strong and advancing, and the speculatives very fair. Thursday was quite brisk, in spite of a rapid thinning out of members, and cheerful to the end. Railways again were strong and full of rise. The Exchange then closed until Tuesday morning. In the Money Market, movements were somewhat irregular. Rates for short loans closed rather easier, but discount ruled steady. Business in the Gas Market was not active—about the average for the four days before Easter. But the tendency was good; and a fair number of quotations made advances. In Gaslight and Coke issues, the ordinary was unchanged; transactions ranging from 103½ to 103¾. The secured issues were fairly active; the maximum realizing from 88¾ to 89½, the preference 104¼ and 105, and the debenture from 80½ to 81½—a fall of 1. South Metropolitan was quiet and firm, making 121 and 121½. In Commercial, the 4 per cent. changed hands at 106 and 106½, the 3½ per cent. at 103, and the debenture at 81 free. Among the Suburban and Provincial group, Alliance and Dublin was done at from 86½ special to 87½, Bournemouth "B" at 16¼ and 16½, Brighton ordinary at 152½ and 153 (a rise of 1), British at 44½ to 45½ (a rise of ½), and North Middlesex at 13. South Suburban advanced 1, Ilford "A" 3, ditto "B" 2. In the Continental companies, Imperial was a point higher at from 178½ to 180, ditto debenture made 94¼, Union from 98 to 98½ (a rise of 1), European fully-paid at 24½ and 24½, and Tuscan at 9¾. Among the undertakings of the remoter world, Primitiva changed hands at 7½, ditto preference at 5½ and 5½, ditto debenture at 99½, and South African at 12¼ and 12¾.

## ELECTRICITY SUPPLY MEMORANDA.

### The Fixed Price Light Again—The Latest News from Newmarket—Public Lighting.

THE humorous fixed price per lamp project has penetrated to Weymouth; and it has been written up in the "Weymouth and Portland Standard" in a laudatory manner that suggests inspiration from electrical headquarters. The writer of the article has shown an extraordinary swallowing capacity; and has made the whole thing highly amusing to those with more intimate knowledge than he has. He tells us that in several places the scheme has been, and is being, worked by a Company. We should like to know the names of those several places. We are only acquainted with one, and that in the South of London. Again, we read that the Fixed Price Light Company, "in the districts in which they operate, receive proposals for wiring, in selected localities, not less than three rooms in any one house." Of course, the writer in his ignorance does not know that he ought to have written that the Fixed Price Company "would like to receive proposals" in the one district in which they would like to operate. As a matter of fact, at the recent meeting of the South Metropolitan Gas Company, the Chairman (Mr. Charles Carpenter) stated that they could only find one place that had been wired by the Fixed Price Company, and that was the Company's own show-house. This information will not be encouraging for Weymouth. The Electricity Department of the Corporation are intending to enter into this quixotic business; and we venture to think they have not before them the whole of the facts, and that if they persist they will meet with just about as much success as the Fixed Price Company in the only district in which they have aspired to operate. No one appears to want the Company's attentions—benevolent or otherwise. The Weymouth scheme is on all-fours with that which was described in the "JOURNAL" when the Fixed Price Company started their scheme—a scheme that the more intelligent electrical engineers ridicule. With all the elaborate verbiage in the article as to the provision against misuse, nothing (and the Electrical Engineer knows it) can be really effective against misuse save the presence of a meter. That lesson the gas industry learnt generations ago, when fixed prices per gas-burner were charged. It has been learnt also at Dundee, where a twelve-month's trial has been given of the rental system in a tenement. The Electrical Engineer reports that, comparing the result with another tenement in the district using meters, it was found that, with care, the meter system was cheaper than the rental system. A return is therefore to be made to the meter system.

Although an article one-and-three-quarter columns long has appeared in the "Weymouth Standard" talking round about the



question, no definite information is supplied as to the money terms on which the lights are proposed to be furnished. We believe current is supplied to the ordinary consumers at 5d. per unit; while gas is supplied at 3s., or thereabouts, per 1000 cubic feet. At 5d. 7-2 units of electricity can be purchased by the ordinary consumer for 3s., which, calculating (using the metallic filament lamp) 800 candle-hours per unit, gives the consumer 5760 candle-hours for an expenditure of 3s. The inverted gas-lamp will give 20 candles per cubic foot of gas consumed per hour; so that 3s. worth of gas will represent 20,000 candle-hours. These figures are mentioned for two reasons: (1) The fixed-price scheme is to appeal to comparatively poor householders. (2) The figures show that, at the ordinary price, the electric light is considerably more expensive than gas-light using modern inverted lamps. The consumer using electricity on the fixed-price system has to pay a figure sufficient to meet the expenditure on the cost of wiring, lamps, and electricity, and, in addition, to pay for the renewal of metallic filament lamps, which are somewhat expensive. It is rumoured that the price will probably be 2½d. per week per 30-watt lamp, or 2s. 6d. per quarter. Ten shillings a year for a lamp that will only give about 24-candle power is a costly method of lighting! And this lamp (which it is considered will represent adequate illumination) the consumer is to solemnly swear he will only use in the evening, and during such portions of the day when ordinary occupations cannot be carried on owing to dull weather. He is also to undertake to have his apartments satisfactorily illuminated by daylight during the daylight hours. The Gas Company will be willing to show any consumer how a 24-candle power light can be obtained for more than one-third of the hours in a year on 10s. worth of gas.

There is keen competition between the Newmarket Gas Company and the Electric Light Company; and naturally they both say things which are affirmed to be true by the side on which authorship rests, and are as emphatically denied by the other side. Last year the Chairman of the Electric Light Company made some remarkable statements at the meeting of the shareholders as to the baneful effects of gas upon the health of the people. A twelvemonth has passed by, but we have not heard that the medical men or the coroner of Newmarket have been busier than usual during the interval, owing to the greater prevalence of gas lighting than of electric lighting. We had a few criticisms to pass on last year's *ipse dixit* statements of the Chairman, to which he has not replied; and it is noticeable that he steered well clear of the matter on this occasion. But this year it is a question of costs. The Chairman charges the Gas Company with extravagant statements as to the respective costs of gas and electricity; and it will not be wrong on the part of the Gas Company if they assert that the Chairman and the faithful Manager of the Company (Mr. F. A. Simpson), in representing that by electricity light can be obtained for a less price than light by means of the new inverted gas-burners, are not keeping within the border-line of truth. The Manager of the Electricity Company has made, it seems, a remarkable discovery, which is supposed to prove that all electrical men do not come within the category which, in his haste, the Psalmist labelled with a word of five letters. There is a consumer who used to employ candles in his bedrooms and cellars, gas in other rooms, and gas for a cooking-stove. His rooms are now lighted electrically; and the gas-stove continues its useful services. In this confusion of conditions, it is found that the consumer's combined electric light and gas bill for last quarter came to 3s. 7d. less than in the corresponding quarter of 1908, before electric lighting was introduced. But this does not prove anything. No information is given as to whether there is any equality between the light of to-day and a time past, or between the hours of use; nor as to whether the cooker has been doing more or less work. Many accounts can be produced by householders showing a vast saving by completely ejecting electricity in favour of gas. The Chairman of the Electricity Company, too, shows that he is able to save 2s. 6d. a year on a bill of £40 by using electricity instead of gas; but it seems that he has developed a sort of mania for switching off all lights in his house where they are not being usefully employed, and to having a house of darkness instead of one of light. So strongly has this mania taken hold of him, that he now switches off the lights mechanically whenever he quits a room, with the lamentable result that he sometimes leaves his friends in darkness. A man must have the light-economizing mania badly when he does a thing of this sort. Most electricity consumers develop a mania the other way about; and the ease and availability of the switch result in extravagance and carelessness. We must not, however, talk too much about this, as many gas consumers are now applying switch lighting and extinguishing.

The use of metallic filament lamps for side street-lighting continues to be a live topic of discussion by municipal electricity departments; and inner influences are constantly at work to get the municipal authorities to throw over the hated incandescent gas-lamp, and to adopt the most modern electrical article. But there seems to be a ruling difficulty in getting local authorities who own the electricity concerns to permit any public demonstration between inverted gas-lamps and the metallic filament lamps, because such a demonstration either ends in public approval of the former, or in the provision of street lighting by metallic filament lamps at a price that does anything but improve the financial results of the central station. There is an excellent piece of demonstration work now going on in Victoria Street, Westminster, in which flame arcs, metallic filaments, and triple-light inverted gas-

burners are taking part; and the best piece of uniform lighting is, without question, in the portion of the street where the three-light inverted gas-lamps are used. Taking a perspective view, a person must have poor eyesight, or a tongue given to distortion, who does not say that there is more life in the light of this part of the street than in any other part. Going from this particular demonstration to general street lighting, there is a disposition on the part of electricians to, for cheapness, put in metallic filament lamps of too low candle power for adequate lighting; and the effect is miserable in the extreme. In Croydon there are side streets illuminated—forgive the word!—with 38-watt lamps, fixed at a height of 12 feet at an average interval of 75 yards. Such lighting as this can only produce dissatisfaction. The Marylebone Electricity Department based their estimates for public lighting on lower power metallic filament lamps than are now being used, with the result that they had to change them. Hence a statement in the last report of Mr. A. H. Seabrook, that the number of public lighting units is greater than the original estimate, owing to the decision to put in larger candle-power lamps in the more important thoroughfares. "Notwithstanding this, the average price obtained (after allowing for maintenance and proportion of capital charges) is practically the same figure as that on which the scheme was adopted." The consumption and cost figures are not given, so that one cannot precisely determine what is meant by "practically the same."

### Evening Star Lodge.

The Installation Meeting of the Lodge was held last Wednesday; and after an absence from the Freemasons' Hall for five years, the members found themselves back in the old quarters, at which satisfaction was generally expressed. The year of office of W. Bro. Jacques Abady, as Master of the Lodge, was completed; and he installed his successor, W. Bro. W. A. Surridge. Bro. Cyril Davis was appointed and invested S.W.; while W. Bro. C. W. Offord (Enfield), who has been Organist of the Lodge for some years, and now takes the position in the Lodge that he would have normally occupied had he proceeded to the chair step by step, was appointed J.W. As a result of this appointment, most of the other officers of last year retained their positions—namely, Bro. W. Edgar, S.D.; Bro. E. G. Smithard, J.D.; W. Bro. A. E. Croager, I.G.; Bro. J. T. Randall and Bro. J. F. Wicks, Stewards. W. Bro. T. E. Priestman, L.R., had been elected Treasurer, and was invested; while the W.M. reappointed W. Bro. W. D. Child as Secretary. W. Bro. Walter T. Dunn, L.R., was appointed D.C.

### The Chemistry of Light.

Commenting on a paper read before the American Chemical Society, by Dr. Whitney, "Engineering Record" (New York) says: There is still pioneering work for the chemist in the improvement of illuminants, besides all the outstanding collateral problems bearing on the subject. There is at least a chance that in the field of organic chemistry may be found the solution of the most important problems of light production. It is now well known, for instance, that the firefly radiates light in a manner which is highly selective—light that represents about the highest possible type of selective radiation for the purpose of illumination. Here is a task for the chemist which would mean, if successfully accomplished, not improvement, but revolution. There is good reason to believe that similar kinds of radiation appear in the organic world elsewhere than in the firefly. They are photogenic bacteria, for example, that probably play a part in many phenomena of organic decomposition. The efforts of chemistry in improving light production have been even up to the present time exercised in the field of inorganic chemistry. What organic chemistry holds for the future one can hardly venture to guess; but it is clear enough that chemical research directed toward the problems of efficient light production has possibilities of brilliant innovations surpassing anything it has achieved in the past.

**Scottish Junior Gas Association.**—A joint visit of the Eastern and Western Districts of the Association will be paid to the Falkirk Corporation Gas-Works on the afternoon of the 9th prox.; and the annual general meeting of the Eastern District will be held in Glasgow next Saturday.

**Manchester and District Junior Gas Association.**—The eleventh annual meeting of the Association will be held next Saturday, at the Exchange Hotel, Manchester, when the members will take "high tea," at the invitation of the President-Elect (Mr. Frank Thorp), at 4.30 p.m. After tea the business will be the election of officers, the presentation of the annual report, the delivery of the Presidential Address, &c. A smoking concert will follow.

**Informal Meeting of Scottish Gas Managers.**—We learn from the Convener (Mr. W. B. M'Lusky, of Perth) that the twenty-seventh annual meeting will be held in the Windsor Hotel, Glasgow, on Wednesday, the 6th prox., at 2 p.m., when the following subjects, to be introduced by the gentlemen named, will be discussed: "Appropriation of Surplus Revenue of Gas Undertakings to Relief of Rates and other Purposes," by the Chairman, Mr. D. Vass, of Airdrie; "Smokeless Fuel," by Mr. A. Wilson, M.Inst.C.E., of Glasgow; "Vertical Retort Carbonization," by Mr. W. R. Herring, M.Inst.C.E., of Edinburgh; and "Valuation and Income-Tax," by Mr. Alex. Yuill, of Dundee.



ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1909.

	Gaslight and Coke.			South Metropolitan.			Commercial.			All the Companies.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Capital and borrowed money (including premium capital)	27,452,192	11	9	8,325,840	0	0	2,646,888	7	6	38,424,920	19	3
Income—viz.:												
Sale of gas by meter	2,904,706	3	11	1,321,791	12	8	..			..		
Public lighting and under contracts	142,384	10	11	34,051	5	9	..			..		
Total gas rental	3,047,090	14	10	1,355,842	18	5	395,510	3	2(g)	4,798,443	16	5
Rental of meters	57,101	6	6	76,249	8	3	31,981	12	3	165,332	7	0
Rental of stoves, fittings, &c.	235,456	14	8(a)	137,476	9	9(e)	19,536	16	9(h)	392,530	1	2
Residual products—												
Coke and breeze	513,151	13	9	302,644	7	8	57,653	6	2	873,449	7	7
Tar and tar products	88,651	9	7	65,093	12	2	14,408	5	9	168,153	7	6
Ammoniacal liquor and sulphate of ammonia	171,647	17	8	112,088	7	11	19,159	7	6	302,895	13	1
Miscellaneous, including old materials	20,237	19	5	11,417	15	7	747	8	1	32,403	3	1
Total income from all sources	4,133,337	16	5	2,060,812	19	9	539,056	19	8	6,733,207	15	10
Expenditure—viz.:												
Coal, including carriage and dues	1,073,312	10	11	700,777	1	7	186,856	7	0	2,115,879	18	8
Oil, do.	154,933	19	2	..			..			65,748	14	8
Coke and breeze used in making carburetted water gas	65,748	14	8	..			..			62,073	16	3
Salaries of engineers and officers at works	29,657	8	8	27,432	7	4	4,984	0	3	305,491	9	9
Wages—manufacture	178,052	0	1	99,011	9	2	28,428	0	6	45,847	14	3
Purification	23,631	11	3	19,474	18	0	2,741	5	0	653,246	8	4
Wear and tear—manufacture	373,907	8	5	221,430	3	4	57,908	16	7	141,881	1	11
Salaries and wages—distribution	94,308	0	8	38,623	3	11	8,949	17	4	176,561	8	10
Repair and maintenance of mains and services	107,525	7	7	55,615	16	5	13,420	4	10	514,642	14	2
Repair and renewal of meters, stoves, &c.	290,521	0	8(b)	183,072	13	7(f)	41,048	19	11(i)	50,446	0	8
Lighting and repairing public lamps	40,504	14	11	5,129	1	2	4,812	4	7	414,449	12	7
Rents, rates, and taxes	297,147	12	8	91,693	5	10	25,608	14	1	27,099	1	5
Salaries—management	17,466	13	4	7,107	13	10	2,524	14	3	85,512	12	3
Collectors' salaries and commission	45,328	6	2	31,087	16	3	9,096	9	10	57,262	16	11
Stationery, printing, and general charges	28,074	4	9	24,152	16	7	5,035	15	7	15,306	15	11
Directors and auditors	6,906	6	0	5,750	9	11	2,650	0	0	70,322	9	3
Co-partnership and profit-sharing schemes	24,605	0	0	40,122	19	2	5,594	10	1	71,947	2	4
Annuities to officers and workmen	54,263	6	1(c)	15,245	2	6	2,438	13	9	10,110	14	7
Law and parliamentary charges	5,925	15	0	3,644	14	5	540	5	2	44,203	4	10
Bad debts and extraordinary expenses	34,333	15	0(d)	7,972	11	5	1,896	18	5			
Total expenditure on revenue account	2,946,153	16	0	1,577,344	4	5	404,535	17	2	4,928,033	17	7
Gross profit	1,187,184	0	5	483,468	15	4	134,521	2	6	1,805,173	18	3
Do. per cent. on capital and borrowed money	4	6	6	5	16	2	5	1	8	4	14	0
Do. do. gas-rental	38	19	3	35	13	3	34	0	3	37	12	5

(a) Stoves, £89,049 os. 11d.; fittings, £146,407 13s. 9d. (b) Meters, £121,278 7s. 5d.; stoves, £107,907 2s. 3d.; fittings, including labour (automatic-meter supplies), £61,335 11s. (c) Including £3502 15s. 3d. paid to workmen's compensation account. (d) Including £12,000 paid on account for stamp and conveyance duties, under the Company's Act of 1909. (e) Including £76,919 18s. 7d. received for gas-fittings. (f) Meters, £52,513 1s. 2d.; stoves, £63,835 4s. 2d.; fittings, £66,724 8s. 3d.; (g) £402,956 1s., less £7445 17s. 10d. for discounts and allowances. (h) Including £1113 9s. 7d. for maintenance of incandescent mantles. (i) Made up as follows: Meters, £4342 11s.; stoves, £14,995 7s.; prepayment meters and fittings, £20,597 13s. 10d.; and maintenance of incandescent mantles, £1113 8s. 1d.

TABLE showing the Capital, Income, Expenditure, and Profit per 1000 Cubic Feet of Gas Sold in 1909.

	Gaslight and Coke.		South Metropolitan.		Commercial.		All the Companies.	
	s.	d.	s.	d.	s.	d.	s.	d.
Capital and borrowed money (including premium capital)	24	4'30	13	3'35	16	5'88	20	0'84
Income—viz.:								
Sale of gas by meter	2	6'93	2	1'30	..		..	
Public lighting and under contracts		1'52		0'65	..		..	
Total gas-rental	2	8'45	2	1'95	2	5'57	2	6'08
Rental of meters		0'61		1'46		2'39		1'04
Rental of stoves, fittings, &c.		2'51		2'63		1'46		2'46
Residual products—								
Coke and breeze		5'46		5'79		4'31		5'47
Tar and tar products		0'94		1'25		1'08		1'05
Ammoniacal liquor and sulphate of ammonia		1'83		2'14		1'43		1'90
Miscellaneous, including old materials		0'21		0'22		0'06		0'20
Total income from all sources	3	8'01	3	3'44	3	4'30	3	6'20
Expenditure—viz.:								
Coal, including carriage and dues	11	43	1	1'41	1	1'97	1	1'26
Oil, do.		1'65		..		..		0'41
Coke and breeze used in making carburetted water gas		0'70		..		..		0'39
Salaries of engineers and officers at works		0'32		0'53		0'37		1'91
Wages—manufacture		1'90		1'90		2'13		0'29
Purification		0'25		0'37		0'20		4'09
Wear and tear—manufacture		3'08		4'24		4'33		0'89
Salaries and wages—distribution		1'00		0'74		0'67		1'11
Repair and maintenance of mains and services		1'15		1'06		1'00		3'23
Repair and renewal of meters, stoves, &c.		3'09		3'50		3'07		0'32
Lighting and repairing public lamps		0'43		0'10		0'36		2'60
Rents, rates, and taxes		3'16		1'75		1'91		0'17
Salaries—management		0'19		0'14		0'19		0'53
Collectors' salaries and commission		0'48		0'60		0'68		0'36
Stationery, printing, and general charges		0'30		0'46		0'38		0'10
Directors and auditors		0'07		0'11		0'20		0'44
Co-partnership and profit-sharing schemes		0'26		0'77		0'42		0'45
Annuities to officers and workmen		0'58		0'29		0'18		0'06
Law and parliamentary charges		0'06		0'07		0'04		0'28
Bad debts and extraordinary expenses		0'37		0'15		0'14		
Total expenditure on revenue account	2	7'37	2	6'19	2	6'24	2	6'89
Gross profit	1	0'64		9'25		10'06		11'31



## NOTES FROM WESTMINSTER.

THERE is not much to record concerning work in the Committee-rooms last week. There was nothing doing on Monday; and on Tuesday the East Grinstead Gas and Water Bill was under consideration. Only a small part of the Bill refers to gas; the bulk of it having reference to water supply. One of the objects of the measure is to legalize the taking of water from land purchased by agreement. In addition to this there have been pipe-laying difficulties; and modification of the conditions as to the use of certain pipes, was required. A new pumping-station also forms part of the Company's scheme. There were a few private opponents, but the points of difference were not of any magnitude; and they were soon composed—the preamble of the Bill being declared proved. This closed the business in the Committee-rooms, until after the brief Easter recess.

The only other piece of news is that Lord Joicey has retired from the Committee to consider the Standard Burner Bills; and in his stead Lord Ritchie of Dundee has been selected.

## CARBONIC ACID AND THE VITIATION OF THE ATMOSPHERE.

THE question of the vitiation of the atmosphere by gas-burners and human beings has received a little discussion in the articles of the Engineering Correspondent of the "Daily Telegraph."

This writer, we feel, would not wittingly do an injustice to gas lighting; and he is always open to suggestion and, if necessary, correction. Just recently he was dealing with the question of lighting in places off the track of the town-gas main, and in doing so made reference to acetylene. In respect of this gas, he said that, as with coal gas, oppressive products are only given off when the gas is not thoroughly consumed. This is rather more difficult to obtain in the case of acetylene than with coal gas; the former requiring a larger quantity of air per cubic foot for its complete combustion. Only well and scientifically-constructed burners by reliable makers should be employed. Then we come to a point where the writer went astray: "From a hygienic point of view, it is to be noted that whereas a coal-gas burner consuming 5 cubic feet per hour vitiates the atmosphere as much as 18 adults, a similar acetylene burner only produces a vitiation equivalent to three persons. At the same time it consumes less oxygen per candle power than any other form of gas, and as a consequence gives off less carbon dioxide."

In a subsequent issue, this same "Engineering Correspondent" acknowledges an interesting correcting letter from Mr. Douglas Helps, of Reading, and admitted that his correspondent had, in his communication, achieved his object. In the course of his letter, Mr. Helps considered the misstatement—that a coal-gas burner consuming 5 cubic feet of gas per hour vitiates the atmosphere as much as eighteen adults, and that a similar acetylene burner only produces a vitiation equivalent to three persons\*—to be a misprint. The statement, he points out, does not agree with that made above, where it is stated that acetylene requires a larger quantity of air per cubic foot for its combustion, because, if acetylene requires more air for its combustion, it must of necessity vitiate the atmosphere to a larger extent. But the statement that a coal-gas burner consuming 5 cubic feet per hour vitiates the atmosphere as much as eighteen adult persons, is obviously incorrect. The combustion of 1 cubic foot of ordinary coal gas produces from 0.52 to 0.54 cubic foot of carbonic acid, and an average individual exhales 0.6 cubic foot of carbonic acid per hour; so that the combustion of 5 cubic feet of coal gas would produce about as much carbonic acid as 4.4 persons—not 18, as stated in the article.

As this matter is so frequently referred to by competitors of the gas industry, it will not be out of place to remind readers of the following statements of authorities.

Professor Frank Clowes, Chief Chemist to the London County Council, pointed out, in a paper he read before the Society of Chemical Industry at Nottingham: "It is not so much the carbonic acid produced by the combustion of gas or by the respiration of individuals that is injurious as that the carbon dioxide present may be considered to imply an increase of a far more pernicious organic matter excreted from the surface of the skin of the human body."

Dr. Whitelegge, writing in "Public Hygiene," remarks: "Where carbonic acid gas is present in excess, it is important merely as an index of the amount of injurious organic impurity contributed by human exhalations."

The "Lancet" has stated: "Any carbon dioxide resulting from the combustion of coal gas is quite insignificant compared with that exhaled by the human individual. Of the two, the human exhalation is much the more prejudicial to health."

Professor Carlton Lambert, M.A., writing in the "Hospital," says: "In the old days of gas lighting, air pollution was in ill-ventilated rooms a more serious matter; but now that we get the same light as formerly by burning only from one-sixth to one-tenth

the amount of gas, this objection to gas lighting has practically vanished."

Professor Vivian B. Lewes and many other authorities have made similar statements to the above.

To the foregoing may be added the fact that some time ago the St. Pancras Borough Council published a statement in a pamphlet entitled "Electricity: Useful Hints," as follows: "One ordinary gas-burner consumes the same amount of vital oxygen as five people. Putting it in another way, an ordinary gas-flame will render poisonous the atmosphere in a room 12 ft. by 14 ft. by 11 ft. in six minutes." The Gaslight and Coke Company sent a communication to the Council informing them that, unless this statement was withdrawn, they would have to consider the taking of further steps in the matter, with the result that the Council withdrew the pamphlet.

## MUNICIPAL TRADING IN THE METROPOLIS.

AT the time of its issue recently, brief mention was made of Part IV. of the returns in regard to municipal trading in the United Kingdom which have long been under process of compilation and publication at the instance of Mr. L. G. Chiozza Money, the late Member for North Paddington. A few figures have been at different times given from the preceding volumes; and it may be as well to continue the process now by setting forth some points from Part IV., which consists of particulars furnished by the London County Council, the Corporation of the City of London, and the Council of each Metropolitan Borough. The objects aimed at in the collection of the statistics of which this series of Blue-Books is composed is to indicate the nature and extent and, for each of the last four years for which figures are available, the financial results of reproductive municipal undertakings, including for each undertaking separately "a short description thereof, date and terms of original acquisition or establishment or subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of relief or burden to rates, number and salaries of the chief paid officials, number of work-people, rate of wages paid in chief classes of labour, and prices charged for products or services supplied or rendered." In the returns, the places embraced are the municipal boroughs in England and Wales which at the date of the Census of 1901 had a population of upwards of 90,000—with the addition of two (Stockton-on-Tees and Blackpool) which have a smaller population. When noticing Part I. in the "JOURNAL" for June 22 last, some details were given with regard to the form in which the information was asked for and has been supplied.

In the present volume particulars are given (in addition to the London County Council and the City Corporation) with regard to twenty-seven Metropolitan Borough Councils; the single exception being Finsbury, which did not carry on, during the period to which the return relates, any undertaking deemed to be within the terms of the resolution of the House of Commons. With regard to these various authorities, the number of reproductive undertakings which fall to be included are respectively: London County Council, three; City Corporation, two; Battersea, four; Bermondsey, three; Bethnal Green, two; Camberwell, three; Chelsea, two; Deptford, three; Fulham, two; Greenwich, one; Hackney, two; Hammersmith, four; Hampstead, four; Holborn, one; Islington, three; Kensington, two; Lambeth, two; Lewisham, one; Paddington, one; Poplar, two; St. Marylebone, four; St. Pancras, four; Shoreditch, three; Southwark, two; Stepney, four; Stoke Newington, one; Wandsworth, one; Westminster, two; Woolwich, five. Gas supply, of course, does not figure at all in the present batch of statistics; while the water supply of London is in the hands of a separate authority. There are, however, in connection with the Metropolitan Councils named, no less than sixteen electricity undertakings. The only case of tramways, is that of the London County Council, who were also, at the time of the return, the proud possessors of a fleet of river steamboats, which have since found other owners, under circumstances that should long prove a thorn in the side of perfervid disciples of indiscriminate municipal trading. Of the other undertakings in the hands of the authorities, sixteen are working-class dwellings, and twenty-six are baths and washhouses. The remainder consist of eight cemeteries, three markets, and two milk depôts.

During the four years included in the return—1902-3, 1903-4, 1904-5, and 1905-6—some of the undertakings were successful in relieving the rates; while a great many more were not. The London County Council tramways, for instance, in the first year named provided £20,000 for this purpose; but in the three following years there was no repetition of this achievement. In the four years, the working-class dwellings of the same authority benefited the rates to the extent of nearly £18,000. The artisans' dwellings of the City Corporation handed over nothing to the rates; while as to the markets under the control of the Corporation, they do not regard these as undertakings coming within the terms of the resolution of the House of Commons.

So far as relieving the rates was concerned, the Battersea electric lighting undertaking might just as well not have been in existence during the period under review—in fact, better, for the

\* A low-pressure incandescent burner consuming only 1½ cubic feet of gas would give a light of from 20 to 30 candles, and would not vitiate so much air as one adult.



rates had on two occasions to contribute sums for the relief of the undertaking. The Bermondsey electricity undertaking was once aided by the rates; a favour which it did not reciprocate during the four years. There has in each of the four years been a deficiency on the Fulham electricity concern which the rate-payers have had to meet. The record at Hackney has been a better one; for there on one occasion a sum was handed over to the rates. A note in reference to this states that the Council had, previous to the year ended March 31, 1903, paid out of the general rate fund sums amounting to £4703, being expenditure in excess of income during the years ended March 31, 1901 and 1902. The sum of £1329 was transferred in 1904-5 in aid of general rates by way of recoupment. In the last year of the returns, Hammersmith ratepayers received £3000 from the electrical works; while those of Hampstead benefited by £2000 in each of two years. In respect of Islington, no figures appear in either of the columns; and a like remark applies to Poplar and St. Marylebone. There were at St. Pancras two sums handed over to the rates—£7220 and £3000 respectively. At Shoreditch, the reserve fund was once called upon for £2241; and nothing was given to the rates from the electricity works. The Southwark works twice received assistance from the rates; a favour which was not returned. In the case of Stepney and Stoke Newington, no figures appear in either column. At Woolwich, in all the four years a deficiency had to be made good from the rates; the total sum amounting to no less than about £20,000. The remark is made that "there has, as yet, not been any surplus income from the undertaking."

With regard to the other concerns of which particulars are given, baths and washhouses have in every instance involved a practically continuous call on the rates. The other losses have been: Dwellings—Battersea, Chelsea, Marylebone, Shoreditch, and Woolwich. Milk depôt—Battersea. Cemeteries—Hampstead, Marylebone, and Woolwich. In some cases, however, cemeteries have assisted the rates; the following being the extent: Deptford, £800; Hammersmith, £350; and St. Pancras, £1500. Markets, also, at Woolwich have benefited ratepayers in the four years to the extent of £2600.

It will be seen that in the case of the Metropolis, with the exception of electricity, the "reproductive undertakings" are mainly of such a character that they have not been entered upon solely, or even chiefly, from a profitable trading point of view. Baths and artisans' dwellings, for instance, doubtless owe their origin to other considerations—as well as milk depôts and cemeteries; and it would be unfair to judge them by the profitable (or otherwise) nature of the results. To the electricity undertakings, however, this remark does not apply. They must be regarded as trading concerns pure and simple; and looked at from this point of view, their record is not a brilliant one. Of course, in this notice no attempt has been made to deal fully with the 230 pages of which the Blue-Book is composed. We have merely, as before, taken the profit and deficiency figures in relation to the rates, as being the standard by which the policy of municipal trading is usually judged. It is under no circumstances a conclusive test of the soundness or otherwise of the policy; and in the case of the Metropolis, the character of the majority of the undertakings concerned renders it even less so than usual.

## CONVENIENCE OF GAS LIGHTING.

A RECENT number of the "Transactions" of the American Illuminating Engineering Society had an article on this subject by Mr. T. J. Little, jun., from which the following are extracts.

The use of illuminating gas in the lighting of the modern American home is a most interesting topic in which we are all directly concerned, even though we may be identified with the electrical interest. The reason that gas is used so generally for artificial illumination is due to the fact of the great comparative economy effected. The disadvantages attributed to gas illumination are certainly offset by the weak features of the electric system; and many of the shortcomings of both systems exist principally in the fertile brains of our rival advertising managers. For instance, a gas critic says gas lighting burners produce excessive heat. The reply comes back like a flash—only in the summer time when the lighting hours are very short; at other seasons, heat is desirable. And then he will probably add: All types of illuminants attract mosquitoes and other terrible insects. The gas light will destroy these pests, much to the comfort of the householder, &c. Again, the gas critic may add: Consider the vitiation of the atmosphere. He is then met with positive proof that gas-burners actually stimulate ventilation, as is pretty well demonstrated in any chemical laboratory. The incandescent gas units which are now available for house lighting are as follows: 3½-inch upright mantle, 1½ inch in diameter; 2½-inch, do. do.; and the miniature upright mantle and chimney combination, which mantle is 2½ inches long and ¾ inch in diameter. Combination carriers are supplied, so that small upright mantles may be used on the large-sized burners; small burners are also supplied, particularly for use with the small mantle. The standard inverted mantle in general use at the present time is 1 inch diameter and about 1½ inches deep; but smaller mantles are now being introduced. The latest fixtures are unquestionably great improvements over the old and stereotyped designs.

The catalytic lighters have long been used for igniting gas-

burners. In some cases the self-lighting material was placed directly on the mantle; in others, a pilot-light was first lighted from this material and the light afterwards lit the burner. Yet another modification is to use a small electric current to bring the catalytic material up to the active point, and then allow the gas to do the rest. The latter is by far the most promising form of electric ignition. The pyrophoric lighter invented by Dr. Auer von Welsbach presents an extremely interesting field for development; but I am not prepared at this time to state that a burner with this scheme of lighting is commercially successful. Electric hot wire lighters do not light gas by the simple process of heating wire to a temperature approximating the kindling-point of the gas, but to a much lower temperature. The gas is always lighted by the catalytic action bringing up to a much higher temperature the already warm wire. A very popular form of hot-wire lighting is the so-called electric torch. In this case the electric battery is concealed in the handle of the torch; the wire to be heated being placed in a cage-like structure in the end.

The use of matches in lighting gas-burners is unnecessary. There are a number of ways in which gas-lamps may be made self-lighting, both at the burner and from a distance; the most simple and popular scheme being the gas pilot ignition. This system, in its simplest form, consists of a cock controlling the supply of gas to the burner as well as feeding a very small supply of gas to the pilot-flame, which is situated close to the side of the mantle. This tiny spark of flame consumes 1-12th of a cubic foot of gas per hour; and apart from being useful in igniting the gas, it produces just enough illumination to guide one to the burner in a dark room. This is a most important feature when considering means to control any type of illuminant, gas or electricity.

Inventors have been busy for years trying to produce some self-luminous indicator in the form of either a pendant ball at the burner or socket, or a luminous wall-plate at the switch. But unless these devices are allowed to absorb considerable light during the day, they are worthless. So that with the pilot-flame we have at once something which is effective in ignition as well as a guide in locating the device in a dark room.

Another system of gas ignition is by means of the pneumatic valve operated by a small pump from a distance; the gas being turned on and off when the pump is pushed in or pulled out by successive pressure and partial vacuum, and the gas being ignited by a small pilot-flame. The tubing is known in the trade as "hollow wire," on account of its small diameter.

The third class of lighting by means of a pilot is in connection with an electric cock. The current is here used simply to turn on and off the gas-cock; the pilot-flame being used for ignition. The fourth device is the mechanical distance lighter, in which a pull-wire is connected with the cock at the burners, and runs in any desired direction or distance. A spring is used to return the cock to its "off" position upon releasing the tension on the wire. The fifth device is where double gas lines are run—one supplying gas to the pilot, the other controlled by a cock at a distance from the burner. Of course, there are various modifications and combinations of the above systems.

The electric spark system of gas lighting has been pretty well developed. In this case the gas may be lighted at the burner by pulling a chain which opens the gas-cock and at the same time operates an arm carrying a wiping-spark contact for igniting the gas. The gas may also be lighted from a distance by means of the automatic electric burner, in which case magnets turn the gas-valve on and off, and an automatic interrupter is pulled out to produce the desired spark for ignition.

Personally, I believe that the most promising form of ignition will be by means of the pyrophoric material before mentioned, because it is not necessary to run special wiring, as is the case with electric ignition. Moreover, there is no deterioration of this material when not in use. It has the further possibility of advantage in the fact that the device is self-contained, and can be made part of the lighting device. It must be remembered that a very large portion of American gas consumers rent their homes; and if we are to introduce a successful scheme of gas ignition, it must not be necessary for them to wire the building, for a tenant will never wire someone else's house.

I have merely attempted to show that gas lighting can be easily engineered for residence work. It is extremely safe and convenient, and the quality of the light, according to the most eminent physicists, is beyond reproach.

**Award in the Ammanford Gas Arbitration.**—The award of Mr. Charles Carpenter in the arbitration proceedings in connection with the purchase by the Ammanford Gas Company of the undertaking of the Amman Valley Gaslight and Coke Company (see *ante*, p. 672) has been given. The amount of the claim was £5365; and the Arbitrator has awarded £4195.

**The Late Sir Frederick Thorpe Mappin.**—There was an immense gathering, representative of all grades of Sheffield society, at the funeral of Sir Frederick Thorpe Mappin, Bart., which took place at Ecclesall Churchyard last Wednesday. Members of the Corporation assembled at the Town Hall, and drove to Thornbury, where they joined the principal mourners in the procession to the church. Among those present were Mr. J. D. Webster, a Director, and Mr. J. W. Morrison, the Engineer, of the Sheffield United Gas Company; the Chairman, Mr. Wilson Mappin, being, of course, one of the chief mourners. The service was conducted by the Bishop of Sheffield (Dr. Quirk).

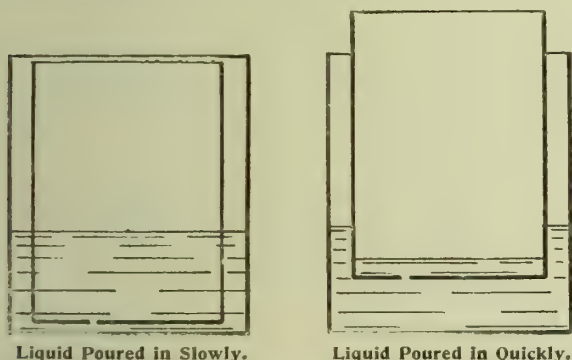


## AUTOMATIC LIGHTING AND EXTINGUISHING OF GAS-LAMPS.

## The A. E. Broadberry Apparatus.

It will doubtless be remembered that in the "JOURNAL" for the 8th inst. it was mentioned that Dr. Rostin, whose name has been intimately identified with the development of a system of lighting and extinguishing public lamps, had severed his connection with the firm of A. Landsberger, with the intention of devoting himself independently to the manufacture of scientific apparatus for the gas industry, and at the same time acting as Consulting Engineer to Telephos Limited, in conjunction with the gas lighting and extinguishing apparatus invented by Mr. A. E. Broadberry, the Engineer of the Tottenham and Edmonton Gas Company. Some further details of this apparatus were then promised; and these we are now in a position to supply.

Though it is hardly necessary to point out the advantages of automatically lighting and extinguishing gas-lamps, they may be briefly summarized by way of introduction to the description of the apparatus with which this article is specially concerned. In the first place, there is no waste of gas, and a longer life for the mantle is ensured—two features which necessarily result in saving of money. It is essential that the system adopted should be one which is controllable from a centre; and this is the special feature of the one in which the pressure is employed. Up till now, however, it has been necessary to determine beforehand the amount of pressure to be applied; and, as this cannot always be guaranteed throughout a district, a system was required in which such pre-determination could be dispensed with. It is claimed for the Broadberry apparatus that it meets this requirement, as it adjusts itself to any conditions, and differentiates between intentional and accidental variations or rises of pressure. Briefly, it works by pressure, but it is independent of its variations. These, when involuntary, take place comparatively slowly, or sometimes quickly to the extent of 1-10th or 2-10ths; but an intentional rise in pressure can always, and under any circumstances, be given comparatively quickly. Even where the governors are loaded with weights, it can be easily arranged for the ordinary rises to be given slowly; but those for working the Broadberry apparatus can be given quickly. Thus it distinguishes between slow and quick rises.



The reader will probably be curious to learn how this is done. A simple experiment will explain the principle. Take two vessels of different size, as in the accompanying illustration, pierce a pin-hole in the bottom of the smaller vessel, and place this inside the larger one. If liquid is poured between the two vessels sufficiently slowly, it will percolate through the small hole into the smaller vessel, and the latter will remain stationary. Should, however, the liquid be poured in quickly, the smaller vessel will rise, and after a time the levels of liquid will equalize. The smaller vessel will then return to its former position, and the process may be repeated. This, briefly, is the principle involved in the Broadberry apparatus; the upward movement of the small vessel being utilized to open a small gas-valve leading to an operating chamber, and the equalizing movement to close the valve and open the outlet from it. What is required for the Broadberry system, therefore, is not a predetermined height of pressure, but a comparatively quick—that is, quick in the sense of loading a governor by weights—rise of (say) 5-10ths. The construction of the apparatus is designed with a view to giving the maximum efficiency to the principle involved, and at the same time to be, as far as possible, unaffected by long exposure in the streets.

The accompanying diagram is a sketch of the apparatus, showing all the working parts; and by referring to it the following description will be readily understood. The bottom portion of the diagram represents a section of the valve-box, which is made of non-corrosive metal, to ensure long life to the apparatus. This case is divided into two chambers; the lower one being filled with a non-freezing and non-evaporating mixture of glycerine and water, and the upper one being utilized to contain a spring-balanced metal float A made also of non-corrosive metal. These two chambers are separated by a horizontal metal partition B, through which a glycerine passage is made by a brass pipe C extending downwards nearly to the bottom of the lower chamber.

In the wall of the valve-box is drilled a longitudinal hole, having an outlet to the bottom chamber at the point D. Into this hole is led an elbow E, connected to the stand-pipe of the lamp.

The pressure of gas issuing from D will cause the level of the glycerine in the bottom chamber to fall; the surplus liquid being forced through the tube C into the top chamber until the difference in levels coincides with the actual pressure prevailing. The float A is provided on its lower surface with a hole F, gauged to allow the glycerine to flow at a given rate into the interior of the float. Obviously, then, should the pressure rise slowly, the levels of the glycerine inside and outside the float will rise simultaneously, and no movement of the latter will follow. Should, however, a sharp rise of pressure take place, as would occur if intentional pressure

were put on at the works by weights, the level of the glycerine outside the float would rise more rapidly than the level inside, and the float will be lifted.

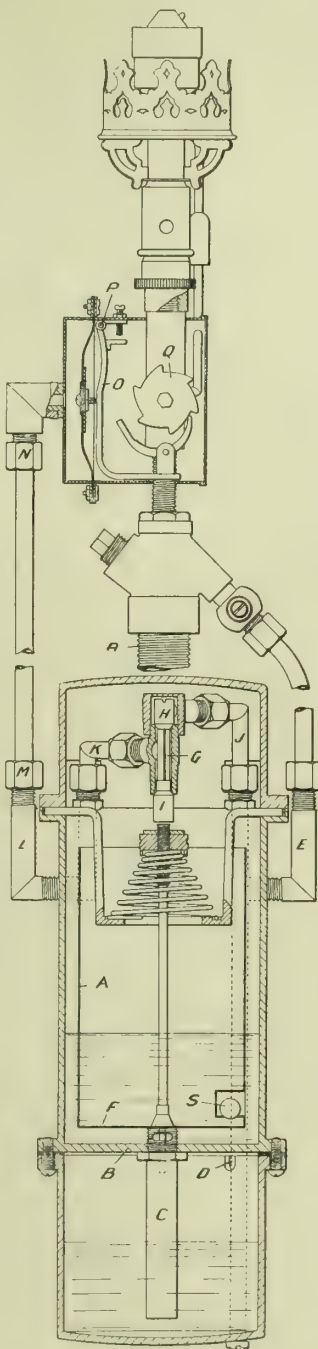
The float is guided by a brass rod, which on the upward lift comes into contact with the valve G. This valve consists of two coned surfaces H and I, which, though quite free in movement, are at the same time absolutely gas-tight, and when moved allow a free passage of gas at full pressure from the elbow E to be transmitted through J to K, thence by way of the elbow L to the "operator;" a connection for this purpose being made between points M and N. The "operator," into which the power for turning the gas on or off is transmitted, and which is shown in the upper portion of the diagram, is fixed directly under the burner. It consists of a vertical diaphragm stretched over a metal box. A curved lever O is suspended from a pivot P above, and on the diaphragm moving outwards in a horizontal direction it turns, by means of a ratchet-wheel Q, the cock of the main burner supply to an open or closed port as desired.

The cock is worthy of some notice, as it overcomes many of the objections which have been raised to the devices generally used in automatic lighting appliances. It consists of a cylindrical plug turning in a correspondingly shaped barrel, and held in position by a special clip—an extremely ingenious and simple device, which renders the cock easy of access, is free from nuts or screws and greatly simplifies cleaning, as the plug of the cock can be removed by a simple pressure of the finger. Another thing worthy of note is that no working parts of the apparatus are inside the gas flow, and consequently there is lessened risk of any stoppages through

naphthalene or other deposits; further, that the gas supply to the burner goes straight from the stand-pipe R and not through the apparatus.

As explained above, the float having risen and lifted the valve, and the gas having passed through to the "operator," which in its turn opens the gas-way to the burner, the apparatus has performed its work of lighting the lamp. This operation completed, the glycerine percolating through the small hole gradually reaches the same level inside the float as outside, thus rendering it non-buoyant, and by so doing allowing the float to drop. This movement closes the inlet H of the valve G, and at the same time opens the outlet. The diaphragm then recedes, the curved lever engages in the next step of the ratchet, and the apparatus is ready for the subsequent operation of extinguishing, when all that is required is another sharp rise of a few tenths.

It has further been found necessary to make provision to cope





with districts where the pressure falls rapidly before lighting-up time, and when rising attains a level not higher than previously recorded. This has been accomplished by the introduction of a special valve S, so constructed as to allow the glycerine to escape out of the float as quickly as the level of the glycerine round the float falls; thus bringing the apparatus into a position to respond at any time to a given increase. As the weight of the float is counterbalanced by the spring, the more the latter is loosened the less sensitive the apparatus becomes. By increasing the tension of the spring, more weight of the float is taken up, and the sensitiveness of the apparatus is increased.

Thus the Broadberry apparatus can be adapted to work by certain quick rises and to remain unaffected by smaller sharp rises. It is easily adapted to any existing make of lantern and to any known type of burner—upright, inverted, self-intensifying, or high-pressure. The bye-pass is arranged to extinguish after the mantle is illuminated, and re-ignites on the gas being cut off from the burner. Where, desired the apparatus can be arranged to work without a pilot-light.

It only remains to say that the apparatus is the embodiment of years of practical experience in automatic lighting.

## FUEL AND REFRACTORY MATERIALS.\*

THE volume under review is a second edition of this useful work. Little alteration has been made in the general arrangement, though considerable additions have been made in several directions, especially in connection with coke-ovens, gas-producers, and pyrometry. In his preface, the author expresses his regret that he has found it necessary to use British weights and measures in preference to the metric system. The latter has not yet progressed sufficiently to justify this course being taken. The author is not alone in this expression of opinion.

The work is divided into fifteen chapters, dealing fairly fully, though not completely, with "Fuels" in general use. From the title, it would be thought that "Refractory Materials" would be more or less thoroughly dealt with; but this is by no means the case, as, out of a total of 355 pages, only some 28 touch this somewhat (in the gas industry) debatable question, and the details given are, for the most part, of little interest to gas engineers. In fact, a perusal by a gas engineer of the book under review gives the impression that it has been written by a metallurgical engineer for metallurgists and other workers in closely allied industries. For instance, in a chapter on "Gaseous Fuel," the subject of coal gas—an important fuel in general use—is dismissed with a badly informed, absurdly insufficient, and inaccurate description occupying a few lines over one page. To commence with, we are informed—and by a book published in 1909—that coal gas is used to "a small extent for domestic heating." Is the author aware that in London alone the gas heating-stoves in use number approximately one million? He has only to compare this quantity with the population of London to convince himself of the absurdity of his statement.

He passes on to remark that "it is too expensive for furnace use, but is used with success in many minor operations where only a small quantity is used, and therefore where its cost is only of secondary importance." Perhaps Mr. Sexton does not know that in Sheffield coal gas is being sold for 1s. per 1000 cubic feet, and is being used on a very extensive scale for furnace and other industrial uses in this and other large towns? We are next informed that gas for lighting purposes is carefully purified from carbon dioxide and sulphur compounds. For the information of the author this was correct to a certain extent some years ago, when lime was in general use; but now, and for some years past, oxide of iron has superseded it in all the principal gas-works, with the result that gas is not purified from either carbon dioxide or sulphur compounds—by which is meant carbon bisulphide and sulphur compounds other than sulphuretted hydrogen—but only from sulphuretted hydrogen.

The author, even in the matter of cost of gas, gives a very false impression of the general charges in this country. He states that it varies from 2s. 6d. to 8s. per 1000 cubic feet. The latter price may be charged in some out-of-the-way place unknown to the writer; but a much lower figure than the first-named—viz., 2s. 6d.—is being charged by scores of gas companies and corporations all over the country, especially in the northern parts of England in close proximity to the coalfields. Even in London the Wandsworth and Putney Gas Company charge only 1s. 10d. per 1000 cubic feet to ordinary consumers and 1s. 6d. or 1s. 7d. to power users. It may also be news to the author, as his knowledge of gas matters appears to be somewhat limited, that a large number of gas undertakings allow special discounts up to 20 per cent. or 25 per cent. for gas used for power purposes; thereby bring down the cost of gas to about 1s. 6d. per 1000 cubic feet, at which rate other fuels must indeed be cheap to compete with coal gas on advantageous terms. On reading this paragraph, one is given the impression that, had it been written 30 or 40 years ago, it would have fairly represented the state of the gas industry at the time. A typical analysis of coal gas is given, as well as

a method of calculating the calorific value of a gas from its composition. The author's method is to ascertain the weight of each constituent and calculate the calorific power from the known heating value of a given weight of gas. Mr. Sexton gives the following figures as an example:

Hydrogen . . . . .	48	litres =	4'291 grs. × 34,180 =	146,666
Carbon monoxide . . . . .	8	" =	9'947 " × 2,427 =	24,141
Methane . . . . .	36	" =	25'804 " × 13,062 =	103,815
Ethylene . . . . .	3'8	" =	4'762 " × 11,857 =	56,463
Non-combustible . . . . .	95'8			
	4'2			
	100'0		50'082 grs.	331,085

So that 100 litres will evolve 331,085 units, and its calorific power will be  $\frac{331,085}{50,082} = 6411$  (C. units), or 11,540 B.Th.U. As 1000 cubic feet weigh 31 lbs., 1000 cubic feet would evolve on combustion 347,740 B.Th.U."

Unfortunately, Mr. Sexton has made an arithmetical error which results in the calculated calorific power being nearly halved. It will be noticed that, in multiplying 25'804 by 13,062, the author gives the result as 103,815, whereas it should be 337,051. This accounts for the calorific power being given as 347,740 B.Th.U. per cubic foot instead of 628'742. The fact that this result was allowed to pass uncorrected is another instance of the author's lack of knowledge on the subject of coal gas. It may here be suggested that an easier method of calculating the heating power of a gas from its composition is to multiply the percentages (by volume) of each constituent by the known heating value per cubic foot. This is the method employed by all gas authorities.

So much space has already been taken up in dealing with a page of erroneous matter on coal gas that it will be advisable to pass on to some other subject. The author commences by describing the principles of "Combustion," followed by a chapter on the "Heating Power of Fuels." The various solid fuels are next dealt with. The subject is divided into natural fuels and prepared fuels; considerable attention being given to the subject of coke making in ovens. All the principal coke-ovens are described in this chapter. Next in order are treated the subjects of "Coal Washing" and "Liquid Fuels." Both chapters are short, but interesting.

Natural gas comes in for some consideration in a chapter on "Gaseous Fuel." It is impossible to observe the ideal nature of the constituents in this gas without wishing that it could divulge the secret of its preparation. A large variety of gas-producers are described with excellent illustrations; and much interesting detail is here given, including an abstract from Mr. T. Duxbury's Presidential Address to the Manchester District Institution of Gas Engineers, in which he compares the relative cost of town gas and suction gas for power purposes. Various methods for the "recovery of bye-products" are described, including the Alexander and McCosh, Dempster, and Gillespie processes for cooling and washing the gas. In the descriptions of the methods adopted in other industries for dealing with gas, it is frequently possible to learn much which may be of service in a gas-works; and in this regard the book under review is no exception.

The author deals in some detail with the subject of "Furnaces for Metallurgical Purposes." The same may be said of "Pyrometry;" no less than twenty pyrometers being described. Three short chapters on "Calorimetry," in which a Junkers calorimeter is described, the "Utilization of Fuel," and "Testing Fuels," conclude what is, taken as a whole, a very interesting and useful book. But for the author's inexplicable disregard of the many and important uses of coal gas for fuel purposes the work might have some claims to be considered complete. The variety and amount of information, the clearness of exposition, the excellence of the illustrations, and the modest price of the book (5s.) are all factors which should commend the work as a useful addition to the reference library of the technical reader.

**The Hamburg Gasholder Disaster.**—In an article on this subject which appeared in the "JOURNAL" for Dec. 21 last, the author (Mr. F. S. Cripps) promised a further article demonstrating the action of gasholder cups, and giving rules whereby it may be determined whether the cups will blow when uncupping, and, if they do so, the remedy for the defect. This article is now ready; but we regret it has had to be held over owing to the pressure on our space of other matter—particularly current news.

**The Dessau Vertical Retort Installation of the Providence (R.I.) Gas Company.**—In the "JOURNAL" for the 3rd of August last (p. 313), we reproduced from "Progressive Age" an article by Mr. F. J. Mayer, describing, with illustrations, an installation of vertical retorts on the Dessau system in course of erection at the new works of the Providence (R.I.) Gas Company at Sassafras Point. We learn from the last number of our contemporary that the Company have placed an order for an additional six benches of these retorts with the Didier-March Company, of New York, who are the designers and builders of the new plant which is approaching completion. A number of reproductions of photographs show the various stages of the work. Owing to the unstable character of the soil, timber piling had to be resorted to in preparing the foundations, in the construction of which concrete was exclusively employed.

\* "Fuel and Refractory Materials," by A. Humboldt Sexton, F.I.C., F.C.S., Emeritus Professor of Metallurgy in the Glasgow and West of Scotland Technical College, &c. London: Blackie and Son, Limited; 1909. [Price 5s.]



## MEETING THE GAS DEMANDS OF BROMLEY AND CRAYS.

Twin Generator Carburetted Water-Gas Plant—High-Pressure Plant and Mains to Supply the Crays District.

(Concluded from p. 798.)

## THE OIL SUPPLY.

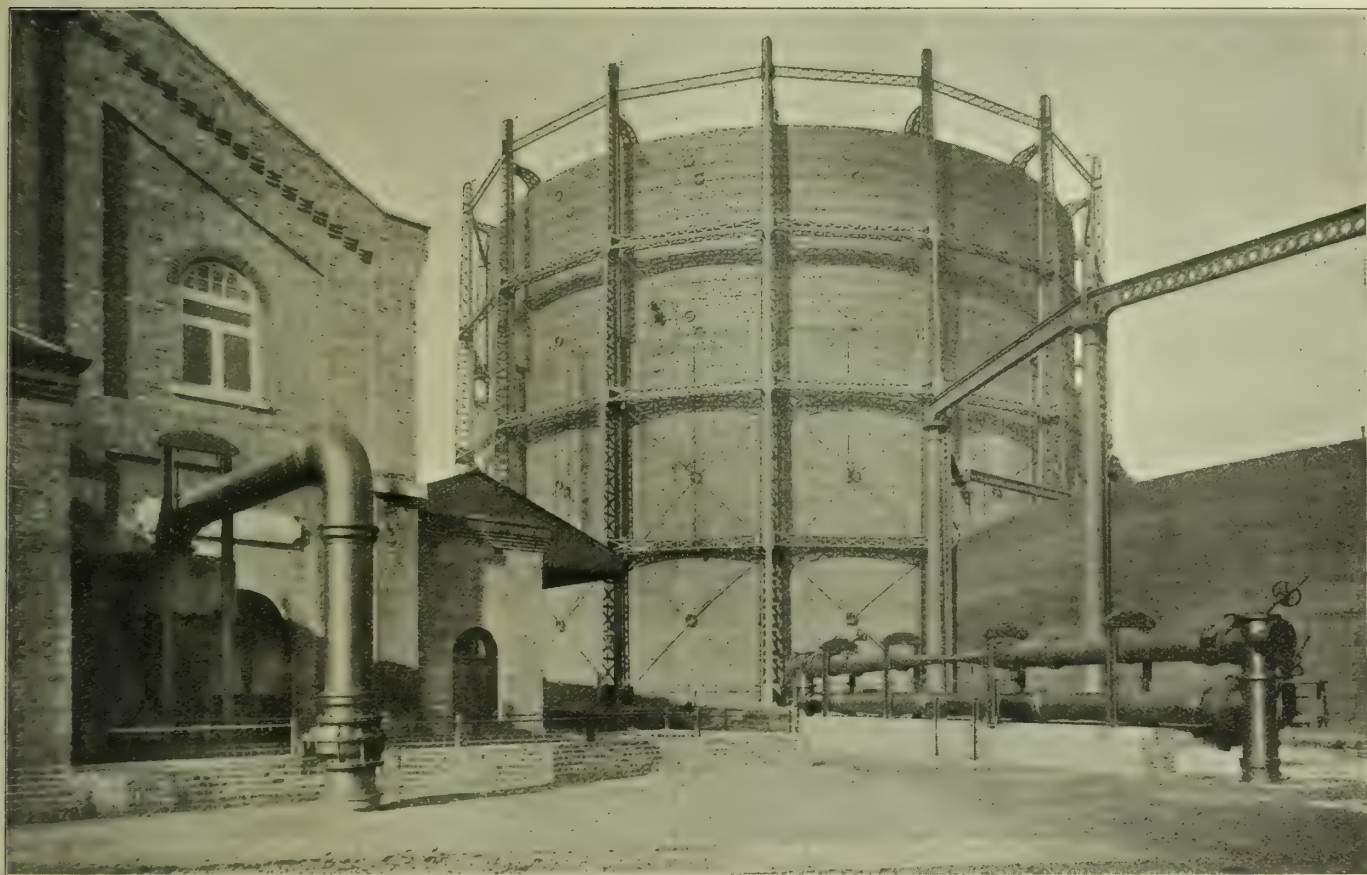
ONE thing in particular that struck us on this visit was the total absence of all pumping of oil, and the necessarily untidy and generally leaky and dirty conditions caused thereby. As a matter of fact, although there is considerable lifting and dealing with the oil used for carburetting, there is not a single pump in use for the purpose. The oil used comes into the works by motor tank-waggon or railway tank as desired; and the oil is then run by gravity therefrom into a closed tank capable of holding 3000 gallons. Immediately the motor or railway tanks have run their cargoes of oil into this tank, by a system of valves, &c., the inlet is closed, and air pressure is brought to play from an Ingersoll "Rand" compressor; and the oil is then forced up into the general storage tank, which holds about 120,000 gallons, from which it comes back by gravity into the gas plant as required. The system is wonderfully simple, and its cleanliness is most marked.

## THE VENTURI STATION METER—A NEW DEPARTURE.

Concerning the Venturi station meter before mentioned, this is a somewhat peculiar piece of apparatus; and as its application to gas measurement is quite a new departure, some description of it may be interesting.

The apparatus erected at Bromley is on the trunk main immediately after the relief holder, and consists of a system of two lengths of pipes one above the other. In the upper length is inserted a taper or Venturi throated tube with its connections to the recorder. The lower row of pipes is simply the bye-pass for use in case of mishap, blockage, or failure in the Venturi tube. The registration device or recorder (which is the patent of Messrs. Hodgson and Kent) is situate some 230 feet away, in the water-gas blower-house, where it stands an example of marvellous ingenuity and perfect English workmanship.

The flow of gas is measured by the fall of pressure between the upstream and the throat of the "Venturi" tube, which is



The Venturi-Tube Meter (shown on the Right-Hand Side of the View).

placed in the upper gas-main before mentioned. The "Venturi" tube is the only part of the meter which comes in contact with the gas, which arrangement eliminates the possibility of the derangement of any mechanical part by tar, water, or naphthalene deposits from the gas itself. In cases where there are possibilities of the tube being fouled by these deposits, the difficulty is overcome by keeping the tube at a slightly higher temperature than that of the gas passing through, by means of a steam or hot-water jacket. The "Venturi" tube is also provided with an interchangeable throat—in an available position, and changeable at a moment's notice; allowing the throat of the one not in use to be examined, and cleaned if fouling is apparent.

The fall of pressure across the "Venturi" tube at full load is 3 inches of water-gauge, and is considerably less at the lower loads. The range over which this type of meter will register correctly is down to 1-28th part of the maximum flow. Below this flow, the meters do not register at all—the counter being cut off by an automatic device. It is possible that this limitation of range will prevent the meters being used in some of the smaller schemes where gas is only made intermittently. If a greater range of registration is required, two Venturi tubes (one large and one small) must be used. This would add to the expense, but would enable a range of 1:400 being obtained.

The meter also corrects automatically for variations in temperature and pressure of the gas; the counter reading giving the quantity which has passed reduced to standard temperature and pressure. In many cases, these corrections will not be necessary

as the total correction so applied under extreme conditions is seldom more than 8 per cent.; a given change of temperature or pressure only causing (we are informed) half the error on a Venturi meter as on an ordinary station meter, owing to the fact that the former depends for its measurement upon the square roots of the pressure and temperature, instead of being proportional to these quantities, as is the case with the ordinary station meter.

The meter does not record continuously as in the case of the present station meters, but takes account of the rate of flow, the pressure, and the temperature at intervals of approximately one minute, and adds the result to the counter-reading. When the flow does not vary rapidly, there is no objection to this method of recording.

The recorder to which the Venturi head, the pressure, and the temperature are transmitted, may be placed at any reasonable distance from the gas-main. In the Bromley installation this distance is approximately 230 feet. This flexibility in the position of the recorder should frequently prove to be an advantage.

The recorder has dials which indicate—

- (1) The rate of flow, in cubic feet per hour.
- (2) The absolute pressure of the gas in the main, in inches of mercury.
- (3) The temperature of the gas in the main, in degrees Fahr.
- (4) The total quantity of gas passed, reduced to standard temperature and pressure.
- (5) The hour of the day.

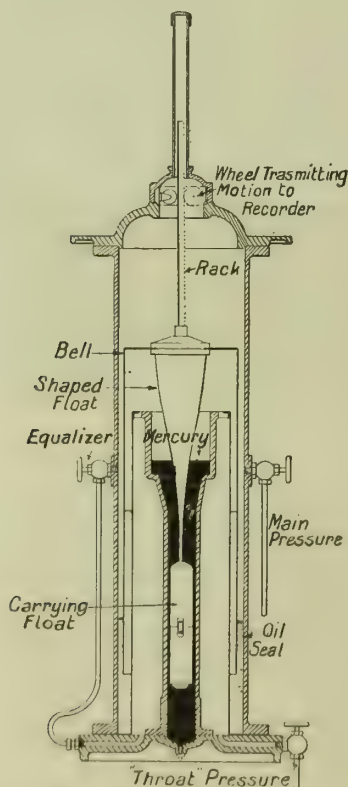




The Venturi Recorder.

The mechanism of the recorder is securely protected in a dust-tight case; the recorder itself being (as previously mentioned) situated in the turbine-house.

The meter does not correct for variations in the density of the gas, due to any changes in its quality caused by alteration in the process of manufacture, &c. It, however, can be immediately adjusted, by means of a small milled screw fixed to the recorder, to measure gas of any density provided the density of the gas is known. The density, of course, can easily be taken by a Lot's balance or an equivalent arrangement.

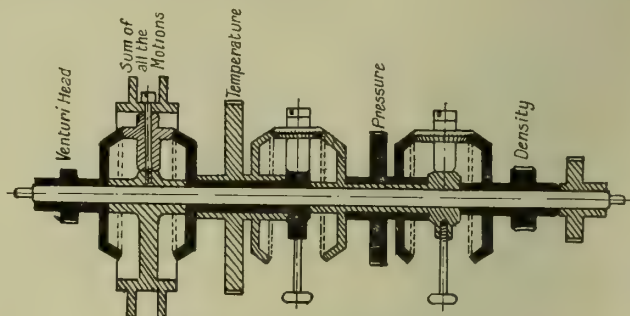


Bell and Float Actuating Mechanism of the Venturi Meter Recorder.

The methods adopted to measure the three variables—Venturi head, pressure, and temperature—are as follows: The Venturi head is measured by the movement of a light inverted bell immersed in an oil seal; the throat pressure acting on the inside of the bell, and the upstream pressure acting on the outside. The arrangement is identical with that of a gasholder, with the exception that the largest pressure acts on the outside, instead of on the inside, and causes the bell to sink instead of to rise. The weight of the bell is taken by a carrying float, which is always totally immersed in mercury.

The amount of movement of the bell for any given increase in the Venturi head is determined by a second float, which is specially

shaped, is placed on the under side of the bell, and dips into the mercury. For any given increase in the flow, the bell descends until the increase in the difference of pressure is balanced by the increase of buoyancy of this specially shaped float. By these means, a movement proportional to the flow itself is obtained. This movement is transmitted to the mechanism outside the bell by means of a rack and wheel.

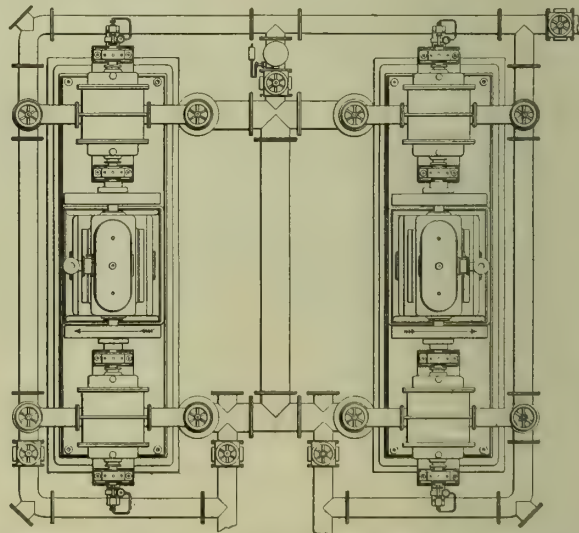


Differential Shaft on the Venturi Recorder.

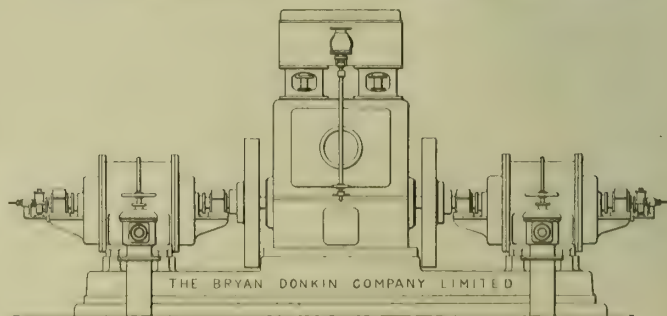
The pressure of the gas is measured by a battery of aneroids similar to those used in an ordinary aneroid recording barometer. This battery is placed in a chamber in connection with the gas-main. The movement is proportional to the absolute pressure of the gas (*i.e.*, to the difference of pressure between the vacuum inside the aneroids and the gas pressure acting outside them). The arrangement thus corrects the readings for variations of atmospheric pressure, and in the gas pressure itself.

The temperature is measured by means of a small steel cylinder placed in the gas-main, which contains liquid ammonia. The vapour pressure of this liquid is transmitted through a thin pipe to a pressure-gauge in the recorder; and since the vapour pressure of any liquid depends only on its temperature, we have here a very accurate and simple method of transmitting the temperature of the gas in the main to a distance.

The makers are Messrs. George Kent, Limited, of Luton, who (in conjunction with Messrs. Fraser and Chalmers, of Erith) have carried out most exhaustive tests and calibrating experiments, costing many thousands of pounds, as this system of meter is being extensively adopted for measuring compressed air supplied from central generating stations for the mines in South Africa.



Plan of the Engines and Compressors, showing the Connections.



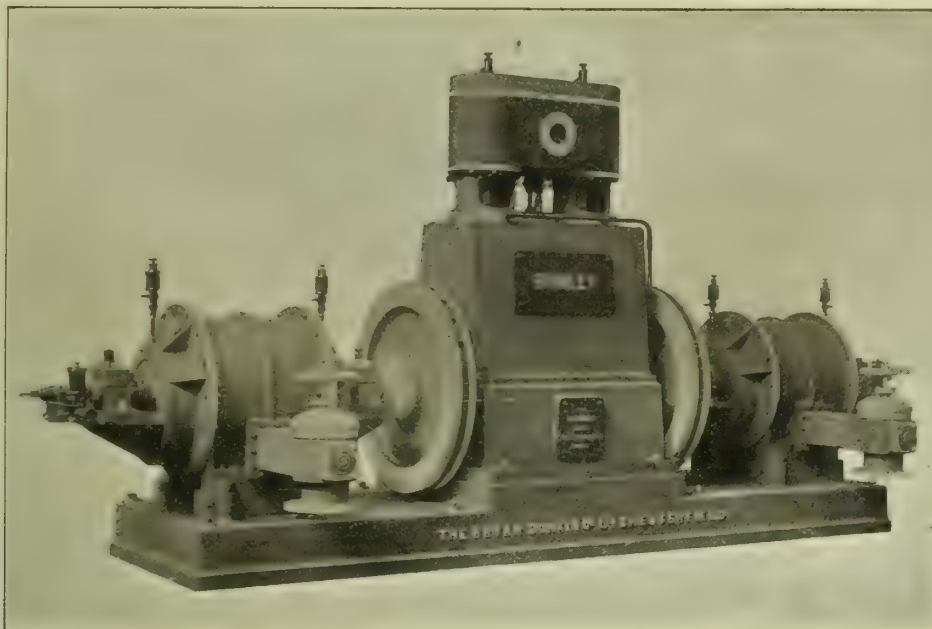
Elevation of the Engine and Compressors.

#### HIGH-PRESSURE PLANT FOR THE CRAYS SUPPLY.

As was said at the commencement of this article, the gas required in the Crays district is now delivered from the Bromley works by compressors through a high-pressure main.

The plant is so arranged that it can take gas from any one of the holders on the Bromley works, and so that the gas can be boosted from one holder to another—that is to say, the gas can be driven from a light holder which will not give sufficient district





The Engine and Compressors.

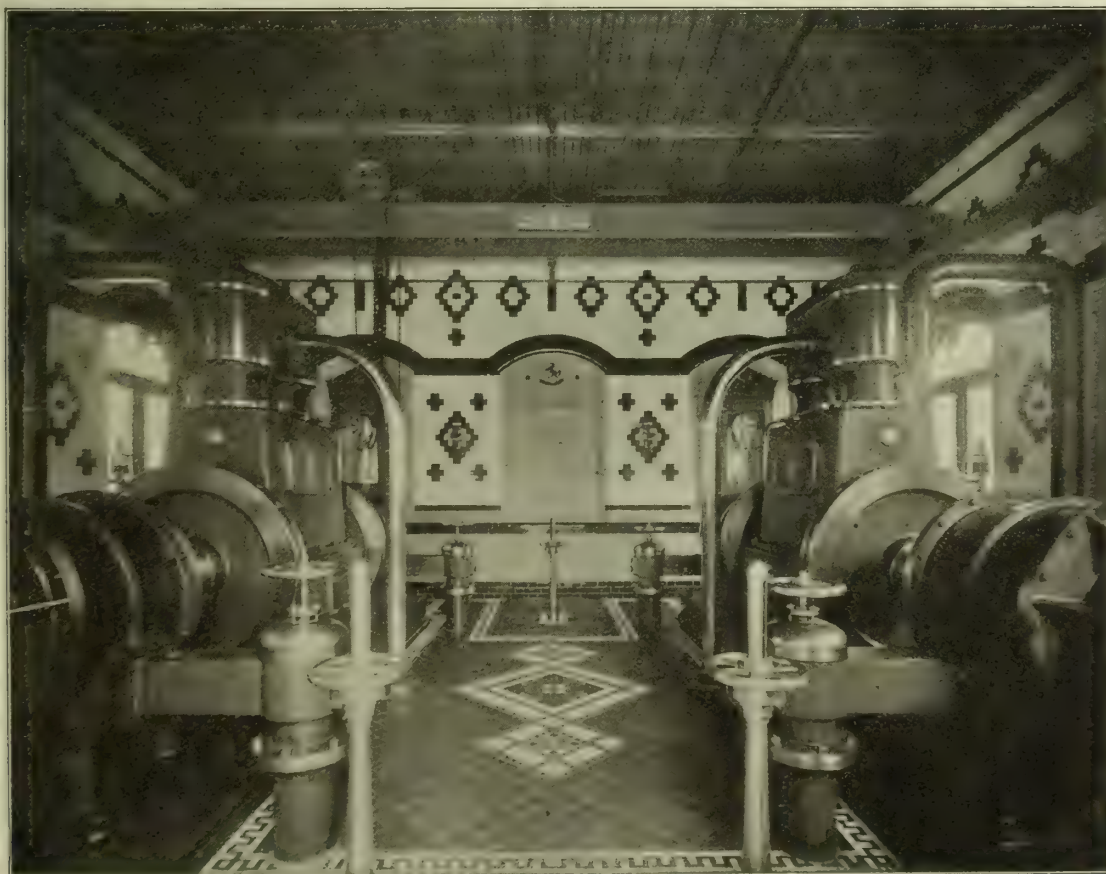
pressure into a heavier one. This is found very valuable in the work of distribution.

The compressors are situated in a specially constructed house, 30 feet by 30 feet, which, with its tiled walls and floor, is quite picturesquely designed. At one end a tablet is let into the wall, bearing the County of Kent coat of arms, the names of the Company's Directors and Engineer at this epochal time in the history of the concern, and the date. But these are merely the surroundings to the central features of the building; and they are features such as will delight the mechanical engineer to examine. They consist of two complete installations of two rotary compressors centrally and direct driven by vertical engines having double cylinders, 12 inches diameter by 10-inch stroke. The double cranks are arranged at right angles, so that a perfect torque is obtained, ensuring steady running; and the engines will start in any position without barring.

The engines and compressors are in each set mounted on a massive cast-iron bed-plate, and are thus self-contained. The engines are of the enclosed type, and absolutely fool-proof, as they have no moving reciprocating parts exposed. All bearings are continuously and positively lubricated by oil under pressure, and which oil the engine itself pumps through the bearings at a pressure of from 15 to 20 lbs. per square inch.

The crank-shafts and pins being hollow, the oil is forced through them to the crank and connecting-rod bearings, and to the eccentrics and every other bearing. The drippings and used oil after lubricating are collected in the engine-base, filtered, and again pumped through the engine-bearings.

The compressors are fine pieces of machinery, made by the Bryan Donkin Company, of Chesterfield and London, to the designs of Mr. H. M. Hodson, the patentee. They are of the rotary type, and are each capable of pumping 30,000 cubic feet of gas per hour against a pressure of 10 lbs. per square inch, at a speed of 110 revolutions per minute. In appearance they resemble the ordinary Beale exhaustor; but the internal design is altogether a new departure. A double-ended slide forming one casting is directly rotated by a block of large dimensions, which forms part of the driving-shaft, and which passes through the machine from one end-plate to the other. This shaft is made of a special steel alloy. The cast-iron drum, which forms the driving member of an ordinary exhaustor, is in this compressor itself rotated by the double slides forming the pistons of the machine. While, therefore, the simplicity of an ordinary exhaustor is retained, the design is stronger, and much more suited for running against the heavier pressures that are involved in modern high-pressure gas transmission.



Interior of the Compressor House.



The drive is taken directly off the steel shaft, which is 6 inches diameter in these machines, and passes right through them, and is supported at each end in heavy bearings on each end plate. The cast-iron drum rotates idly, due to the movement of the slides; and as there is no pressure from the movement of the slides, and no driving pressure between the slides and the drum, the wear at this point is negligible—the only pressure between them being that attributable to the slides dragging the drum round. All the driving pressure occurs at the steel block, the working faces of which get forced lubrication pumped up the centre of the driving-shaft by an independent oil-pump.

The efficiency of the compressors as regards "slip" is much improved as compared with an ordinary exhauster. The special design permits of slides being used of very deep section, with consequent increase in strength, and, the broad ends of these slides running in contact with the end plates, forms with the oil a practically gas-tight joint. The slides are also provided with nose strips of special design, giving broad surface contact against the walls of the compressor cylinder. As there is no end-thrust on the slides, there is practically no cause for wear over these broad ends; and the nose strips are automatically kept up to their work by springs in the usual way. The efficiency of the machines is therefore unaffected by any wear which may take place in the driving-block, which is entirely shut away inside the revolving drum, and cannot affect the gas tightness. The forced lubricators fitted to these machines serve to automatically lubricate all internal working parts.

In the connections to the machines, a relief pressure-valve is arranged as a bye-pass between the inlet and outlet mains. If, therefore, they cease taking gas at the Cray works, and shut down their valve, this relief-valve opens, and thus prevents the pressure rising to a height beyond the limit to which the valve is set. The valve also secures that the gas pumped through the high-pressure main to the Crays works is at a steady rate irrespective of the speed of the compressors; and should the compressors for any reason be running beyond their normal speed, the valve would

relieve as soon as the outlet pressure at Bromley exceeded a given limit, so that the gas would continue to be pumped into the holders at the Cray works at the normal rate.

As before stated, the compressors are each capable of passing 30,000 cubic feet per hour at a pressure of 10 lbs. per square inch; and they deliver and pass the gas through a newly laid Mannesmann steel main, 8 inches in diameter and 5½ miles long, which runs from the Bromley works through Chislehurst to the St. Mary Cray works, where the gas passes through the works station meter, and into the holders, being then distributed through the Crays system of governors and canalization in the usual way. This main is coated with jute covering and special asphalt.

The joints are on the rigid principle; the socket end of the pipes being provided with a recess beyond its depth, 10 inches long, and of a diameter to the exact size of the spigot end of the pipe. The spigot is driven into this recess by heavy rams; and as they are thus a dead-fit, no yarning is necessary. The joint is then made by caulking the sockets full from end to end with lead wool. This provides a very sound joint; and the main before being put into use was successfully tested to over 50 lbs. per square inch.

From this description of the more recent changes at the Bromley works, made in order to meet the requirements of the annexed area of supply, it will be seen that concentration of manufacture at the larger works has greatly added to their importance, to the responsibility of management, and to the technical interest always to be found there. We congratulate the Company and the Chief Engineer on so promptly establishing themselves on a settled line of working under the new conditions brought about by the extension of operations through the recent fusion; and at the same time we thank Mr. Woodward for the facilities afforded in obtaining particulars and illustrations for this article.

ITALIAN GAS-WORKS' RESULTS IN 1908.

THE February issue of our contemporary "Il Gaz" contained a table of figures, taken from the official report of the Ministry of Agriculture, Industry, and Commerce in Italy, relating to the results of gas-works' operations in that country for the year 1908. As the figures may be of interest to some of our readers, who may not easily have access to such records, we append a selection of the results obtained.

It will be seen that a total of 190 gas-works carbonized 1,058,290

(metric) tons of coal, producing 307,464,154 cubic metres of gas, which works out at about the equivalent of a make of 10,406 cubic feet of gas per English ton of coal. The coke produced amounted to 704,454 (metric) tons, or over 66 per cent. of the coal carbonized. The total tar production was 51,107 (metric) tons, or 4·8 per cent. The average cost of the coal was 28 lire per ton, which may be taken, roughly, at about 22s. 6d. Coke fetched, on an average, 40 lire, or (say) 32s., per ton. The average sale price of gas was 0·187 lira per cubic metre; the English equivalent of which would be about 4s. 2½d. per 1000 cubic feet.

Figures relating to the Carbonization of Coal in Italy in 1908.

Name of District.	Number of Gas-Works in District.	Coal Carbonized. Tons.	Gas Made. Cubic Metres.	Average Sale. Price per Cubic Metre.	Coke Made. Tons.	Average Sale. Price per Ton.	Tar Produced. Tons.	Average Sale. Price per Ton.	Number of Workmen.
Alessandria.	11	27,636	7,387,555	0·1635	19,069	41·60	1,194	26·10	156
Cuneo . . . . .	8	13,077	2,925,800	0·185	8,525	46·20	506	27·83	77
Novara . . . . .	7	13,474	3,803,230	0·180	7,691	41·20	554	27·70	86
Torino . . . . .	9	148,565	42,341,870	0·111	89,800	47·80	7,400	29·20	893
Bari . . . . .	2	7,936	2,226,112	0·1431	5,674	35·96	313	35·32	85
Caserta . . . . .	2	3,511	923,270	0·184	1,972	22·59	140	26·92	35
Foggia . . . . .	1	6,544	1,762,800	0·157	4,211	40·00	262	56·20	65
Lecce . . . . .	1	3,869	1,109,480	0·15	2,634	36·60	191	51·00	38
Napoli . . . . .	4	78,749	21,752,300	0·186	55,018	24·75	3,831	26·30	266
Reggio Calabria . . . . .	1	2,229	497,000	0·11	1,586	43·90	96	42·00	25
Salerno . . . . .	2	2,779	1,021,565	0·1785	2,609	28·20	153	28·80	33
Catanzaro . . . . .	1	1,509	413,570	0·2485	980	35·00	47	30·50	15
Bergamo . . . . .	4	293,329	2,230,020	0·16	5,123	42·72	296	26·00	50
Brescia . . . . .	4		2,496,607	0·181	5,450	43·70	350	24·30	84
Como . . . . .	17		5,687,820	0·184	12,084	45·57	856	30·00	135
Cremona . . . . .	2		2,072,360	0·208	4,800	45·00	370	24·35	60
Milano . . . . .	29	76,000	75,951,477	0·15	161,325	41·28	12,150	29·43	1,287
Pavia . . . . .	5		3,512,287	0·184	7,650	45·83	522	32·62	78
Bologna . . . . .	21		21,700,000	0·19	52,000	43·70	3,500	33·70	549
Cagliari Sassari . . . . .	4		2,070,538	0·25	5,498	36·00	375	50·00	78
Caltanissetta . . . . .	7	62,324	17,864,596	0·22	42,710	28·20	2,786	21·40	265
Chieti . . . . .	1	66,700	351,000	0·21	900	44·00	51	29·00	13
Roma . . . . .	5		23,073,911	0·197	44,050	30·77	4,249	32·07	658
Ferrara . . . . .	2		6,800	0·202	4,500	50·00	202	30·00	37
Mantova . . . . .	1		6,245	0·169	4,030	44·80	250	28·00	32
Padova . . . . .	2	19,163	5,179,780	0·1565	14,057	45·50	1,183	38·10	140
Rovigo . . . . .	3	3,088	743,277	0·22	1,888	47·20	147	43·30	23
Treviso . . . . .	2	4,000	1,140,950	0·1705	2,600	45·50	180	29·00	27
Udine . . . . .	1	2,500	650,000	0·20	1,750	48·00	80	30·00	22
Venezia . . . . .	3	29,120	6,865,560	0·152	16,284	40·00	1,144	30·20	150
Verona . . . . .	3	10,389	3,057,580	0·2165	6,491	39·00	487	30·90	159
Vicenza . . . . .	3	6,072	1,608,000	0·18	3,000	40·00	240	27·40	40
Firenze . . . . .	2	42,390	7,524,456	0·266	16,767	40·42	1,016	30·00	169
Livorno . . . . .	1		3,138,570	0·17	7,875	38·50	560	30·00	65
Pisa . . . . .	1		1,577,920	0·21	3,940	40·00	222	30·00	27
Siena . . . . .	1		516,240	0·25	1,373	35·00	79	30·00	15
Genova . . . . .	10	111,607	25,891,751	0·188	69,568	36·29	4,587	32·91	771
Lucca . . . . .	1		950,425	0·172	2,768	40·00	156	30·00	32
Massa-Carrara . . . . .	1		480,778	0·219	1,567	39·68	97	28·78	15
Porto Maurizio . . . . .	4		1,498,199	0·216	4,637	38·11	285	29·84	37
Totals.	190	1,058,290	307,464,154	..	704,454	..	51,107	..	6,792



## ILLUMINATING ENGINEERING IN AMERICA.

## A Year's Progress.

THE number of our American contemporary the "Illuminating Engineer" for the current month opens with an article by the Editor (Mr. E. Leavenworth Elliott) on "The Year's Progress in Illuminating Engineering," in which he shows what has been done to advance the science commercially and scientifically. It follows an introductory note by the same writer, expressing his gratification that the publication has reached its fourth anniversary, and stating that the work done has been satisfactory beyond the most sanguine expectations. The first object in starting the publication—the establishment of illuminating engineering as a distinct profession and division of applied science—has, he says, been accomplished. The next great work is the more arduous one of leading the public to avail themselves of the advantages of better illumination made possible by the achievement of this object. They have to be led up to an appreciation of them by an often slow and laborious process of education; but, fortunately, they are much more ready to hear and to learn now than they were in the past.

Leaving Mr. Elliott's introductory remarks, we turn to what he has to say on the progress of illuminating engineering. He begins by quoting the predictions made in his summary a year ago, which were to the effect that progress would probably be most pronounced on the following lines: First of all, the installation of better systems of street lighting, both from the decorative and practical standards; secondly, more "aggressive action" on the part of the gas interests to maintain the present status of gas lighting; next, more extended recognition of illuminating engineering principles in both the manufacture and sale of lighting fixtures and accessories; and, finally, the continued increase in the recognition of illuminating engineering by those largely interested in the subject of illumination, including users of light, architects, contractors, and producers of luminants.

That these predictions have been very largely fulfilled is now, the writer says, a matter of record. The movement for decorative and spectacular street lighting has not only held the centre of the stage, but has attracted attention from every part of the country and from every class of municipality, from the remote country village to cities of the first magnitude; and there are no present signs of abatement. He frankly acknowledges that some of the installations have been conceived in enthusiasm and executed in haste, with the inevitable result that they will be more or less short-lived; not that the better illumination itself will be discarded, but that systems more in keeping with the dignity of a permanent public improvement will be eventually put in. To have made the start, however, is the important thing. In one of its spasmodic reform administrations, New York City had the good fortune to stumble on to a man who cleaned its streets, so that the citizens for the first time in its history had an example of what cleanliness meant; and no administration since has ever dared to go back to the old conditions of filth, nor is there any possibility of such an eventuality in the future. So in the case of public lighting. When once the streets have been lighted up, and the citizens have had an object-lesson in what modern illumination means, they will never go back to the old *régime* of darkness and gloom. Cities of the first class that have carried out extensive modern lighting equipment are Boston, Philadelphia, Chicago, St. Louis, Seattle, and Atlanta, while installations put into smaller cities and towns are numbered by scores. These special lighting installations form a sort of electric sign for the city as a whole; and the movement for better light is still being generally carried on through the initiative and efforts of local boards of trade or civic organizations. At first undertaken often in a spirit of rivalry, it has now come to be more a matter of self-preservation—not in the literal sense of preventing the downfall of the city, but in preserving its prestige and reputation for thrift and progressiveness. Looking at these results, Mr. Elliott considers that his first prophecy of a year has been fulfilled to the letter.

The progress predicted for illuminating engineering in the field of gas lighting has also, he says, been realized. The Welsbach Company, who hold the foremost place in the production of gas lighting apparatus, have established an illuminating engineering department, with one of the best American illuminating engineers at its head, and have been doing excellent work. Papers touching on various phases of illuminating engineering as connected with gas lighting have been presented at all the meetings and conventions of the various organizations connected with the gas industry. There has been a very large accession of members to the Illuminating Engineering Society from the ranks of the gas men; and there is no doubt as to the actual awakening of interest in the subject in this branch of the lighting field. Consequently, the second prediction has proved true.

In the fixture trade, the progress of illuminating engineering has been less marked, though by no means imperceptible. Mr. Elliott attributes this to a considerable extent to the absolute lack of organization and co-operation among the manufacturers. Efforts have been made to remove this anomalous condition of affairs; but apparently without success. He says that as yet no single firm or individual has appeared with sufficient moral strength and conviction to come out into the open, and follow the path of progress so clearly indicated by the march of collateral interests. He admits that there are peculiar difficulties in the

way which will have to be removed or ameliorated before real progress can be made. There is no doubt, however, that there was some awakening on the subject during the past twelve months; and as reforms generally grow in a geometrical ratio, he thinks it safe to predict that a larger amount of interest will be shown in the current year.

Coming to the final prediction—as to the growth of illuminating engineering as a science and a profession, and its acceptance as such by the other engineering professions and the public at large—Mr. Elliott says it has been realized to an extent which may well cheer the heart of the prophet. Among the most conspicuous evidences of this may be mentioned the marked prosperity and progress of the American Illuminating Engineering Society, as shown in its increased membership, stronger financial position, and the greater number and better average quality of the papers and discussions presented at its meetings; the final organization of the British Illuminating Engineering Society, with Professor Silvanus P. Thompson as President, with a roll of distinguished Vice-Presidents; the greater number and better quality of articles on subjects pertaining to illumination in the trade and technical Press; the appearance of several standard works on various branches of the subject by competent authors; the greater extent to which illumination curves and other technical data are used in commercial literature; the elimination of much of the sporadic effort to acquire or use the science without due knowledge or preparation, and a more serious, painstaking, and scholarly view of the profession by those who have assumed the title of illuminating engineer.

Mr. Elliott says that in the development of light-sources, the past year brought forth nothing essentially new. In gas lighting, the inverted burner became a standard; there being no longer any question as to its successful use under average American conditions. Its application to the so-called "gas-arcs" was brought to commercial success. High-pressure gas lighting, which made steady progress elsewhere, was the subject of only a few desultory experiments in America; and the writer says there are no immediate signs of its becoming a factor in either public or private lighting installations. The question of distance lighting, which has also reached the commercial stage abroad, does not appear to have been experimented with to any extent in America. Some very needful attention has been given to the subject of modernizing gas-fittings; and in connection with this the methods of lighting and extinguishing gas without the use of the troublesome match have also received consideration. The different methods of electric lighting gas-burners have been worked upon, apparently with such success that very much improved and more practical forms will soon appear on the market.

After offering a few remarks on electric lamps, glassware, and car lighting, Mr. Elliott passes on to deal briefly with acetylene and gasolene, which he says "afford to the smallest isolated installations the means of securing an illumination equal to that furnished by the largest of central stations and gas companies." He then makes a few predictions for the current year. He thinks it is safe to prophesy that the lead will be taken in the direction of better street and public lighting; and that next to this, industrial lighting will come in for a "general overhauling." With the full return of prosperity, and its attendant necessity for overtime and double-shift work, additional importance attaches to the latter field of illumination. We learn, on the authority of Mr. Elliott, that for the first time in history a definite move in the direction of regulating industrial lighting by legal enactment is to be made; a Bill now being prepared for introduction into the New York State Legislature covering the subject, and providing that the lighting shall be subject to inspection by the proper authorities along with the other matters affecting the health and safety of employees.

In conclusion, Mr. Elliott considers that in the development of new means of producing light nothing of a radical nature is in sight. With the number and character of scientists experimenting in this line, however, a discovery which may ultimately place all our modern methods in the shade may, he thinks, be announced at any time. On the other hand, another quarter-of-a-century may pass without anything further developing than improvements in the method of manufacture. With regard to illuminating engineering, he considers that its progress has now "settled down into a steady gait, which will surely not slacken during the coming year." It is established beyond all question; and it only remains to maintain a healthy growth along with other professions.

Mr. James Paterson, M.A., the Engineer and General Manager of the Redhill Gas Company, and the Hon. Secretary and Treasurer of the Southern District Association of Gas Managers, of which he is the immediate Past-President, has been appointed General Assistant to his father, Mr. R. Ormiston Paterson, the Engineer and Manager of the Cheltenham Gas Company, and will leave Redhill at the end of June. Mr. Paterson has been there seven years, having been selected in March, 1903, to succeed Mr. Douglas H. Helps, who then became Engineer and Manager of the Reading Gas Company. Before going to Redhill, Mr. Paterson filled the position of Assistant-Engineer to the Gloucester Gas Company. His work at Redhill has given entire satisfaction to his Directors; and we cordially wish him equal success in the discharge of the duties incidental to the new position he has now been called upon to fill. Mr. Paterson obtained his degree at Cambridge in 1901.



## OBLIQUE &amp; HORIZONTAL CHAMBER SETTINGS.

The German Company carrying on business under the title of the Ofenbau-Gesellschaft m.b.H. have taken out French patents for settings of oblique and horizontal chambers suitable for the carbonization of coal and other materials. They are shown in the following illustrations.

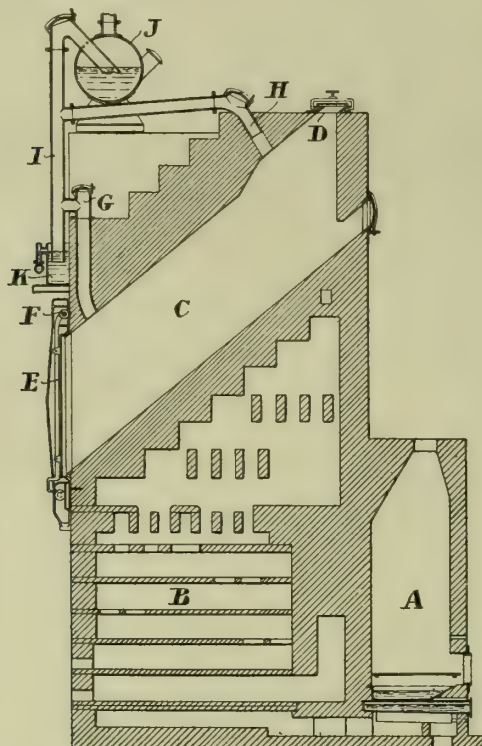


Fig. 1.

In the arrangement fig. 1, the object of the patentees has been to produce a setting in which the carbonizing chamber will be relieved as much as possible from the high pressure to which it is subjected during the distillation of heavy charges, and the resulting gases conveyed quickly away. This object is attained by providing the sloping roof of the chamber with two gas outlet-pipes both in connection with the same tar-receiver. The chamber is heated by the generator furnace A, the gases from which mix with the preheated air coming from the regenerator B, and burn in the well-known manner. The hot gases are conducted along the side walls of the carbonizing chamber C, at the top of which is a charging-hole D, which can be closed by the lid shown, while the opening E for discharging the chamber is closed by a door turning upon an axis F. From the lower part of the roof of the chamber rises the outlet-pipe G, and from the upper part the pipe H. The former is connected with the pipe I, leading to the tar-vessel J; so that the cleaning of the ascension-pipe, which is provided with a cover, is greatly facilitated. The pipe H opens into this pipe, the lower end of which dips into the water-seal shown at K; this vessel serving as a receptacle for the pitch and tar separating from the gas.

The other invention patented by the Company is a setting having either horizontal or oblique chambers, as in fig. 2.

The object here is to heat the walls of each combustion chamber in such a way as to avoid heating very highly the gases collecting in the upper parts, and also to prevent the formation of carbon there. This object is attained by having on the sides of the chambers gas-heating channels running longitudinally, which can, if necessary, be either isolated or in groups. They are arranged one above the other, and can be inspected through sight-holes in the wall on the charging side of the furnace, for the purpose of regulating the heat.

Fig. 2 is a vertical section of a setting with gas-heating channels, with a transverse section on the line X X. The setting is heated by the generator A, the gases from which pass upwards by way of the channel B, the chamber C, and the channel D to mingle in the vertical channels E and burn with the preheated air coming from the channel F of the regenerator G. In front of the channels E, and arranged on the two sides of each combustion chamber H, are other channels I, which are separated from the channels E by a partition J, provided with openings as shown. The channels I communicate with the channel F, and convey to the hot gases rising in the channel E, at various heights, fresh quantities of air.

Starting from the channels E are hot-gas channels K running in a longitudinal direction, and separated from each other by partitions as shown. Their purpose is to heat the sides of the chambers H, and they may be formed singly or in groups as needed for regulating the flow of the hot gases to the various parts of the setting. In the arrangement shown, the upper channels K may be entirely or partially closed by the slide L. The lower channels are closed below upon the transverse channel M, running

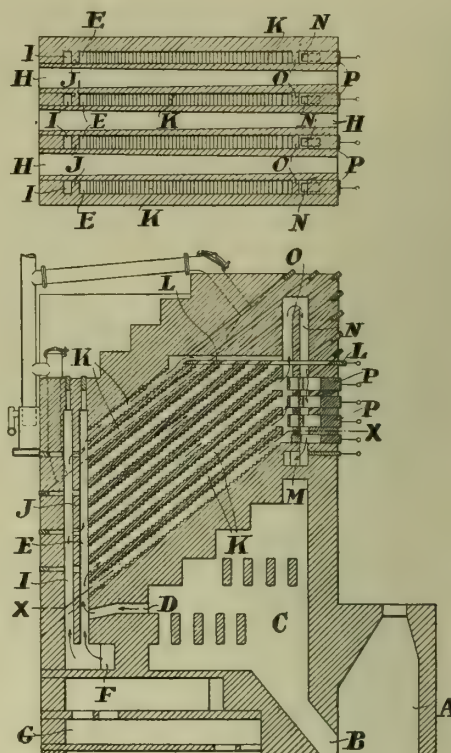


Fig. 2.

towards the discharging channel N by a baffle-plate O, in order that they may not be subjected to too strong a current of air. The baffle-plate is perforated, and serves for guiding the perforated registers P, by the aid of which the lower channels may be closed singly, if required. These registers are so perforated that, even when the corresponding hot-gas channel is closed, the suction of the hot gases by the other channels in the direction of the arrows is not interfered with. On the charging side of the setting, sight-holes are arranged in the wall, to enable the gas channels to be inspected while at work. It is preferable for the capacity of the individual carbonizing chambers H to be reduced in the direction of the course of the hot gases, in order that the bulk of the charge may decrease in the same direction, to accord with the lowering of the heat from the bottom upwards.

DISTILLATION OF WATER-GAS TAR  
AND ANALYSIS OF OIL GAS.

By E. C. UHLIG,

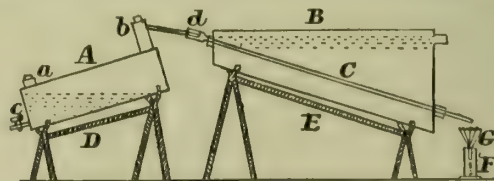
Chemist at the Citizens' Gas-Works, Brooklyn, New York.

[Papers Read before the New York Section of the Society of Chemical Industry.\*]

## APPARATUS FOR DISTILLING WATER-GAS TAR.

Great difficulty has always been found in carrying out distillations of water-gas tar, especially when the operation was conducted in a glass flask. The tar will bump, break the flask, and cause not only loss of time, but also danger to the operator and damage to his clothing.

This apparatus was designed to overcome these difficulties and supply a rapid and ready method to ascertain the percentage of water a tar may contain; thus furnishing a means of knowing the efficiency of the settling-tanks. It was constructed by the



works blacksmith, and consists (as shown) of a wrought-iron pipe A, 12 inches long and 2½ inches internal diameter, with plugs welded into the ends. It has a 1-inch nipple a closed with a screw-plug, and another 1-inch nipple b, about 2 inches long, closed with a cork, and having a bent piece of ½-inch pipe d connecting with the condenser C. A cock c allows the retort to be emptied of the pitch left after the distillation is finished. D is a stand, made of wrought iron, supporting A in an inclined position. The object of the cork in b is to allow the insertion of a thermometer when a fractional distillation is to be made, and to provide a vent in case of an explosion in A allowing the cork to blow out. This has heretofore not happened, as the explosions have been so weak that their force has been directed through the condenser tube C.

\* Reprinted from the Society's "Journal."



The retort A may be attached to an ordinary Liebig condenser; but the condenser shown in the figure is used because a burner may be placed under E to heat the water around C when naphthalene oils are coming off. The tube C passes through a copper box which has water running through it. C is 30 inches long; and the box has the following dimensions: Upper side, 16 inches; bottom, 26 inches; sides, 3 inches and 6 inches; width, 2½ inches. It is supported by a wrought-iron stand E, similar in construction to D. A graduated cylinder F supports a glass funnel G, in which is placed a piece of wet filter-paper which acts as a separator for the oil and water dropping from C—the water passing through into F, where its volume may be read, while the oil remains on the paper.

To use the apparatus, the plug in *a* is unscrewed, the tar weighed in the can in which it comes, and some tar (about 300 grammes) poured into A. The can is reweighed—the difference in weight being the tar to be distilled. The plug is then screwed into *a*, and *d* is connected from C by a perforated cork. The dotted lines show the position of the tar in the retort. A triple bunsen burner is placed under D at the end nearest the condenser, and as the distillation proceeds the burner is moved toward the other end. This movement is gradually done, and when the other end is reached the flame is increased, and the heating continued until no more water is seen dropping into the funnel. The burner is extinguished, and after waiting a short time to allow the retort to cool somewhat, the cock *c* is opened, and the warm pitch allowed to run out. The volume of water in F multiplied by 100 and divided by the weight of tar taken gives the percentage of water in the tar.

If naphthalene should form in C, it can be readily pushed out with a piece of cotton on the end of a long wire. Naphthalene does not appear until all the water has been driven off the tar; so this cleaning-out is done when the operation is finished. In case of a fractional distillation where naphthalene was one of the constituents to be determined, the water in the copper box would be heated when this point was reached.

The great advantage of this apparatus, apart from the impossibility of breakage, is the manner in which the heat is applied to the tar. It will be noticed that the tar is first heated where it is shallowest, and as the distillation goes on, at the deeper parts. This ensures quiet distillation, and prevents bumping.

When the retort becomes stopped with pitch from many distillations adhering to the inside, and cleaning is necessary, the parts *a*, *b*, and *c* are unscrewed, the retort taken from the support D, and placed in a forge fire, where it can be heated till all the pitch is burned out. The parts are then reassembled.

Water-gas tar containing upward of 75 per cent. water has been distilled with this apparatus without loss of material or danger to the operator.

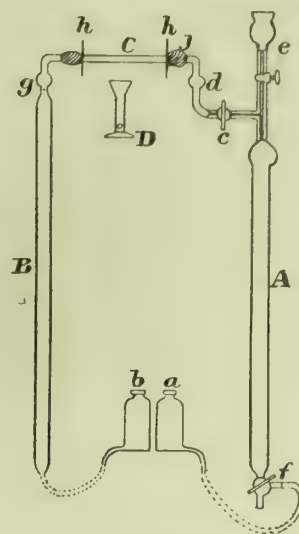
#### OIL-GAS ANALYSIS APPARATUS.

This apparatus was designed for gases in which the methane is in greater proportion than the hydrogen. It is based on the observation of E. Jaeger that when a mixture of methane and hydrogen is passed through copper oxide at 250° C. the hydrogen is burned to water; the contraction in volume being a direct measure of the hydrogen that was present, while the methane is unchanged until the copper oxide is heated to redness, when it is burned to carbon dioxide, which may be absorbed in sodium hydroxide. The residue of gas left after combustion and absorption is then read, added to the other constituents, and the sum subtracted from 100 gives the methane. This apparatus has been used for gases made by decomposing oil in retorts. These gases are of the following type:—

	Per Cent.	Per Cent.
Carbon dioxide . . . . .	0.0	0.0
Illuminants . . . . .	54.2	45.4
Oxygen . . . . .	0.4	0.4
Carbon monoxide . . . . .	0.3	1.2
Hydrogen . . . . .	9.8	5.0
Methane . . . . .	32.8	43.6
Nitrogen . . . . .	2.5	4.4

The apparatus consists of an absorption tube A, similar to that used on the Elliott apparatus, but having the part *c d* in addition. This part is made of tubing 1 mm. internal diameter to the bottom of the upright part *d*, which has an internal diameter of 6 mm. and an external diameter of 10 mm.; the bulb being 15 mm. external diameter. The tube A may be graduated. The tube B is 100 c.c. capacity, and is graduated in 0.1 c.c. It is contracted below the bulb *g*, which is 15 mm. external diameter. The part above *g* is 6 mm. internal and 10 mm. external diameter. C is a quartz tube filled with fine granular copper oxide, and the ends are stopped with plugs of asbestos fibre. The connection of A and B is made with rubber tubing wired on, and covered with wet lamp-wick shown at *j*. This wick must be kept wet during the combustion by running water over it. Two discs of asbestos board through which the tube C passes are shown at *h h*. The tube C is heated by the burner D.

To prepare the apparatus, the tubes A and B are filled with water by raising the bottles *a* and *b*, which are attached to the tubes by rubber tubing. The next step is to fill the apparatus from the cock *c* to the narrow part under *g* with atmospheric nitrogen. This is done by lowering the bottle *a* and opening the cock *e*; thus admitting air into A. Cock *e* is then closed, and the funnel filled with sodium pyrogallate solution, which is gradually allowed to flow into A. When all the oxygen has been removed from the air in A, the cock *c* is opened, and the nitrogen passed from A to B and back several times, applying some pyrogallol solution



when the nitrogen is in A. Finally, the bottle *b* is raised so that the level of its water is at the narrow part of B under *g*. When the water in B is at this mark, the cock *c* is closed, the three-way cock *f* opened to drain A, and *e* also opened. The tube A is then emptied, and washed out with water admitted through the funnel; and the bottle *a* is emptied, washed out, and filled with fresh water. It is then raised above *e*, and when A is full of water the cock *e* is closed. The apparatus is now ready for the gas which is to be analyzed.

The funnel is removed, and the gas admitted to A. When a little more than 100 c.c. of the gas has been admitted to A, the cock *e* is closed and the funnel replaced. The excess of gas over 100 c.c. is expelled, and the volume adjusted in the usual manner. We now have 100 c.c. of gas in A, and proceed to make the absorptions in the same manner as in the Elliott apparatus; admitting the reagents in turn through the funnel. The tube A being graduated, the various contractions are read on it. When all the constituents of the gas have been determined except hydrogen, methane, and nitrogen, the residual gas is passed into B and the cock *c* closed. A and *a* are now washed out and refilled with fresh water. The burner D is lighted, and a small flame permitted to burn about 3 inches below C. The gas is passed from B to A and back about six or eight times. The burner is removed, and water run over C to cool the gas. When cool to room temperature, a reading is taken by raising *b* until its water-level coincides with the water-level in B. The heating and cooling may be repeated to ensure that all the hydrogen is burnt. The contraction found gives the hydrogen. The burner D is replaced, and C raised to a red heat. The funnel is filled with sodium hydroxide solution (10 per cent.), and the gas passed from B to A and back. When in A, the cock *c* is closed and some sodium hydroxide admitted. This is continued until no further contraction is observed in the volume of gas. The burner is removed, and the tube C cooled with water as before. When at room temperature, a reading is taken of the gas in B; and this gives the nitrogen. The sum of the constituents subtracted from 100 gives the methane. Any ethane is burnt, and reported as methane.

This apparatus, as originally used, had a platinum tube at C; but it was found that the reduced copper alloyed with the platinum, and this caused the tube to crack. A quartz tube was tried, and found to answer very well. It may be heated to redness and suddenly cooled with water without danger of cracking; and neither copper nor copper oxide has any effect upon it. It may be readily cleaned by immersing in *aqua regia* in a test-tube; allowing it to stand over night, washing out with water, and drying in a flame. It then can be cooled and refilled with copper oxide.

When an analysis is finished, the tube C is heated again to redness, and air passed through. This oxidizes the reduced copper to copper oxide. The last of the oxide is then removed by pyrogallol, and the water-level in B adjusted to the narrow part as before. A and *a* are emptied, washed out, and refilled with water, and the apparatus is ready for the next analysis.

The following comparisons were made of results from this apparatus and from an Elliott apparatus. A portion of the residual gas from the latter apparatus was passed into A by a capillary tube, and the combustions made as above described.

	Elliott, Per Cent.	Copper Oxide Apparatus, Per Cent.	Difference, er Cent.
Hydrogen . . . . .	32.5	32.7	0.2
Methane . . . . .	17.9	18.8	0.9
Nitrogen . . . . .	4.6	5.3	0.7

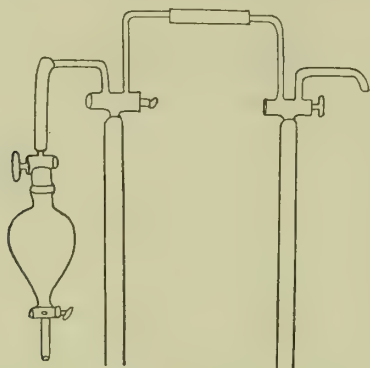
Mr. Henry Rule, Assistant-Manager at the Falkirk Corporation Gas-Works, has been appointed Gas Manager of the Kelty Gas Company, Limited, in succession to Mr. James Dickson, who, as announced in the "JOURNAL" a fortnight ago, has obtained the position of Gas Manager of the Forfar Corporation. Mr. Rule is President of the Eastern Division of the Scottish Junior Gas Association; and this is the second promotion from the ranks of this branch of the Association within the past few weeks.



## SIMPLE EUDIOMETER FOR GAS ANALYSIS.

At a Meeting of the Yorkshire Section of the Society of Chemical Industry, a paper was submitted by Messrs. F. W. RICHARDSON and A. JAFFÉ, in which they described a simplified form of eudiometer for general gas analysis. The paper, with some notes of the few remarks upon it, appeared in a recent number of the Society's "Journal," from which the following portions of it are reproduced.

The illustration will suffice to show the simple modification of, and addition to, the ordinary nitrometer. The side flask with its stoppered thistle funnel and small reflux bulb, or the bulb made from an ordinary pear-shaped separator, is exhausted of its air by means of a Geissler glass filter-pump. Any small amount of residual air is now removed by means of the mercury columns of the eudiometer. In this manner a perfect vacuum can be obtained. The entire absence of air or gas of any kind is a desirable feature in a number of operations. By means of the side bulb *in vacuo*, the estimation of gases dissolved in water is easily



done. The bulb, with the measured volume of water, is immersed in water at about 80° C. The gases are soon extracted and removed to the more remote tube, or laboratory vessel. Into this the usual solutions for removing the carbon dioxide and then the oxygen are admitted, and these gases are calculated from the losses observed. A well boiled and cooled water was shaken vigorously with air until presumably saturated. In our eudiometer, a rapid estimation of the dissolved gases measured at 0° C. and 760 mm. showed 0.64 per cent. of oxygen and 1.32 per cent. of nitrogen—the amounts observed by various authorities.

Where the quantity of gas dissolved in a water is very small, quite a large flask may be used for the extraction. We use a 500 c.c. flask, and insert a perforated rubber cork bearing a stoppered glass tube. After producing a complete vacuum, a known volume—some 400 c.c.—of the water is allowed to enter the flask. At a temperature of about 80° C., the whole of the gases can now be extracted and transferred to the laboratory tube. If the perforated rubber cork containing the straight tube with stopper is inserted into a large pear-shaped separator with the terminal tube cut short, we are able not merely to estimate the dissolved gases in the water, but also to determine the amount of combined carbon dioxide. A few cubic centimetres of normal sulphuric acid are allowed to enter by the bottom tap to liberate this carbon dioxide. That the estimation can be accurately made is shown by the fact that 0.2514 gramme of pure mon carbonate of sodium, after solution in gas-free water, gave carbon dioxide corresponding to 100.1 per cent. of  $\text{Na}_2\text{CO}_3$  in the sample taken.

For the analysis of such complex mixtures as coal gas, we have used the excellent eudiometer devised by Dr. Bone; but this piece of apparatus is complex, and requires careful handling. Moreover, it is expensive. By attaching a gas explosion burette to the side outlet from the laboratory tube, we are able to make a fairly accurate analysis of coal gas. The carbon dioxide is first absorbed by potassium hydroxide, the oxygen by pyrogallate, and the olefines by bromine water. As the bromine acts upon the mercury and produces a species of scum which interferes with the readings, we tried several chemicals to remove the mercury bromide; and at last we found potassium cyanide effected this completely. Of course, all cyanide must be subsequently washed out of the eudiometer.

The following figures show a comparison between the results obtained from the analysis of a coal gas by Dr. Bone's apparatus and our eudiometer:—

	Bone.	Richardson and Jaffé.
Hydrogen . . . . .	47.19	48.02
Methane . . . . .	37.22	37.81
Hydrocarbons ( $\text{C}_n\text{H}_{2n}$ ) . . . . .	5.01	5.04
Carbon dioxide . . . . .	1.39	1.17
Carbon monoxide . . . . .	6.79	6.58
Oxygen . . . . .	0.18	trace
Nitrogen (by difference) . . . . .	2.22	1.38

This year's meeting of the American Gas Institute will—according to an intimation just issued by the Secretary, Mr. A. B. Beadle—be held in New York City.

## REGISTER OF PATENTS.

### Manufacture of Incandescent Mantles.

STILL, W. M., and ADAMSON, A. G., of Hatton Garden, E.C.

No. 25,549; Nov. 26, 1908.

This invention has reference to the manufacture of incandescent mantles, and has for its objects to obviate uncertainty of results and waste of material, to reduce to a minimum the time taken to complete the process, and to produce a mantle finer in structure and more tenacious in character than that usually obtained by other processes.

The improvements relate to various steps in the process of manufacture and to the method of carrying out the process. One improvement is the use of a mixture of steam with a gas (such as ammonia), or with the vapour of any organic base capable of converting the salts of the rare earths into oxides, such as pyridine or the like, or an admixture of such, as a precipitant wherewith to precipitate the oxides from the nitrate salts held in the body of the impregnated fabric. Another improvement is the use of such gases or vapours without steam as precipitants for converting into oxides the salts in the body of fabric contained in a vacuum chamber. Still another improvement is the treatment of the fabric, before its impregnation with the salts of the rare earths, with steam, so as to expand its strands and open its fibres.

### Manufacturing Incandescent Gas Mantles.

ROBIN, J. I., of Tooting, S.W.

No. 5093; March 2, 1909.

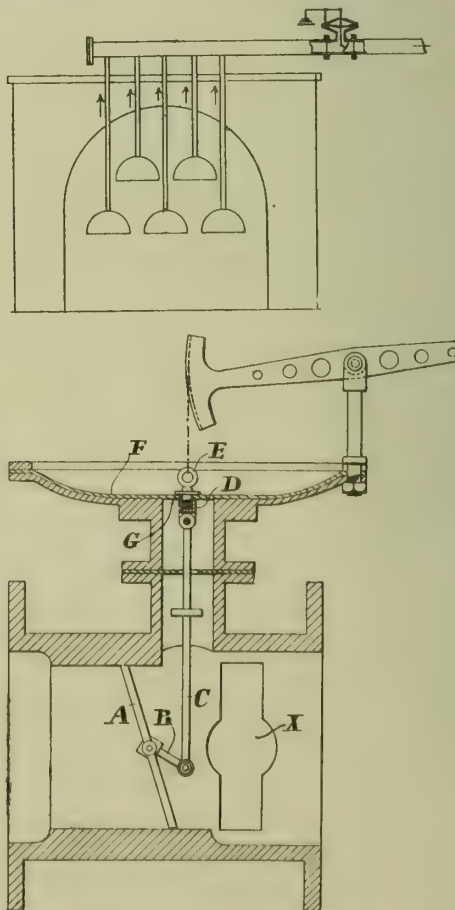
This invention relates more particularly to a method in which the incandescent gas mantle stocking is mounted and clipped upon two mandrels arranged in alignment with one another; the object being to enable this method of manufacture "to be adopted in such a manner as to facilitate accurate and rapid manipulation by the operator, whereby a greatly increased output per operator can be effected."

### Governor for Regulating the Flow of Gas in the Foul-Gas Main.

REESON, J. N., of Beckton.

No. 5278; March 4, 1909.

This invention, relating to the automatic regulation of the flow of gas in the foul-gas main, consists in the use of a special valve or governor in the foul-gas main, and subject to the same conditions—viz., working under vacuum—for the purpose of keeping a uniform vacuum in the main.



Reeson's Foul-Gas Main Governor.

The illustrations show the valve or governor applied to the foul main, and a vertical section of the valve itself.

The method of obtaining a uniform vacuum is by placing the governor direct in the foul main itself and in the neighbourhood of the retorts, and passing the whole of the gas through the governor valve. In retort-house governing, the valve will be working with the underside of the diaphragm exposed to the action of a partial vacuum; for it is



the degree of this vacuum on the inlet side of the governor which, the patentee points out, controls the working of the valve—the valve taking the position shown when (1) there is a large decrease in the yield of gas from the retorts; or (2) an increase in the speed of the exhaustor has caused such an increase in the vacuum as to pull the diaphragm right down and entirely close the valve—thus preventing further withdrawal of gas by the exhaustor until sufficient gas has come from the retorts to restore the vacuum to the correct amount.

The valve A may be of throttle or other type, connected by an arm or lever B, link C, socket D, and screw eye E, with the diaphragm F, which on its underside G is open to the gas vacuum. Owing to the high temperature of the gas as it leaves the retorts, and the deleterious impurities it contains, the diaphragm would be quickly destroyed; and to obviate this, the diaphragm is formed of closely woven canvas and rubber cloth "or other suitable material, for the purpose of rendering it impenetrable while readily yielding to the gas vacuum."

The eye of the diaphragm is connected to one end of a pivotal beam, which at its outer end is weighted so as to adjust the valve in its required position. X represents the usual covered hand-hole for access to the valve.

The diaphragm is preferably provided with a cover, which protects it from external injury, and also forms a chamber above it which the air only obtains inlet to, and egress from, through a small hole, "thus cushioning the diaphragm and preventing any jerky movement of the valve during vibrations of pressure of the gas on the side of the diaphragm open to the main."

### Bye-Pass for Incandescent Inverted Burners.

FOSTER, H. A., and JACKSON, C., of Tottenham.

No. 6563; March 18, 1909.

This invention has for its salient feature the provision of means whereby a single inverted flame or two horizontal flames are left burning within the mantle—thus "abolishing concussion on the mantle when the same is lit up and increasing the life of the mantle."

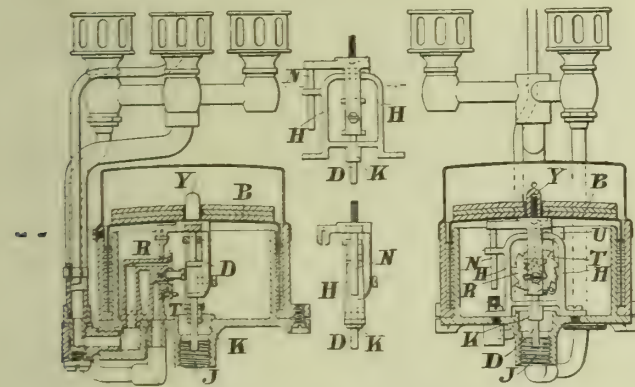
The bye-pass extends from the underside of the gas-cock and passes down through the burner tube to the interior of the mantle. It is perforated at its lower end to admit of a single flame or the two horizontal flames; gas in its passage to the bye-pass being regulated by two adjusting screws which engage in the usual groove of the gas-cock. To prevent the destruction of the lower part of the bye-pass tube, it is made up of two parts connected together—the lower part being of steatite and the upper part of brass, which at its other end is secured to the gas-cock.

### Automatic Gas Lighting and Extinguishing Apparatus.

ANDERSON, J., of Edinburgh.

No. 6754; March 20, 1909.

This invention relates to automatic gas lighting and extinguishing appliances, especially those in which a loaded bell provided with a mercury seal is lifted by means of temporary increase in the pressure of the gas in the mains, thereby actuating a device for admitting or preventing the access of gas to the burners.



Anderson's Automatic Lighting and Extinguishing Apparatus.

The part of the guiding means attached to the bell B consists of a bracket fixed to the underside and at the centre of the dome of the bell. At the other end of the bracket is a lug, through which passes a guide-rod D, secured by a set-screw. The guide member attached to the base of the pressure chamber is formed by two upright side pieces H, connected together at each end by a cross piece preferably formed in one. This member is placed directly over the gas-inlet J, and the cross pieces are pierced to form bearings for the rod D. One of the cross pieces of the guide member attached to the base of the pressure chamber (preferably the lower one) is formed with an extension so as to provide a bearing K of relatively great length compared with its diameter; and the length of the guide-rod below is such that, when the bell is raised to its highest position, the rod just extends beyond the end of the lower bearing. The upper cross piece is in close proximity to the top of the bracket, where the latter is fixed to the bell, and the lower cross piece is in close proximity to the base of the pressure chamber. The lug on the bracket, through which the guide-rod passes, is placed between the two cross pieces; and the distance between the under surface of the top cross piece and the top surface of the lug of the bracket, when the bell is in its lowest position, determines the height to which the bell may rise.

One of the uprights H of the guide member attached to the base of the pressure chamber is provided with a slotted lug, in which works another rod N, which prevents any circumferential movement of the bell, and also serves to steady it.

The construction may be modified in many ways—for instance, the guide-rod D may be fixed rigidly to the member attached to the base of the pressure chamber and the bracket carried by the bell be adapted to slide on it. By placing the guide means within the bell, the bearings can be arranged on substantially the same level as the mercury seal, and forces acting to cant the bell are prevented from producing a turning moment, which would cause the bearings to bind. These forces can only produce on the bearings side-pressure, which cannot affect the operation of the apparatus.

A step-by-step valve B, of the rotary disc type, is provided to control the supply of gas to the burners; being operated by a pendulum link T, attached to the dome of the bell itself, or carried by an extension of the bracket attached to the bell. This pendulum link is provided at its point of support with a short arm U, at right angles to the link, and acting as a stop to limit the angular movement of the pendulum link when the apparatus is laid on its side or otherwise placed, thereby ensuring that the link shall assume an operative position when the apparatus is in a working position. The pendulum link is provided, at the end remote from its joint support, with a pin, which engages with ratchet teeth formed on the valve.

An extension Y on the upper side of the bell serves to position weights for loading the bell to correspond with the gas pressure of the service to which the apparatus is connected.

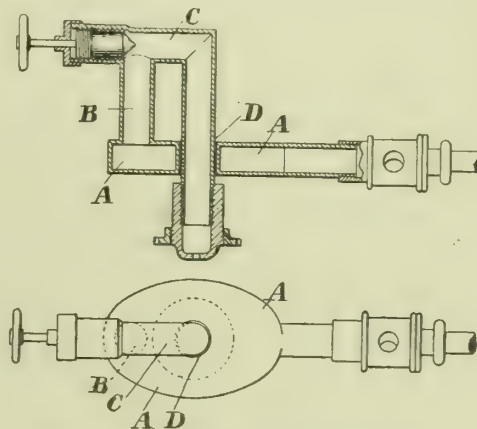
The bell and its mercury seal are enclosed by a cover or cap, which fits closely over the outer wall of the mercury seal, whereby the air contained within the cover cannot escape when the bell rises, except by a small orifice provided for the purpose. This orifice only allows the air to escape slowly; and thus any increases of the gas pressure in the mains, unless of a predetermined value and duration, are prevented from lifting the bell and so lighting or extinguishing the gas at any other time than that required.

### Regenerative Gas-Burners.

GLOVER, R. B. G., of Queen Victoria Street, E.C.

No. 10,664; May 5, 1909.

This invention relates to gas-burners in which the gas and air are heated before combustion; the object being to construct the appliance through which the gas and air pass, so that they are "very highly heated," and there is "no possibility of flashing or lighting back at the gas spit."



Glover's Regenerative Incandescent Burner.

The heating chamber proper (as shown) is in the shape of a flat, circular, oval, or other shaped box, having at the edge or at one side a pipe or opening leading to, or for connection with, the gas supply pipe and mixing-chamber A, and to which opening the gas and air inlets may be connected. From the box a pipe B is led—preferably from the side, bottom, or top opposite to the entrance of the gas and air. The pipe is led upwards a certain distance; then curved or brought at right angles as at C towards the centre of the box; and then down through the box at or near the centre as at D, so as to project below the box the required distance. To the end of the pipe D is affixed the burner proper. The pipes B C D are arranged in this way so as to form a syphon, which is said to effectually prevent lighting-back and the explosion of the mixture of air and gas at the burner orifice.

At some convenient point of the syphon is a screw for regulating the flow of air and gas, operated by a thumb-button so as to reduce the area of the passage through the syphon, either by itself or with the aid of a ring as a seating or otherwise.

When used for inverted incandescent gas-lighting, the burner and mantle are placed just under the centre of the box, and, if used for upward flame-gas lighting, the pipe may be extended and curved so that the flame or incandescent body is just under the box.

By this invention, the patentee points out, the heat of the products of combustion plays directly upon the bottom of the box and completely over it, passing up the outer edge, and acting upon the pipe or pipes projecting above the box, so that the whole of the appliance is heated to a great extent, imparting its heat to the gas and air which enter at the side, bottom, or top, pass across or through the box, up and along or round and down the tube to the burner, where the mixture "issues as an atmospheric flame of great intensity, and produces a more brilliant incandescence of the mantle or other filament than has hitherto been obtained."

### Automatically Lighting and Extinguishing Street-Lamps.

CLERC, E. C., and BIDAULT, E. A., of Paris.

No. 16,628; July 16, 1909.

This apparatus for lighting and extinguishing gas street-lamps at predetermined times, is said to "work indefinitely without requiring



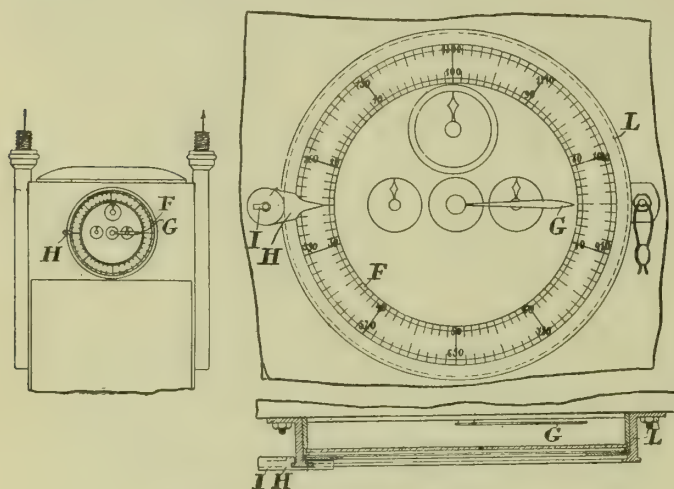
any other attention than the maintenance of the electric battery which suffices to effect its actuation." The apparatus comprises an electromotive device adapted to open and close periodically the cock which governs the supply of gas to the burner; automatic regulating mechanism by means of which the apparatus (once adjusted) lights the gas-burner each day at a definite time, and keeps it alight with due regard to the hour of sunset and the length of the night at the corresponding season of the year; and an electric igniting device which "saves the expense and trouble resulting from the use of a permanent pilot light." The feature of the proposed arrangement is that the cock regulating the passage of the gas is actuated by the fall of a weight raised periodically by pins governed by an arm which receives its actuation from the core of an electro-magnet.

### Indicator Scale for Gas-Meters.

FRANK, A., of Charlottenburg, near Berlin.

No. 19,534; Aug. 25, 1909.

The object of this invention is to provide means whereby a gas customer may "readily himself determine his daily, weekly, or other expenditure, or control expenditure in his absence." It consists in a value indicator scale within an enclosed and sealed chamber, and a pointer (adapted to be adjusted exteriorly without breaking the seal of the chamber) to co-act with the value scale to enable the customer to determine the value expended in any desired interval.



Frank's Indicator Scale for Gas-Meters.

The meter shown is provided with a scale F and the corresponding pointer G. The inner scale may represent units of gas used, while the outer one represents the money value of the gas. The scale and pointer are enclosed in a casing L (having a glass face), usually sealed with a lead wafer. In order that the consumer can determine the value of the gas used in any given time, there is an external pointer H, which is adapted to ride on a ledge on the casing L, and may be clamped in any position desired by inserting a key in the opening I. Thus only the possessor of the key can effect adjustment of the indicator pointer H; and this adjustment may be effected without breaking the meter case seal.

### Gas-Burners.

BOULT, A. J.; a communication from F. Yockey and J. H. Jones, of Sioux City, U.S.A.

No. 19,962; Aug. 31, 1909.

This invention has particular reference to burners in which the gas supply is automatically cut off after the flame is extinguished, by a valve actuated by expansion and contraction due to changes of temperature. The automatic cut-off consists of a pillar having an opening in one side and with a tube of expansive material secured in the opening. There is a valve in the pillar, and a lever pivoted therein is adapted to control the valve. A wire secured in the tube permits the valve to open by the pressure of gas on it or to hold the valve closed, according as heat is applied to or withdrawn from the tube and the tube consequently expanded or contracted.

### Recovery of Bye-Products from Gases.

OTTO AND CO., G. M. B. H., of Dahlhausen a/Ruhr, Germany.

No. 21,010; Sept. 14, 1909. Date claimed under International Convention, Oct. 7, 1908.

In the recovery of bye-products from gases derived from combustibles, the patentees state, it is essential to separate the tar from the gases; and endeavours have recently been made to separate it at a comparatively high temperature, "in order that the gases may be conducted directly into an acid bath for recovery of the ammonia." A very effective separation at a high temperature is afforded by the use of a spray of tar which removes the tar from the gases at a single operation; a few grammes per 100 cubic metres being left after the treatment.

This and other tar-separating processes are, according to the present invention, essentially simplified and facilitated by dealing with the crude gases as they are produced, in two portions—first, a larger portion from which the tar is removed by suitable treatment and then a smaller portion, which, being the last produced, is practically free from tar. This portion is mixed, before it is cooled, with the larger portion after the treatment of the latter for the removal of the tar.

In the carbonization of coal in coke-ovens—that is to say, in coking processes generally—the gases produced during the last period of the

process contain little or no tar, because the high temperature of the oven has decomposed the tar into volatile hydrocarbons. It has already been the practice for some purposes to separate the gases produced during the different periods of the carbonization; and devices have been used for separating the gases for different applications, such as lighting and heating.

The invention is said to possess special advantages for separating tar from the gases at a high temperature, since it prevents the condensation of steam and thus favours the direct precipitation of ammonium salts in the saturator. No further details of procedure are given; and the specification concludes with this claim: "In the recovery of bye-products from gases derived from combustibles, dealing with the crude gases in two portions as they are produced in such a manner that a smaller portion, which is that produced last and is substantially free from tar, is mixed before it is cooled with the larger portion after the latter has been freed from tar."

### APPLICATIONS FOR LETTERS PATENT.

- 6178.—SCHMIDT, O., "Regulating cocks." March 11.  
 6235.—JONES, G. H., "Mantle rods." March 12.  
 6246.—BREEDEN, J., AND CO., LTD., and BREEDEN, F., "Gas-valves." March 12.  
 6250.—CUSS, C. T., "Incandescent gas lighting and heating." March 12.  
 6260.—OECHSLIN, H., "Rotary pumps." March 12.  
 6282.—WAGENER, E., "Separating tar from hot gas." March 12.  
 6328.—SCOTT-SNELL, E., "Compressing air for gas-lamps." March 14.  
 6334.—BOURNE, J. J., "Governor for air-gas generators." March 14.  
 6396.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires." March 14.  
 6427.—LYNES, W., "Gas-taps." March 15.  
 6496.—SANDMANN, F. W., "Gas-fired furnaces." March 15.  
 6502.—SANDMANN, F. W., "Gas-producers." March 15.  
 6507.—GLOVER, R. B. G., "Inverted burners." March 15.  
 6508.—BURSTALL, F. W., and BRITISH PURE FUEL, LTD., "Extracting tar and other bye-products from gases." March 15.  
 6509.—BURSTALL, F. W., and BRITISH PURE FUEL, LTD., "Improved construction of retort." March 15.  
 6525.—JONES, J., "Ammonia concentration plant for gas-works." March 15.  
 6549.—JACKSON, S., "Cutting pipes for branches." March 15.  
 6556.—PARKINSON AND W. & B. COWAN, LTD., and CHESHIRE, W., "Street-lamps." March 15.  
 6557.—HARRISON, S. C., "Chandelier-chains." March 15.  
 6685.—MILLER, W., and NICOLSON, W. B., "Constant pressure gas thermometers." March 17.  
 6755.—WEIL, J. A., "Suction-producers." March 17.  
 6786.—OTHMER, E., "Gas-regulators." March 17.  
 6793.—TULLY, C. B., "Retort-furnaces." March 17.  
 6806.—WHITE, O. H., and SHARPE, J., "Air-heating devices for gas-burners, stoves, or the like." March 18.  
 6811.—HARRISON, E. J., "Plate-rack and linen-airer applied to gas cooking-stoves." March 18.  
 6815.—MARCUS, H., "Conveyors." March 18.  
 6898.—HUESSENER, K., SCHAEFER, J., and HENSS, E., "Removing the aqueous vapours from dry distillation gases freed from tar and ammonia." March 18.  
 6899.—HUESSENER, K., SCHAEFER, J., and HENSS, E., "Extracting tar from hot distillation gases by means of tar, gas-water, or both." March 18.  
 6900.—HUESSENER, K., SCHAEFER, J., and HENSS, E., "Extracting ammoniacal salts from dry distillation gases which have been freed from tar." March 18.  
 6902.—HEADING, H. J., and WILLIS, T., "Slot-meter box." March 19.  
 6905.—BURLEY, F. B., and FROUDE, C. E., "Combined table-lamp and telescopic wall-bracket." March 19.  
 6938.—WADE, J. T., and AUBLETT, HARRY, AND CO., LTD., "Rotary gas or air compressor." March 19.  
 6950.—SPERRY, G., and WOOD, W. H., "Taps or cocks." March 19.  
 6968.—CLARK, W., "Coin-freed meters." A communication from Knauer, Haas, Weichelt, and Elster. March 19.

### Position of the Winchcombe Gas Company, Limited.

The Gas Company at Winchcombe, a town of a little over 2000 inhabitants in Gloucestershire, have for some time been in very low water, and have not paid a dividend for fifteen years. Engineers have been brought in in consultation, and some alterations and repairs have been carried out; but money was lacking, and the thorough renovation that was needed has not been done. The concern has been for sale for years, and numerous would-be buyers have come forward, but only to decline further negotiations. The capital of the Company is £1800 (£50 of which has been forfeited by a late shareholder) and £750 of loans and debentures. There are creditors to the value of £587, and debtors estimated to produce £286. A meeting of the shareholders was held last Tuesday, to receive a report of the Directors as to their efforts to effect a sale. The best offer was one of £1350, from Mr. Sheldon, of Ludlow. It was thought that if this were accepted it would allow 22s. 6d. for each £5 share; and the shareholders were urged to accept this, as if the Company were wound up the expenses would absorb all the assets, and there would not be a penny for the shareholders. There were legal difficulties in the way of selling the works bodily; and it was pointed out that if the shareholders would agree individually to sell to Mr. Sheldon, this would answer the purpose. Mr. Sheldon would not do anything unless it was agreed that at least three-fourths of the 350 shares were transferred to him or to his nominees at the price named. It was at once promised that 262 shares should go to this contemplated purchaser, and others, it was thought, would be forthcoming. Mr. Sheldon expressed himself as satisfied, and the concern will be handed over to him as soon as the transfers can be made out and completed. Mr. Sheldon is prepared to spend £1000 on putting the works into an up-to-date condition.



# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

Tuesday, March 22.

### WATER SUPPLIES PROTECTION BILL.

LORD DESBOROUGH, in moving the second reading of this Bill, reminded their Lordships that it was read a second time last August. He understood the Government now took a more favourable view of the Bill than they did on that occasion. The first principle of the measure was that no water company should sink wells or construct works for obtaining a supply unless these and their sites had been expressly approved by Parliament; the second was that compensation should be due to owners of private supplies which were injured by the abstraction of water for a public supply by means of future works; and the third was that districts whence water might be taken, and through which it might be conveyed by means of future works, should have a right to a share of the water upon terms to be agreed upon, or fixed by, the Local Government Board.

The EARL OF VERULAM remarked that experience gained in Hertfordshire of the results of the depletion of local and private sources of water supply arising from the works of large water companies, led him to support the motion.

The EARL OF LIVERPOOL said the Government had no objection to the Bill being read a second time on the understanding that it would be referred to a Committee of both Houses of Parliament, who would be able to consider the subject generally. The points at issue were of great importance, and it was hoped that the investigation of them by a Joint Committee would lead to some practical proposals being made with a view to putting matters on a satisfactory footing.

The Bill was then read the second time, and referred to a Joint Committee.

The following further progress has been made with Bills:—

Bill presented and read the first time: Aberdeen Corporation Water Bill.

Bills read a second time and committed: Havant Gas Bill, South Lincolnshire Water Bill.

Bills reported, with amendments: Gowerton Gas Bill, Southend Water Bill.

Bills read the third time and passed: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Wicklow Gas Bill.

After the "JOURNAL" had gone to press on Monday last week, it was announced that Lord Blyth had been proposed to the House as a member of the Select Committee on the Gas Companies Standard Burner Bills in place of Lord Joicey, and been accepted; and that Lord Ritchie of Dunfermline would be the Chairman of the Committee.

The Abertillery and District Water Board Bill and the Cambridge Water Bill have been referred to a Select Committee, consisting of the Earl of Kintore (Chairman), Lord Poltimore, Lord De Mauley, Lord Seaton, and Lord MacDonnell, to meet on Thursday, the 7th of April.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Farnham Gas and Electricity Bill, Wicklow Gas Bill.

Bill read a second time and committed: Tipperary Gas Bill.

Bill reported, with amendments: East Grinstead Gas and Water Bill.

The Glasgow Gas Consolidation Bill and the Wishaw Burgh Extensions, &c., Bill have been referred to a Select Committee, consisting of Mr. Mooney (Chairman), Mr. Esslemont, Mr. Elverston, and Captain Tryon; to meet next Tuesday.

The Mallow Gas Bill, Mallow Urban District Gas Bill, Slough Water Bill, South Hants Water Bill, and Tipperary Gas Bill have been referred to a Select Committee, consisting of Mr. Armitage (Chairman), Major Willoughby, Mr. Scanlan, and Mr. Hodge; to meet on Wednesday, the 6th of April.

Last Tuesday, a petition was presented for an additional provision in connection with the Glasgow Gas Consolidation Bill; and it was referred to the Examiners. It had reference to the acquisition of the undertaking of the Baillieston Gas Company.

Last Tuesday, Mr. Norton-Griffiths (Wednesbury) asked the Chancellor of the Exchequer what would have been the revenue which would have been received from the export duty on coal, if it had not been taken off, during each of the past four years, and assuming that the export trade had not been affected by such duty. Mr. Hobbouse, replying to the question for Mr. Lloyd George, said that, under the conditions specified, the revenue that would have been derived from the export duty on coal during each of the four years, 1906 to 1909, inclusive, was estimated at £2,500,000, £3,150,000, £3,100,000, and £3,050,000.

### EAST GRINSTEAD GAS AND WATER BILL.

House of Commons Committee.—Tuesday, March 22.

(Before Mr. ARTHUR STANLEY, Chairman, Mr. HAWORTH, Mr. GUINNESS, and Mr. M'LAREN.)

This is a Bill promoted by the East Grinstead Gas and Water Company for authorizing certain existing water-works and the construction of new water-works, the estimated cost of which would be £19,000.

The opposition came from Mr. James W. Larnach and others, and

the Marriott Trustees, who were represented by Mr. RIGG, K.C.; Mr. ARTHUR H. HASTIE, who appeared in person; and Mr. COOPER, a landowner, who was represented by Mr. CUTHBERT BROWN. For the promoters, Mr. G. J. TALBOT, K.C., and Mr. CLODE appeared.

Mr. TALBOT, in opening, said the Company were incorporated under an Act of 1878, under which, among other things, they were empowered to buy land by agreement up to 5 acres. In 1892, further water was required; and the Company went to Parliament with a scheme, and works were authorized. When the matter came to be investigated, however, it was found that the supply would be a disappointment, and the works were not proceeded with. It was considered by the Company that, in cases where water companies had power to buy land by agreement, they acquired the ordinary landowner's right to take the water from under the land for the purpose of supplying their district. A suitable position was found at Hackenden; but the landowner would not sell part of the 113 acres, and the Company could only purchase 5 acres. The Chairman of the Company undertook to acquire the 113 acres, and let the Company have the part of the land which they wanted for water purposes for £1200. A well was sunk, and a 5-inch main was laid to the water-tower. There was a decision in the Courts with regard to the pumping of water from under land acquired by agreement; and the Company were acting *ultra vires*. One of the principal objects of the Bill was to legalize this supply. A main had been laid under a footpath which was the property of the Marriott Trustees, who brought an action against the Company to restrain them from laying the pipe there, because the water was from an unauthorized source. An injunction was granted; but ultimately the Marriott Trustees allowed the main to be laid under onerous conditions. Another main went into a roadway of which Mr. Hastie and his sister owned the subsoil; and an agreement was entered into in that case also. The Company were also asking for a new pumping-station at Forrest Row. The yield of the Hackenden well was 242,000 gallons per day. One of the chief points in the petition of Mr. Hastie was that he alleged that there was grave risk of the supply of water from the works proposed to be authorized being subjected to contamination and that stringent provision should be made to secure the purity of the water.

Mr. W. V. Graham gave evidence in support of the proposals in the Bill. He said that the new works would cost £19,000, and £3500 had been spent on filtration. The water supply now was good, sufficient, and permanent so far as it went.

Mr. RIGG, in addressing the Committee, contended that it would be a departure in Private Bill Legislation, in the case of a company of this kind coming to Parliament and asking that the agreement which had been entered into with them should be set aside.

Mr. TALBOT, in reply to the Chairman, said the points at issue were that, under the agreement, the pipes were removable after fifty years; that the use of the pipes was confined to certain water only; and that if the roads were broken up they must be repaired by the Company.

Mr. RIGG remarked that they would not press the point with regard to the use of the pipes for certain water only. He contended that where there were special circumstances there should be a variation of the Water-Works Clauses Act; and if the Company wished to lay mains through the Marriott Estate and along the footpaths, it should only be done with the consent of the owner.

Mr. TALBOT said that since the point with regard to the use of the pipes was not pressed, the promoters would consent to the agreement standing.

Mr. CUTHBERT BROWN then addressed the Committee on behalf of the estate of Mr. Cooper; and his contention with regard to the laying of mains was similar to that made by Mr. Rigg.

Mr. HASTIE's case was that he had provided a water supply for his own property; and he asked the Committee to say that any powers given to the Company should not extend to his property.

The Committee found the preamble proved, and that the Bill should proceed subject to the insertion of a clause carrying out the Marriott Estate agreement, with the exception of the point which had been agreed.

## LEGAL INTELLIGENCE.

### PURCHASE VALUE OF THE HAMILTON (N.Z.) GAS-WORKS.

#### Question of Commercial or Structural Value.

The Judicial Committee of the Privy Council, consisting of Lord Macnaghten, Lord Atkinson, Lord Shaw of Dunfermline, and Sir Arthur Wilson, recently had before them an appeal from a decision of the Supreme Court of New Zealand on the question of the amount to be paid by the Corporation of Hamilton (N.Z.) for the undertaking of the Hamilton Gas Company, Limited.

In August, 1895, an Act was passed to authorize the Company to establish gas-works; and by section 46 the Corporation were entitled, at any time after the expiration of twelve years, to purchase the works and plant at a price to be determined by arbitration. The Arbitrators did not agree, and an Umpire was appointed; and he stated for the opinion of the Court the question whether the price should be determined on the basis of the commercial or the structural value. The Supreme Court decided that it should be the latter; and the Company appealed. At the close of the arguments, judgment was reserved; and it was given a few days ago.

Sir R. FINLAY, K.C., and Mr. ROWLATT (instructed by Messrs. Herbert Smith, Gass, King, and Gregory) appeared for the appellants; Mr. LEVETT, K.C., and Mr. NORTHCOTE (instructed by Messrs. Murray, Hutchins, Stirling, and Co.) represented the respondents.

Lord SHAW, in delivering their Lordships' judgment, said the judgment appealed from was pronounced upon a special case stated by Mr. Goldie, who, as Umpire in an arbitration between the parties, made alternative findings with reference to the interpretation to be placed upon the words "gas-works and plant," which were being taken over by the Hamilton Corporation from the Gas Company. The



alternative, upon which a very large difference of valuation depended, was thus stated in the special case:

At the hearing, the Gas Company contended that the price to be paid for the purchase of the gas-works and plant should be the commercial value thereof as a going concern, taking into consideration their present condition, rental value, earning power, and all surrounding circumstances, and not merely as on a sale of apparatus *in situ* and land and buildings; and that the Arbitrators and Umpire, in arriving at and determining such price, were entitled to capitalize the net annual profit or rental which, in their opinion, the Gas Company was, and might reasonably be expected to be, able and continue to earn and receive thereby and therefrom.

On the other hand, the position of the Borough Council was thus stated:

The Borough Council claimed that the price should be merely the value of the gas-works and plant regarded as gas-works and plant *in situ* capable of earning a profit, and that this value should be arrived at by taking the present value of the land and buildings and adding thereto what would be the present cost of the machinery and materials of a similar gas-works and plant and of placing such gas-works and plant *in situ* and making good the ground and deducting a sum for depreciation; or by taking the cost of the land, buildings, gas-works, and plant, and of laying down the gas-works and plant, making good the ground, and deducting a sum for depreciation.

Stated in the briefest terms, the controversy between the parties was accordingly whether the gas-works and plant should be treated as merely the material thing or as truly the undertaking for which that thing existed. The case depended not upon any rule or principle of law of general application, but solely on the just construction of the language regulating the measure and nature of the claim. It was argued that the Company had no monopoly or goodwill to dispose of, because they were liable to be bought out in twelve years. But circumstances might have so shaped themselves as to make it unwise for the Corporation to take over the gas supply, and the Company might have been left—and had the profit been small or dwindling, they probably would have been left—for an indefinite period undisturbed. While the position of the Company was measured by the language of the Statute, the Corporation had certain powers of acquisition under the Municipal Corporations Act of New Zealand, 1886. It was very plain that if the Corporation of Hamilton had attempted to exercise their general powers, under the Statute Law of New Zealand, for the acquisition of the gas-works, there could have been no doubt that they would have bought not only the works themselves, in the material sense, but all rights, powers, and privileges in connection with them; and that, on the other hand, so strong were those rights, powers, and privileges, that the Corporation were prohibited from establishing rival works in the same locality or any part thereof, except after obtaining the authority of the Legislature to do so by a Special Act. The Corporation were accordingly apprised of the wide scope of the term "gas-works," so far as the general law of New Zealand as to the acquisition of such works was concerned. On the other hand, the Company were apprised of the same fact; and, in these circumstances it appeared to their Lordships that, if a more limited signification of the term was to be introduced by the Company's Act of 1895, such limitation should have been plainly and easily made in language which would have excluded either monopoly, goodwill, or undertaking as such from being included within the term "gas-works and plant" employed. One limit to the profit-earning power of the undertaking appeared in the Act—viz., that the profits could never be declared at more than 15 per cent.; any balance over this figure being by anticipation drawn off for the benefit of the community in the reduction of the price of gas. All these matters were elements for consideration in ascertaining the price to be paid for the undertaking. In their Lordships' opinion, the decision of the Court below on the point submitted in the appeal was wrong; and they humbly advised His Majesty that the appeal should be allowed, and that the answer to the first question put by the Umpire in the special case should be that the price to be paid for the gas-works and plant of the appellants was £31,382. The respondents must pay the costs of the appeal.

### CLAIM FOR WATER-RATE AGAINST A RECEIVER.

In the King's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Channell delivered his considered judgment in an action brought by the Metropolitan Water Board (for whom Mr. Danckwerts, K.C., and Mr. A. B. Shaw appeared) against one Brooks, a receiver (represented by Mr. Horace Avory, K.C., and Mr. Givens), who was sued for water-rate as an "owner by Statute" of certain flats in the East End. The facts are set forth in the judgment.

His Lordship said a Mr. Davies was owner of the flats, and he agreed with the East London Company for a supply of water to them by meter; the water to be conveyed through a pipe of larger dimensions than the Company were bound to use. Therefore the supply was entirely under the agreement, which provided for a minimum rate of payment and a rate per 1000 gallons of water supplied in excess. The agreement had never been determined, and the supply had continued practically on the terms contained in it. Davies got into arrears with his payments; and when there were substantial arrears, his mortgagees, the Norwich Union Insurance Company, took possession of the premises, and appointed defendant Brooks receiver of the rents. The question arose whether Brooks was personally liable for the arrears of water-rate. It was quite clear that he could not be liable at common law on the agreement with Mr. Davies, and he was not liable unless the Statutes set forth to the contrary. He (his Lordship) therefore had to consider the Statutes. The plaintiffs said that, under the various Statutes dealing with water companies, the defendant was liable, because, as receiving the rents of the tenements for the persons interested, he must, for the purpose of the water-rates, be deemed to be the owner of such tenements. This was a convenient remedy given to water companies in case of tenements where it might be difficult to find the real owners; and it was also intended for the relief of occupiers who were not in default. The question was whether Brooks was to be deemed to be the owner under the 81st section of the East London

Water Act; and, looking at the purpose for which the Act was passed, the point was whether the owner there did not necessarily mean the real owner, who had the property charged with the water-rate, or whether it could be applied to a mere constructive owner, such as Mr. Brooks, as receiver and manager. In his opinion, it could not be so applied; and a merely constructive owner such as a receiver and manager could not be made liable for arrears of water-rate. Water-rates were a charge on the property; whereas here it was sought to make Brooks personally liable. He was not the owner under the Act, because he received the rents for the Norwich Union Insurance Company. Upon these grounds, he thought the claim failed. The plaintiffs asked also for a declaration that the rates were a charge on the property; and this was the case. He could not, however, make such a declaration against the defendant, who was a mere manager or agent, in the absence of the real owners of the property as parties to the action. The action therefore failed; and judgment must be for the defendant, with costs.

### Embezzlement by a Gas Manager.

Before the West Riding Magistrates at Doncaster last Tuesday, Walter Blinco, Gas Manager, was charged with embezzling £72 17s. 6d. belonging to the Conisborough Gas Company. In opening the case for the prosecution, Mr. J. L. Turner said prisoner's duties as Manager of the Conisborough Gas-Works included seeing to the collection of money in the slot-meters. Prisoner had been in the service of the Company for five years; and his duties were all satisfactorily performed until recently, except that upon one occasion he was censured for being the worse for drink. Between Dec. 31 and the day of the arrest, Charles Oswald, the collector, paid over £374 17s. 6d., and received receipts up to the amount of £370 19s. 2d. About the middle of January, the Secretary of the Company (Mr. A. E. Rands), wishing to make up his books, wrote to prisoner asking him how much had been collected for the last quarter; and he replied £370 19s. 6d. He also stated that he had paid £300 worth of copper into the Sheffield Bank; and he would pay the remaining £70 odd in at the Mexborough branch during the week. Prisoner did not hand in the balance of the money; and the Secretary wrote to him again, when he replied that he had been very busy. Ultimately, the Secretary reported the matter to the Chairman of the Company (Mr. C. Kilner), who went to the office the same day. Prisoner did not account for the balance; and Mr. Kilner went out to seek legal advice. When he returned, prisoner had gone and left his key. An examination of the safe disclosed the fact that there was £72 17s. 6d. short. Later prisoner delivered himself up to the police at the Conisborough Railway Station, after sending word that he would be there. Prisoner pleaded guilty, and said: "I hope you will take into consideration my previous good character. Until a year-and-a-half ago, I was a teetotaler, from 1885. Only bad company, drink, and gambling have brought me into this to-day. I have a family of little children." Prisoner was sentenced to three months' imprisonment.

### Metropolitan Water Board and Farming Agreements.

The case of the *Metropolitan Water Board v. Cannon*, which came before his Honour Judge Woodfall, in the Westminster County Court early this month, on a reference back to him from the King's Bench Division, as reported in the "JOURNAL" for Nov. 2 last, was decided a few days ago. It was a claim against the occupier of a flat at Brixton for water-rate which he said he had paid in his rent. The occupants of the flats in question paid inclusive rents, and under a farming agreement the landlord was to pay all rates. Having received demands for water-rates, they consulted Mr. George Kebbell, with the result that it was agreed to make a test case of the claim against Mr. Cannon. Mr. A. B. Shaw, for the Water Board, cited the Water-Works Clauses Act and the Board's Charges Act in support of his contention that the consumer was liable. Mr. Givens appeared for the defendant. His Honour had previously held that the consumer was liable, and he said a second trial of the case had not altered his opinion. He could not understand why the case had been sent back to him. It was a question of law, and he must assume that the Divisional Court considered he was wrong; but the Court took a strong view because, he was told, an unauthenticated note of his judgment was taken, and plaintiffs' Counsel was practically never heard. He must give effect to his decision, and enter judgment for the defendant, with costs. Mr. Shaw asked leave to appeal; but his Honour refused it.

### Maintenance of Water-Supply Pipes.

The disputed liability for maintaining water-pipes from mains to residences has been productive of two days' litigation in the County Court at Portsmouth, where, on Monday last week, the Portsmouth Water Company obtained a reverse judgment at the hands of his Honour Judge Gye. The action was brought by Mr. Thomas Parnell, who claimed 20s. 8d. for repairing a pipe between the main and his house; the Company having threatened to cut off the water in consequence of leakage. Mr. Payne contended for the plaintiff that his client had no power to break up the public road, and, moreover, the Company had placed a tap outside each house in the borough, which showed that tenants were liable only for pipes under their own roofs. Mr. Cababé maintained the view that all the repairs from the mains devolved upon consumers. His Honour, in the course of a lengthy judgment, complained of the indecisive wording of the Act of Parliament, but, owing to the Company's threat to cut off the water, he decided in favour of the plaintiff, with costs. In view, however, of a possible appeal by the Company, execution was stayed for a month.

The Annual National Trades and Industrial Exhibition was opened on Monday of last week at Bingley Hall, Birmingham. Almost every trade and manufacture is represented; the present show being the largest of the series. Among the gas exhibits, the Corporation Gas Department illustrate four recent systems of high-pressure lighting.



## MISCELLANEOUS NEWS.

### BOLLINGTON GAS-WORKS IMPROVEMENTS.

#### Local Government Board Inquiry.

Last Wednesday, an inquiry was held at the offices of the Bollington Urban District Council, by Mr. R. C. MAXWELL, K.C., respecting an application made by the Council to the Local Government Board for a Provisional Order to partially repeal, alter, or amend the Bollington Improvement and Lighting Act, 1862, so as to remove the limitation of the amount of the general district rates levied in any one year; to enable the Council to purchase by agreement a plot of land adjoining their gas-works; to provide for reducing the illuminating power of the gas; to enable the Council to borrow, with the sanction of the Board, further moneys for the purposes of their gas undertaking; to remove any doubt as to the validity of the outstanding loans of the Council for the purposes of that undertaking; and for other purposes. The total amount required for the gas undertaking was £27,859; but £17,000 of it has already been borrowed, and of this loan the Board have sanctioned £15,000. The present application, therefore, was for authority to borrow a further £10,000, and to obtain the sanction of the Board to the balance of the £17,000 not already sanctioned (£2859).

Mr. SAMUEL KNIGHT, the Clerk to the Council, explained that they asked permission to insert a clause in the Provisional Order allowing them to supply gas of 16 instead of 18 candle power. The Council considered they were justified in asking for such a reduction, inasmuch as out of 697 local authorities and companies supplying gas, only nine, including Bollington, were required to supply gas of 18-candle power or more. Of 24 local authorities and companies in Cheshire supplying gas, only two—Bollington and Wilmslow—were required to send it out of 18-candle power; in six cases it was to be of 16-candle power; in eight, of 15-candle; in seven, of 14-candle power; and one (Stockport) was not required to supply at any fixed standard. Taking England and Wales as a whole, there were five local authorities and four companies supplying gas of 18-candle power, 25 local authorities and 20 companies supplying 16-candle gas, 83 local authorities and 179 companies supplying 15-candle, 94 local authorities and 261 companies supplying 14-candle, and 16 local authorities and 20 companies were not required to supply at any fixed standard. From these particulars it would be seen that the greater portion of the local authorities and companies were only called upon to supply gas of 16-candle power or less; the numbers being 653 out of 697. The Council considered they were not asking for any unreasonable reduction. Gas was used almost universally with incandescent burners and for cooking; there being in Bollington more than 700 stoves out on hire. It was generally admitted in the gas industry that the lower the candle power of the gas, the better suited it was for both incandescent lighting and cooking.

Mr. William Rogerson, the Gas Manager to the Council, said that from a canvass of 900 houses in Bollington it had been shown that 230 were using incandescent burners entirely, 597 used them partially, and 73 used flat-flame burners. There were about 200 houses that had not been canvassed, as they were just outside the district. He thought that if they could adopt a lower candle power for the gas it would be more beneficial to about 90 per cent. of the present consumers, for the manufacture would be cheaper, and consequently the price would be lower. They had accommodation for the purification of gas by oxide of iron; but they still used lime. If they used oxide instead of lime, it would effect an economy of fully 40 per cent. in purification. At present, owing to the unnecessarily high standard, they could not take advantage of the more up-to-date method.

Mr. William Newbigging, the Engineer and Manager of the Macclesfield Gas-Works, said he quite agreed with the evidence given by Mr. Rogerson. The Council were taking a step which had been approved by Parliament. They had not gone so far as the authorities would allow; but he thought they were acting judiciously. At the same time, he was opposed to gas of very low illuminating power—as low as 14 candles. In making the application, the Council had not said anything about the kind of burner to be employed; but he took it they would use the most up-to-date one.

Mr. Rogerson said in 90 per cent. of the houses the occupants would feel the benefit of the lower candle power. In answer to a question by the Inspector as to the method of testing the gas, he said the Council had under consideration the purchase of more modern apparatus; and he thought personally that the standard adopted should be the "Metropolitan" burner No. 2, as this would tend to uniformity in methods of testing.

Mr. T. DAVIES said he did not wish to raise any objection to the application, but he would like to ask if the people who used flat-flame burners would have the same illuminating power with 16-candle gas as with the 18-candle gas. He thought it would be much less.

Mr. Newbigging said the question was a very sensible one; but he could answer it in this way: The flat-flame burner people would suffer if the Model Clauses were put on the Council in their entirety; but if the application of the Council were allowed to reduce the power, he did not think they would suffer at all—in fact, he was quite sure they would not.

Mr. KNIGHT said the Council also asked permission to purchase a plot of land near the works for purposes incidental to the manufacture of gas, as at present they could not purchase under the powers of their Act. The land was 1532 square yards in extent. Part of it consisted of a long strip between the works and the Railway Company's road to the goods station; and the Council hoped to construct shoots over the strip into their coal-shed. It was expected that the saving thereby effected would amount to at least £30 per annum. The Council had entered into a provisional agreement with the owner of the land for the purchase of it. Since 1905, the general district rate had been at its limit; and notwithstanding this there had been a deficiency—in 1906 of £98, in 1907 of £403, in 1908 of £287, in 1909 of £353, and he was expecting one of about £250 this year. In 1906, the gas profits were drawn upon to the extent of £100, in 1907 of £250, in 1908 of £150, in 1909 of £335, and this year, up to the present, they had drawn

£100. Unfortunately for the district, the assessable value compared with the population was very low, as the majority were working-class people. With reference to the outstanding loans of the Council, of £17,959 borrowed up to date, only £6162 remained owing, and towards this £1946 had been invested in Consols at March 31 last year, and a further £139 had just been paid into the sinking fund. On going through the last Board of Trade returns, he found that the average capital outstanding—amounts in sinking funds being taken into consideration—worked out at 8s. 7d. per 1000 cubic feet of gas made for the whole of England and Wales, while for Bollington itself it was only 2s. 6d. Local authorities making about the same quantity of gas as the Bollington Council were allowed to raise considerably over £27,859, which would cover the amount now applied for, together with that already actually raised. The Council proposed to use the additional money for reconstructing the existing plant, mains, &c., for laying new mains and services, for providing more carbonizing plant and storage, and for the purchase of land for coal-shoots, &c. The Council were prepared to accept such provisions as appeared necessary to ensure the repayment of the money borrowed.

Mr. F. F. Grafton, the Chairman of the Council, said they had not made the application with any desire of increasing the rates, but they realized that they were getting in a very dangerous position.

Mr. Newbigging said the capital applied for was very reasonable indeed. They would really have been justified in asking for more; but perhaps they were not quite so sanguine as he was as to the increased trade in the future.

The INSPECTOR said the Council's case had been very well put, and Mr. Knight had given in a very able manner all the information he could. They were indebted also to Mr. Newbigging and Mr. Rogerson for their valuable evidence.

As there was no opposition, the inquiry closed.

### PROPOSED GAS-WORKS FOR WARSOP.

#### Local Government Board Inquiry.

A Local Government Board inquiry extending over two days has been held at Warsop by Major C. E. Norton, regarding an application by the Urban District Council for a Provisional Order authorizing them to borrow £10,000 for the construction of gas-works. The inquiry was largely attended, and considerable opposition was offered. The Council were represented by Mr. C. C. Hutchinson. Mr. L. Macassey opposed on behalf of the Staveley Coal and Iron Company; Mr. R. S. Clease for the Shirebrook and District Gas Company; and Mr. W. H. Mole for the Great Central Railway Company. We hope next week to publish a fuller report of the proceedings than is possible now.

Mr. HUTCHINSON, in opening, explained that under the Mansfield Corporation Act in 1907, with or without the consent of the Warsop authority, the Mansfield Corporation could have supplied the whole district with gas; but eventually a price of £300 was agreed upon between the Mansfield Corporation and the Warsop authority for the purchase of the right to do so. The Inspector would learn from the objections of a Company that part of the district in question already came within the scope of their profitable operations. In 1899, some promoters entered into a bargain with the Mansfield Corporation, and purchased for £500 such rights and privileges as the Corporation had not then exercised for Warsop Vale, which comprised a small portion of the population of the parish of Warsop, amounting to not more than one-sixth of the whole. Strictly speaking, if the matter were brought before a Parliamentary Committee, probably the Company, having no interest in the parish of Warsop, for which the Urban Council sought their own legal rights, would not be heard. The matter was one entirely of domestic economy. It was intended to spend about £8000; leaving £2000 in reserve for anything that might arise. It was estimated by men of experience that gas could be supplied at 3s. 4d. to 3s. 6d. per 1000 cubic feet.

Mr. CLEASE submitted that the Mansfield Corporation, having obtained statutory rights for the supply of gas, could not legally sell such rights to another authority.

Mr. MACASSEY argued that the Staveley Company paid 65 per cent. of the total rates of the parish; while practically the whole of their property was situated within the area of supply of the Shirebrook Company, so that they would not benefit by the new gas-works.

Mr. MOLE said that all the Great Central Railway Company required was protection for their railway where it was thought the undertaking might interfere with the Company's works—such as at level crossings. The Company associated themselves with the opposition of the Staveley Company; their interests being of a similar character, but in a less degree.

Mr. Arthur Graham, Gas Engineer to the Mansfield Corporation and Engineer of the proposed scheme, said he considered that gas could be supplied at 3s. 6d. per 1000 cubic feet to the ordinary consumers, and 4s. 2d. for slot-meters. He calculated the total consumption at 6½ million cubic feet, exclusive of public lighting. The estimated expenditure was £840, and the receipts £1620—leaving a gross profit of £780; and after the payment of interest and sinking fund charges, there would be a profit of £600.

Mr. Corbet Woodall, Consulting Engineer to the Shirebrook Gas Company, said he did not think it would be to the advantage of Warsop ratepayers to be supplied with gas by the Council. He did not wish to speak disrespectfully of the advice which had been given to the Council, but he was sure they were wrong to contemplate the undertaking proposed.

Mr. R. G. Shadbolt, Engineer to the Grantham Gas Company, said gas, from works such as were proposed, could, he thought, be supplied at 3s. 4d. per 1000 cubic feet. He based this opinion upon his experience of similar small undertakings which were operated at a profit after the first two years' working. After allowing for interest and sinking fund, he estimated a profit of something like £137 per year on



the sale of gas supplied at 3s. 4d. per 1000 feet to ordinary consumers, and 4s. 2d. to slot consumers. The Council would be well advised in gaining possession of the gas supply of the district.

Mr. *Sleight*, a schoolmaster, gave evidence that the supply of gas to Warsop Vale by the Shirebrook Company was unsatisfactory; and Mr. *Renshaw* made a similar statement respecting the street lighting.

Mr. *J. N. Derbyshire*, the Chairman of the Shirebrook Gas Company, stated that his Company were able and willing to give a supply of gas to Warsop, as soon as they had power to do so, at the same price as they were at present charging in their district. He believed his Company could supply gas at a cheaper rate than the Council.

After the Inspector had been addressed on behalf of the various parties, the inquiry closed.

## IPSWICH AND THE STANDARD BURNER BILL.

### An Agreement Arrived at.

At a Meeting of the Ipswich Town Council last Wednesday—the Mayor (Mr. A. Gibb) in the chair—the Paving and Lighting Committee further reported as follows regarding the Gas Companies' Standard Burner (No. 3) Bill.

At the meeting of the Council held on Feb. 9 last, the Bill was referred to the Committee for consideration; and they were also empowered, if they thought desirable, to affix the common seal to a petition against the Bill, and to take all necessary steps to effectively oppose it. There were seventeen gas companies promoting the Bill, with the object of having the burner known as the "Metropolitan" argand burner No. 2 substituted for the burner described in the Acts and Orders relating to their respective undertakings, for the purpose of testing the gas supplied by them. Under the Ipswich Gas Acts, the Ipswich Gaslight Company were at present under obligation to supply gas of an illuminating power of 15 candles, when tested with a burner known as Sugg's "London" argand burner No. 1. The Committee were advised that the effect of substituting the new standard burner defined in the Bill for the Sugg "London" argand burner No. 1 would be to enable the Company to supply as 15-candle gas, gas which, tested by the present testing-burner, would be only 14 candles. The Bill did not offer any *quid pro quo* or compensation to the Corporation or general public in return for this reduction of illuminating power, though the effect of the change would be to enable the Company either to obtain a larger quantity of saleable gas from each ton of coal, or to save the expense of the enrichment of the gas. The Committee accordingly prepared a petition against the Bill; and the same was duly lodged on the 18th ult., and the Committee agreed with other local authorities affected by the Bill that joint action should be taken in the opposition. The Committee had no desire to oppose the Bill, provided the interests of the public were properly protected, and a reasonable concession was made by the Company in return for the undoubted pecuniary gain which would accrue to them. Negotiations were accordingly opened with the Directors, after the petition was lodged; and the Committee were happy to report that the Company had now agreed definitely to reduce the price of gas 1d. per 1000 cubic feet after Dec. 31 next, if the Corporation withdrew their opposition and the Bill became law. The Committee considered this a fair arrangement; and they had therefore withdrawn their petition, and asked that their action be approved and confirmed.

Mr. PIPE said that, after the last meeting of the Council, the Committee entered into negotiations with the Gas Company. While the latter were not prepared to withdraw their Bill, they were ready to reduce the price of gas 1d. per 1000 feet. In view of this concession, the Committee thought it wise to withdraw their opposition to the Bill. He moved the adoption of the report.

Alderman GRIMWADE: Will it mean a reduction of a penny to all consumers?

Mr. PIPE: Yes.

Mr. E. P. RIDLEY said it seemed to him that this was a matter which did not redound to the credit of the persons who had been dealing with it. At the last meeting of the Council, it was said that the Ipswich Gas Company would, by the Bill, be able to supply gas of a quality inferior to the present, and to the prejudice of the consumers. Other objections to the Bill were also mentioned—such as the facilities provided for testing. These points were all of some importance; but instead of dealing with them, they were content with a miserable 1d. reduction—a 3 per cent. reduction on the price of gas. If this was the whole object in view when the Committee advised that the matter should be dealt with by a petition against the Bill, he thought it unworthy of the Corporation to take such a course. They could not say how long the reduction in the price of gas would continue, and the probability was that, apart from their action, the price would have been reduced.

Mr. J. B. CULLINGHAM inquired whether the Gas Company would pay the costs which the Corporation had incurred so far, and what they amounted to.

Mr. PIPE replied that they would not exceed £30; and he pointed out that the 1d. reduction would make £1800 difference to the consumers, which was a substantial concession. It was the general opinion of the Committee that, though they might have spent a considerable sum of money in fighting the Bill, the probability was that they would not have been successful.

Mr. J. R. STADDON did not think they were protecting the public sufficiently from the power the Gas Company were trying to get in order to give them an inferior quality of gas.

Miss COULCHER inquired whether the light in the side streets would be lessened by the difference in the gas.

Mr. PIPE replied that the Bill proposed to lower the illuminating power of the gas; but street lighting would not be affected, as incandescent burners were used. They did not require gas of a high illuminating power, but heat. Many private consumers used the same class of burners, and would be in the same position. He believed that most of the other companies were negotiating for certain concessions.

The report was adopted with three dissentients.

## BRITISH GAS LIGHT COMPANY, LIMITED.

### Revival of the Bonus.

The Ordinary Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, and afterwards the Directors' report and, in compliance with the Act, the Norwich accounts. The former was as follows:—

The Directors submit the half-yearly accounts of the Company to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £31,622, after deducting (omitting shillings and pence) the following sums: Income-tax, £2146; Hull debenture interest, £2118; Norwich debenture interest, £1779; Potteries debenture interest, £659; Trowbridge debenture interest, £164; and interest on Debenture Stock, £2260—£9128.

HULL.—The gas-rental shows an increase of £1007, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke exhibits a decrease of £1421; tar and tar distilling an increase of £200; and ammoniacal liquor and sulphate of ammonia a decrease of £396. Coals have cost 13s. per ton, as against 14s. 3d. Coke has realized 10s. 6d. per ton, as against 11s. 4d. The gas sold was 638,903,202 cubic feet, against 627,842,142 cubic feet in the corresponding period of 1908—an increase of 11,061,060 cubic feet, equal to 1.76 per cent. Of this quantity 43,535,000 cubic feet was supplied in bulk to the Corporation for the supply of the old Town; being a slight reduction, as compared with the quantity supplied in the same period of 1908. The profit realized is £6007 in excess of the parliamentary interest. This sum has been invested, making the reserve fund £43,565.

NORWICH.—The gas-rental shows a decrease of £1544; the price of gas having been 3s. per 1000 cubic feet, as against 3s. 3d. for the corresponding period of 1908. Coke shows a decrease of £150; and tar and ammoniacal liquor an increase of £435. Coals have cost 16s. 1d. per ton, against 17s. 8d. Coke has realized 14s. 6d. per ton, against 15s. 8d. The gas sold was 262,585,900 cubic feet, as against 250,983,900 cubic feet—an increase of 11,602,000 cubic feet, or equal to 4.62 per cent. The profit realized is £2438 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £554, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. The decrease is principally attributable to the granting of further rebates to large consumers from Oct. 1 last. Coke shows a decrease of £59; tar an increase of £306; and ammoniacal liquor and sulphate of ammonia an increase of £10. Coals have cost 10s. 5d. per ton, as against 11s. Coke has realized 8s. 6d., as against 8s. 5d. per ton. The gas sold was 176,403,563 cubic feet, as against 176,395,877 cubic feet—an increase of 7686 cubic feet. The profit realized, after writing off £1000 on account of plant thrown out of use, is £1420 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £1648 to the credit of that account.

TROWBRIDGE.—The gas-rental shows an increase of £115, as compared with that of the corresponding period of 1908; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show an increase of £145. Coals have cost 16s. 3d. per ton, against 17s. per ton. Coke has realized 11s. 11d., against 12s. 3d. per ton. The gas sold was 37,446,130 cubic feet, against 36,712,676 cubic feet—an increase of 733,454 cubic feet, or equal to 2 per cent. The profit realized is £267 in excess of the parliamentary interest.

HOLYWELL.—The gas-rental shows a decrease of £12; and residual products a decrease of £3. The profit realized is £441.

The available profit added to the previous balance of profit and loss amounts to £85,333. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both free of income-tax. The dividend and bonus will amount to £27,562, and leave a balance of £57,771.

The CHAIRMAN, in moving the adoption of the report and accounts, said he hoped the former had given as much pleasure to the shareholders as it had to the Directors in drawing it out; for although they could not show on this occasion any very large increase in the gas business, still they were able to give the shareholders a very satisfactory account of the works, and of the business generally at the different stations, as well as of the profits earned, which had made a slight increase in the dividend possible. The half year under review might be called one of small events—that was, they had not been doing any vast work, nor had they made any great increase in the business. It had been rather a period of marking-time. It would be recognized that the state of the country during the last six months had been such—upset as it had been by a General Election and varying financial difficulties—that it was not likely that an industrial Company of this nature, depending so much upon good trade, and the peace of the trade of the country, would show anything more than what he had called "marking-time." If the shareholders had followed the report, they would have noticed that at Hull (which was by far the largest station, and a very important industrial centre), the amount of gas which the Company supplied wholesale to the Corporation for the supply to the old town, had shown a decrease; and in the Company's own district, which embraced the larger portion of the outer city, they had only had an increase of 1½ per cent. This was not what they would naturally expect from a place of the position and magnitude of Hull. But as it was, they must accept it so. At Norwich, probably owing to the reduction in the price of gas by 3d. per 1000 cubic feet, they were able to report that they had an increase of 4.62 per cent. That was much better; and he thought this was due in a great measure to the energetic management of Mr. Thomas Glover, who presided over the Company's business in that town. The 3d. reduction at Norwich represented a cost to the Company of £2800; but they had sold an increased quantity of gas yielding £1300, so that the actual decrease in rental was only £1500. He hoped and believed the able management there, and the pushing of the sale of gas would, in a short space of time, pick up this rental, and more. Turning to a few details in connection with the business, he reported six months ago that the Company had acquired certain premises immediately adjoining the Hull offices and workshops; and they were now able to report that the extensions and additions which were urgently required there were approaching



completion. The Company would then have a complete set of both offices and workshops, in a central position, and in close proximity to the very handsome show-room the Company rented from the Corporation in one of the principal parts of the city. There was one little piece of information he might give the shareholders with regard to the shop which they had rented for the last five years. The lease was coming to an end; and the Corporation were so pleased with the Gas Company as tenants that they had granted them seven additional years at the same rent. This showed that the Company were on good terms with the Municipality. As to the works at Hull, there were two gas-holders of considerable age. They were requiring a little additional storage there; and as one of the holders had been in service for a period of 35 years, and the other for 44 years, it was decided to replace the larger one with a spiral-guided holder of increased capacity. This was now in course of erection, and would, he believed, be a valuable addition to the property of the Company at Hull; the cost being only £5345. They were also constructing at Norwich, to meet the increasing business, a new tank and holder. He mentioned this at the last meeting. The work was now well in hand—the tank, in fact, was almost finished. They were going to put up a spiral-guided holder, and the cost of it, when completed, would be about £13,000. The new works at the Potteries station which, as the shareholders knew, had been in course of construction on a new site, were, practically speaking, finished. They had still a balance of £12,000 to wipe off. This must be done gradually, as the business could afford it. The reserve there had been reduced to a very small amount; but they sincerely hoped trade would revive in the district before very long, so that the business might warrant the writing-off of the amount in suspense. Some of the shareholders might remark that the business of the Potteries was not quite so profitable as it ought to be. They had to meet severe competition there in the way of electric light; and they had also some large consumers who required special discounts, and, to retain them, they had had to practically reduce the price by granting the discounts. There had also been a small reduction in the charge for public lighting. That was briefly the work they had gone through during the half year. There was one other matter. They were, in conjunction with a great many other gas companies, promoting the Standard Burner Bill for their Potteries, Trowbridge, and Holywell stations. There were no petitions against the Bill so far as the Company were concerned, though, of course, as it was a joint Bill, they would have to stand the racket of the petitions put forward by other towns. He should imagine, however, that Parliament would grant the standard burner, as it had been granted in so many cases, and was now almost universally used in the great towns, and entirely so in the Metropolis. He was glad to be able to report improvement in the prices of sulphate of ammonia and tar products; so that the prospect was rather better than it had been during the past year. Just one word about the bonus. The Directors were exceedingly glad to be able to recommend it. It was just twelve years since they last distributed a bonus; and he foreshadowed in his remarks a year ago that the Board hoped very shortly to be in a position to give one. He did not intend to prophesy with regard to future bonuses. Of course, it would be wrong on his part to attempt to indicate what the future would bring forth; but they would certainly on future occasions, if all went well and rightly, hope to continue the bonus in the same regular way that they did a good many years ago. This was all he had to say that day, because the small amount of increase in capital at the various stations, and the additions to the meters placed, service-pipes laid, and lamps fixed were all very much what had been regularly done for many past half years; and there was just a steady increase in the consumption of gas and in the consumers.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. CORBET WOODALL, a dividend at the rate of 20s. per share and a bonus of 2s. 6d. per share, clear of income-tax, was declared.

Major-General W. T. CORRIE proposed a vote of thanks to the Secretary and the officers of the Company; for (he remarked) without their able assistance, the Board would not be able to work so satisfactorily for the Company. The Board were delighted with the services of Mr. Brookes; and the officers at the stations were so good at their work that, when the Directors made their periodical visits to them, they came back with great pleasure, feeling that they could report to the shareholders that the officers at the stations were always doing their duty and their very best in the interests of the Company.

Mr. LEONARD R. WILKINSON seconded the proposal, which was cordially carried.

The SECRETARY, in acknowledging the vote, said he should convey it to the officers at the various stations, to whom it would be an incentive to further effort and also a source of much gratification.

Mr. KENNETH R. MACKAY moved a vote of thanks to the Chairman and Directors, congratulating them on the results at the different stations. He added that, as shareholders, they were pleased to get the bonus, partly because it added extra value to their shares.

Mr. LOUIS PENNY seconded the motion; and it was at once heartily agreed to.

The CHAIRMAN, in responding for himself and his colleagues, observed that the Board sincerely hoped they would be able to present to the shareholders six months hence a report equal to the one they had presented that day.

**Barnard Castle Gas Company.**—The 76th annual meeting of the Company was held last Tuesday. The Chairman (Mr. R. T. Richardson) pointed out the main features of the year's accounts, which showed a profit of £1298, and a balance in hand, subject to dividend, of £1525. The dividend recommended (5 per cent. per annum) was declared. The Directors' fees were increased to 50 guineas; and the Secretary (Mr. Robert Wood) received an increase of salary. The Chairman stated that it was proposed to reduce the price of gas by 2d. per 1000 cubic feet; and he also mentioned that a new exhaustor plant was being obtained, and every effort made to improve the quality of the gas, which he acknowledged had not been all that could be desired during the past six months.

## OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C., under the chairmanship of Mr. STEPHENSON R. CLARKE.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting and the certificate of the Auditors; and the report (which was noticed in last week's "JOURNAL," p. 831) and the statement of accounts were taken as read.

The CHAIRMAN remarked that he had received a letter from Colonel Le Geyt Daniell expressing regret at being unable to meet the shareholders that day. It was, however, a pleasure to be able to say that the Colonel was better for his stay abroad, and hoped soon to return to this country. The proprietors would see, on turning to the balance-sheet, that this half year there was one great difference as compared with that for the six months to June 30 last. An amount of £16,000 of debentures, which were the unredeemed balance of the issue of £25,000, had now been redeemed, and had disappeared from the accounts. This redemption of the debentures caused the amortisement and reserve accounts, which now amounted to £43,600, to be apparently very unequally balanced by investments, totalling only £3931. But to the latter figure must be added this sum of £25,000 of debentures redeemed, and the balance of the account was employed in the business. On the other side, there was a considerable increase in the amount owing to the Company. This was principally because of the sum due from the Municipality for public lighting. There had been, unfortunately, since the regime was changed in Turkey, a tendency, both on behalf of private individuals, and especially of public bodies, to postpone the settlement of accounts. He said "unfortunately," as it undoubtedly tended to check the feeling of sympathy which Englishmen felt with the desire of the Turks for a more liberal system of Government. However, he was pleased to say that the Directors had that morning received better news; and the debt was now largely reduced. With regard to the revenue account, increasing business had compelled the Company to carbonize 300 tons more coal; but in spite of this, the outlay had been on the half year £80 less—the average cost showing a reduction of just over 1s. per ton. The make of gas per ton was 10,787 cubic feet; and they had sold 9840 cubic feet—an increase of 220 cubic feet per ton. Stocks had been well written-down, and the fitting department had been very busy, which he thought they might take as a sign that at present there was no symptom of a decline in the Company's business. He concluded by moving the adoption of the report and accounts.

Mr. H. WARD ANDREWS seconded the motion; and it was, without further comment, carried unanimously.

The CHAIRMAN proposed the payment of a dividend for the half year at the rate of 7 per cent. per annum, less income-tax, on the preference shares, and of 8 per cent. per annum, tax free, on the ordinary shares.

Mr. A. M. PADDON seconded this; and it was agreed to.

The retiring Directors (Colonel Daniell and Mr. Andrews) were then re-elected, on the proposition of the CHAIRMAN, seconded by Mr. PADDON; and the Auditors (Messrs. T. H. Cooke and A. W. Cooper) were likewise re-appointed, on the motion of Mr. COLLINGWOOD, seconded by Mr. W. T. CLARKE.

The CHAIRMAN proposed a vote of thanks to the Engineer and Manager (Mr. John Gandon) and the Secretary. A foreign company, he remarked, needed the closest possible attention and the hardest work from its officers; and the Ottoman Company had this, both at Smyrna and in London.

Mr. PADDON, in seconding, said that, by reason of the recent changes in Turkey, the conditions had grown no easier; and yet the officers were as successful as they had been in the past in maintaining the position of the undertaking. He did not think any similar company could have a better outlook than theirs; but this would always be governed by the zeal and assiduity which the officers brought to bear upon their work.

The vote was heartily accorded, and acknowledged by Mr. GUYATT.

Mr. A. F. PHILLIPS (the Company's Consulting Engineer) proposed a vote of thanks to the Chairman and Directors. It was, he said, due to the ability they showed and the efficiency of the control they exercised, that the Company had attained its present prosperity. He did not think any Board of Directors could more fully realize than did that of the Ottoman Gas Company the absolute necessity in the case of a foreign undertaking of keeping down the expenditure and preparing for the time when their contract would expire. It was only those foreign companies who had written-down their capital that could be assured of continued prosperity. He knew from experience that this was the great aim of the Directors of the Ottoman Company. While the consumption grew, they took care that the capital did not follow.

Mr. DAUN seconded the proposal, which was cordially agreed to.

The CHAIRMAN, in acknowledgment, remarked that it was a great pleasure to have one's policy commended by anyone of such enormous experience as Mr. Phillips.

## PROGRESS OF COALITE LIMITED.

The Adjourned Ordinary General Meeting of the above-named Company was held at Salisbury House, E.C., last Wednesday—Mr. J. H. SMITH in the chair.

The CHAIRMAN, in moving the adoption of the report and accounts for the year ended Dec. 31 last, said they represented the financial position of the Company at the end of three-and-a-half years; and the total excess of expenditure over receipts had amounted to only £7007. When the large amount of liability to the British Coalite Company that had been paid off during this period—altogether some £165,000—was taken into consideration, as well as the loss on the realization of their British Coalite shares, he thought it must be admitted that this result was by no means unsatisfactory. At the meeting in December, 1908, the shareholders were informed that patents had been secured in 33 countries, including the chief countries of Europe, America, and the Colonies. Since then patents had been granted in Austria, Egypt,



Ecuador, Roumania, Turkey, and Japan. With regard to the prolonged negotiations which had taken place in connection with the gas supply of St. Petersburg, a fresh Commission was to be appointed to visit the works in England. The Directors would, of course, be only too glad to welcome the Commission and furnish the members with the fullest information; and they felt confident that the Commission would decide on the desirability of adopting the coalite process, the more so in view of the considerable improvements that had been established lately in the new batteries erected at Wednesfield. The conclusion of definite agreements with certain groups with whom the Directors had been in negotiation, and which had to be deferred pending the completion of these alterations and improvements, could now be proceeded with. They were in touch with various groups who were anxious to complete definite arrangements with the Company for the acquisition of the patents for France and Germany; and the Indian negotiations had taken such definite shape that the prospectus of an Indian Company would be issued at an early date. Attention was directed in the report to the important scheme which the British Coalite Company were undertaking to utilize the gas for purposes of electrical power at Barking. During the last two years, it had been frequently said that, though coalite as a smokeless fuel was more than satisfactory, they would always have the greatest difficulty in disposing of the gas. The first answer made by the British Coalite Company was to enter into arrangements with local gas companies to take what gas could be supplied, leaving the Company to dispose of the coalite and the other bye-products. The second reply he could now make—and he made it with conviction—viz., that this gas, which unfriendly critics had described as their weakest factor, would not only prove to be one of the strongest financial links in their chain, but would be the means of effecting an absolute revolution in the cost of electricity. Sir William Preece, who was one of the highest authorities on electricity, told his shareholders that they would have a station at Barking which would enable them to supply power at a lower price than was charged anywhere in Europe. There could be no question that cheap electric power would be one of the most potent economic forces of the future, and that the companies who were able to supply it cheaply would stand in an unrivalled position. Mr. Percy Allen, the Chief Engineer of one of the largest chemical manufacturing firms in England, who was considered one of the foremost experts in the use of gas-engines for the production of electricity, was asked to report to the Directors of the British Coalite Company on the scheme at Barking; and his report confirmed the highest hopes of the Directors. He clearly demonstrated that as soon as the erection of the required number of units was completed and the gas-engines were provided, the Company would be in a position to produce electricity at such a low cost as would yield profits of a most substantial character. This report proved absolutely that the gas from the coalite process could be utilized to great profit for generating electrical power, in which latter direction there was an unlimited field. This power scheme at Barking was to be followed by others which would be developed on a large scale in different parts of the country and outside Great Britain. They held the world's patents. They could not rush a new industry, particularly one of a somewhat revolutionary kind; and they must not dispose of their valuable foreign patents unless they received in return a full and adequate price. That they had something unique to offer was now being appreciated abroad; and they looked forward with the utmost confidence to results in the very near future which could not but afford the greatest satisfaction to all who were interested in the Company.

After a brief discussion, the motion was carried unanimously.

## ANTWERP WATER-WORKS COMPANY, LIMITED.

### An Excellent Report.

At the Annual Meeting of the shareholders of this Company, an excellent report was laid before the shareholders by the Chairman (Mr. Easton Devonshire). It stated that the income, from all sources, amounted to £80,261, as compared with £78,712 for 1908; and after deducting working expenses, the cost of laying on services, and London expenses, there was a balance of £54,984. To this sum was added the undivided profit of £11,781 brought from last account, and interest on investments (£129), making a total credit of £66,894. Against this there had been charged debenture interest and income-tax for 1909; the contribution to the reserve account of 5 per cent. on net profits, as provided by the articles; the interim dividend of £16,500, at the rate of 11 per cent. per annum; the transfer to the sinking fund for the redemption of debentures of £1900, and for that of the share capital, £6250, and the Directors' extra remuneration of £2355. The sum of £31,606 was then left, out of which the Directors recommended that a balance dividend for the six months to Dec. 31 last, be paid at the rate of 11 per cent. per annum, free of income-tax (absorbing £16,500, and making a total dividend of 11 per cent. for the year), that a further sum of £10,000 be transferred to the reserve account, and that the balance of £5106 be carried forward.

In moving the adoption of the report and accounts, the Chairman first referred to the loss by death of Mr. Wilson, the Consulting Engineer, who had been with the Company for the past thirty years. In his place, the Board had appointed Mr. Courtney. Regarding the accounts, he thought the shareholders would agree that it was satisfactory that the Board had been able to increase the dividends by  $\frac{1}{2}$  per cent., as compared with 1908. At the same time, they had not had the enormous boom which they had last year, and which was largely due to the great quantity of water consumed by the State Railway. The railways had been using every possible means to economize; and they had been aided by the fact that it had rained most days. The bad weather had also considerably affected the consumption of water by the large meter consumers. The total revenue from this source had not diminished, but in the ordinary way it would have shown a substantial increase had the weather not been so excessively wet. The shipping returns had fallen off, and trade had not been good during the year. The falling off was partly accounted for by the fact that new docks had been in course of construction into which the ships were taken, and which the

Company were unable to supply at the present moment. The Directors had decided to spend altogether £4000 in enlarging the mains which led directly into the docks, and for encircling the docks with supply mains and hydrants. A satisfactory feature was the steady increase in the number of ordinary customers. In this connection, they had added 1473 new contracts of the value of 72,000 frs. The extension of the town beyond the fortifications had now been begun in earnest; and there would be a great increase in building along the line of their trunk main, and to the greatest extent in the commune of Berchem. The shareholders had also probably noticed in the accounts that there had been overspent a considerable sum on capital account; but the Board had preferred to continue its policy of turning-over the Company's money, so to speak, in view of the altered situation that might occur if the Municipality purchased the works in 1911. As they had the cash available, they felt it would be desirable to postpone any further issue of debentures.

The motion was seconded by Mr. G. Evans; and it was agreed to. Subsequently the various recommendations as to the disposal of the available balance were passed; and other formal business was done.

## RICHMOND GAS STOVE AND METER COMPANY, LIMITED.

### Visit to the Works of Mr. E. W. Smith, M.Sc., of Leeds University.

The twentieth half-yearly conference of representatives of the Richmond Gas Stove and Meter Company was held at the works at Warrington last week, under the presidency of Mr. H. M. Thornton. Considerable extensions have been made to the works since the representatives last met together there; and after the various items on the agenda had been gone through, a visit (under the direction of Mr. J. A. Ransome) was paid to the new foundry at Grappenhall, which has been further enlarged recently. The new fitting shops, covering 2 acres, were also inspected; and the modern appliances and their general up-to-date appearance were much admired. The new premises will be finished in a few weeks. Of the 9 acres of ground recently purchased at Grappenhall, nearly one-half are now covered; and at the present rate of progress, the time when the whole will be occupied does not look far distant. Another department inspected was that devoted to furnace and industrial appliances, which, since its inception three or four years ago, has developed remarkably; many new types of furnaces and other apparatus for laboratory and industrial purposes having been added to the list of productions. As showing the wide range of inquiries received in this department, it may be mentioned that on the day of the visit one was in hand for a furnace for cremating lost dogs, and another for annealing bars of iron 12 ft. by 12 in. in constant succession—the novel feature of this furnace being that the waste gases were utilized to pre-heat the bars. The extension of the enamelling department was also seen, and the process of manufacturing the firm's patent "Porcellanite" fully demonstrated. The analytical laboratories were next visited; and the varied and valuable instruments installed some months ago were explained in detail.

An interesting variation of the usual programme of the conference was made on this occasion, in view of Professor Smithells's letter which recently appeared in the "JOURNAL" suggesting that the Research Committee should work in unison with the gas-stove manufacturers, and would welcome opportunities of visiting their works. Mr. E. W. Smith, the Research Chemist to the Gas Heating Research Committee of the Leeds University, was invited to meet the representatives of the Company; and he gave an interesting exposition of the scientific aspect of present-day gas-fires, and traced the history of their development. He dealt at some length with the difference between radiant heat and convected heat, and the effects of both on the human system. While, he said, the later patterns of present-day gas-fires conformed in many respects with the theoretical requirements, and efficiency had reached a high standard, there was still room for improvement.

A free discussion followed; and it is hoped that the interchange of ideas may be helpful, both to the Research Committee and to the manufacturers—thus conforming to the wish expressed by Professor Smithells as to the union between the practical and theoretical aspects of the question of gas heating.

At the conclusion of the conference, which lasted two days, the representatives and staff were entertained at dinner by the Company.

### Local Government Board Inquiry at Leeds.

An inquiry on behalf of the Local Government Board was held by Mr. M. K. North last Tuesday into an application by the Leeds Corporation for sanction to borrow £3985 for the provision of new workshops for gas-works purposes. It was explained by the Town Clerk (Mr. R. E. Fox) that the new workshops were to take the place of those which were destroyed by fire some months ago in Meadow Lane. The old premises, however, had become much too small for the amount of business which was done in them; and the Gas Committee had already decided to have new premises which would be more convenient. The Corporation were well insured in respect of the old buildings, and had recovered a sum of £8810. Mr. Badlay said that he opposed the borrowing of the money for financial reasons. He opposed the "fatal facility" of borrowing powers given the city. If the old premises had been too small, and the fact had been known for some time, provision ought to have been made out of revenue for rebuilding. He thought that the money received as insurance might have been used for the purpose. Mr. Totty also called attention to the fact that the city "groaned under a debt of thirteen millions." The Inspector, however, pointed out that he was not there to consider general financial matters. In reply to Mr. Totty, Mr. R. H. Townsley, the General Manager of the Gas Department, said the Gas Committee would pay a rent of £268 a year to the Improvements Committee for the use of the land. The Gas Committee were not purchasing it.

Some days ago, Frederick Wynn committed suicide at Sheffield by inhaling gas through an india-rubber tube. He suffered from an incurable spinal complaint; and on different occasions had threatened to kill his wife and child, and to commit suicide.



## DUNDALK ELECTRIC LIGHTING SCHEME.

## Local Government Board Inquiry.

At the Town Hall, Dundalk, an inquiry was recently held by Mr. P. C. COWAN, the Chief Engineering Inspector of the Local Government Board for Ireland, into applications made for several loans by the Dundalk Urban District Council, one being for £20,000 to carry out an electric light scheme. Objections had been submitted on behalf of some ratepayers, on the following grounds: (1) That for a town of the size of Dundalk such an expensive scheme was not at all warranted; (2) that a syndicate failed to raise the necessary capital for a scheme for private purposes, and, if it was likely to result in profit, sufficient capital would have been raised without the slightest difficulty; (3) that no attempt had been made by public canvass or plebiscite to ascertain the number of people in favour of electric lighting; (4) that no attempt had been made to ascertain the number of people willing to become customers; (5) that similar undertakings had almost universally ended in loss; (6) the erection of public slaughter-house, public baths, provision of water supply and drainage were far more urgent; (7) the building trade is almost at a standstill in the town due to the heavy rates; (8) the town is amply provided with light and power.

Mr. T. M. HEALY, K.C., M.P., supported the application on behalf of the Council; Mr. MATHESON, K.C., appeared for the Dundalk Gas Company to oppose the application for the loan for electric lighting, which was also opposed by Mr. DONALDSON, Mr. JOHNSTON, and Mr. MAURICE MOLONY for some ratepayers.

Mr. HEALY said the electric lighting scheme had not been rushed at by the Council; and he was prepared to prove that it was rational, reasonable, and—having regard to modern civilization—necessary. The Council were unanimous as to it; and the people had had an opportunity of expressing their opinions not merely at one election, but at a series of elections. He would produce evidence to show that after two or three years, when the people got into their stride, the scheme would be a paying one. He did not at all object to the opposition; but it would be an intolerable thing that what they knew to be the central opposition—the Gas Company—should be duplicated to show the strength of popular feeling. When electric lighting schemes were introduced, gas companies looked out for new worlds to conquer and new homes to illumine; and in this way got customers which they otherwise would not trouble about. Dealing with the scheme, Counsel said it was proposed to expend £20,000 on it. The Council did not propose to borrow the money from the Treasury, but from a firm of brokers in Liverpool. The scheme, once established, would be a valuable addition to the life and civilization of Dundalk.

Mr. M. Comerford, the Town Clerk, was the first witness. He said the Council were practically unanimous in regard to the scheme. The gross rateable valuation of the town was £33,340 and a rate of 1d. in the pound would bring in £126 15s. 3d. He gave particulars of the different loans already obtained, amounting to £43,110, which left a chargeable debt of £13,153. Their net revenue was £2820. They paid about £627 annually for public lighting; and the general desire was for electricity.

In answer to the INSPECTOR, witness said the Council were charged by the Gas Company, in addition to the amount mentioned, about £40 for lighting the Technical School and Library, and £70 for lighting the municipal offices. The price of gas in Dundalk was 3s. 9d. per 1000 cubic feet. The Company owned the standards and fittings, and the Council the lampheads. The Company had undertaken to put incandescent burners on the lamps in the main streets.

In cross-examination by Mr. MATHESON, witness said the Gas Company offered to pay half the cost of new lampheads in a certain number of streets only; and they had to be requested several times before they put incandescent burners in the main street lamps. Messrs. Millar, Wilson, and Pegg were their Consulting Engineers; and it was their scheme which it was proposed to adopt. It had been submitted to several experts, including Sir A. B. Kennedy, and no objection had been raised. The Council had not taken any steps to ascertain the number of people who would have the electric light. The meetings at which different schemes were considered were held in committee, and were not open to the Press.

By Mr. DONALDSON: The Council had not published the schemes; but a Committee reported in detail on them, and this report was published in the local papers. The churches of the town with communities attached to them would take the electric light, as would also the Distillery Company. The Great Northern Railway Company told them that they would also take it if it was as cheap as gas.

In answer to Mr. JOHNSTON, witness stated that at the public meeting held in the Town Hall, which lasted about ten minutes, most of the councillors, three or four employees, and about a hundred ratepayers, were present. If there were two dozen outside who did not get in, it was their own fault.

Mr. James M'Court, the Chairman of the Council, said he had lived in the town for forty years as a business man, and he was of opinion that three-fourths of the people were in favour of the electric lighting scheme. The meeting in the Town Hall was not a bogus one. He waited for five minutes on that occasion, knowing there were some opponents of the scheme; but they were evidently waiting for a leader, and did not enter the hall.

By the INSPECTOR: He was of opinion that in the first three years there would be a loss of £400 or £500 on the scheme; but after that it would be a paying concern.

Mr. T. W. Millar said his firm were engaged on the electric lighting scheme, the estimate for which was £17,274, with £2000 for extension later on. He calculated as revenue £670 for public lighting and £2437 10s. for shop and private lighting; but he would not expect the latter figure for three years. Electricity at 6d. per unit would be cheaper than gas at 3s. 9d. per 1000 cubic feet. It was intended to charge 61. per unit in Dundalk.

In cross-examination by Mr. MATHESON, witness said he had not done any town lighting in Ireland. He was not aware that there was a loss of £312 on the Londonderry electric lighting scheme; but the majority of these schemes in England were not worked at a loss. The

cost of production in Dundalk would not exceed 1½d. per unit. Three gas-engines of 150 H.P. would be required. He proposed to lay 11 miles of cable. The total running cost he estimated at £1750; and he added £600 in order to be on the safe side. The total number of units he estimated at 215,500.

After some further evidence in reference to the public meeting,

Mr. MATHESON addressed the Inspector on behalf of the Gas Company. He said that never in his experience had he seen a scheme introduced in more cavalier style on the part of the engineers propagating it. When he said this, he meant that it had been introduced without proper forethought. There were some things for which the District Council were justified in incurring expense, even though it might mean a loss to the ratepayers, such as water supply, sewerage works, &c. In the present instance, however, they were dealing with a well-lighted town. They were dealing with a town which, if the Council only co-operated with the Gas Company, would be better lighted without any additional expense. It was not a case in which the Council were justified in forcing a scheme upon the ratepayers or incurring expense, unless they thought and could show that it would be recouped. It struck him as most startling that in a town like Dundalk the rates were 7s. 8d. in the pound, and this scheme would impose an extra burden of 1s. for the first two or three years, and ultimately more. It was the duty of the Council to take precautions to see that the scheme would pay; and they had taken none. They had not inquired the number of people who would take electric light—whether there would be 500, 100, or 50. They might assume that all the enthusiastic and wealthy town councillors would get in the electric light as a first go-off; and they could pay for luxuries. The ratepayers, however, were people who, perhaps, could live comfortably, but who could not afford a luxury like electric light. His clients appealed to the Local Government Board not to impose the proposed burden upon the ratepayers.

Mr. George Airth, the Engineer and Manager of the Dundalk Gas Company, said the present price of gas for public lighting was 2s. 6d. per 1000 cubic feet; but deducting labour, cost of mantles, &c., they received 1s. 11d. They lighted the lamps for 382½ hours per annum; and the gross price paid was £640. For private lighting the Company charged 3s. 9d. They introduced incandescent lights in 1899, and put in 50 fittings at a cost of 15s. 6d. each. They had since got 700 incandescent lights in the town, and several 600 and 400 candle-power lamps. They made an offer to supply the gas at the lowest price of any town in Ireland. The Company had been kept in the dark in regard to the electric lighting scheme, and he could not get any information with reference to it.

In cross-examination by Mr. HEALY, witness said that if the Council would guarantee that the electric lighting scheme would pay, the Gas Company would withdraw their opposition. Their valuation was £1200, and last year they paid £391 in rates.

Mr. J. M. Cox, a Director of the Company, said he was acquainted with the feeling of the people in regard to the question of the electric light; and there was no *bona fide* demand for it in the town. All the large ratepayers were opposed to electric lighting; and about half the population used oil. The estimate of 7000 lamps would appear to provide one for every man, woman, and child in the place. He did not think the people with oil-lamps would take electric light at 6d. per unit. The number who had gas and who would pay for the initial cost of putting in an electric installation would be very small. There was not, in his opinion, the remotest chance of the scheme paying for many years to come.

In cross-examination by Mr. HEALY, witness said the date of the Provisional Order of the Council was 1897, and the Board of Trade had threatened to withdraw it if it was not acted upon. There were some syndicates ready to proceed with the water-works scheme for the town, but none to take up the electric lighting scheme. Asked if the Council were unanimous as to the scheme, witness replied that he understood they were not very unanimous at a recent meeting.

Mr. DONALDSON then opened his case, and submitted that the scheme should never have been brought forward without proper inquiry. The overhead system proposed to be adopted would be very dangerous and unsightly.

Three well-known ratepayers having been called,

Mr. JOHNSTON said he represented one of the most prominent manufacturers, and one of the most important trades in the town—the building trade; and he would show that the electric lighting scheme was not one that was reasonably necessary. Moreover, Dundalk could not afford it. They had heard repeated *ad nauseam* remarks about the rates in the town; and he held that it was not reasonable that a blister of £20,000 should be further clapped on Dundalk.

After some further evidence, the inquiry closed with a vote of thanks to the Inspector.

## GAS INSPECTION IN CANADA.

## Proposed New Regulations.

Rather more than eighteen months ago, we noticed the first number of the "Gas Journal of Canada"—a monthly publication devoted to gas and water supply, sanitary matters, and public utilities, and the official medium of the Canadian Gas Association. The second number of the third volume has just reached us, and it bears evidence of the desire on the part of its conductors to make it useful to its readers. Among the contents is a Bill now before the Canadian House of Commons to amend the Gas Inspection Act. The following are some of its provisions.

By clause 1, section 3 of the Gas Inspection Act, 1906, is repealed, and the following are substituted therefor: "The Governor in Council may make such regulations, not inconsistent with this Act, as are necessary for giving effect to its provisions, and also regulations (a) as to the pressure under which gas is to be supplied; (b) in the case of inodorous gas, to require the addition of such substances as he deems necessary in



order to communicate odour; (c) to establish regulations for the testing of the calorific power of gas; (d) for defining the methods of making the tests prescribed by this Act and the places where such tests shall be made; and (e) for declaring the true intent and meaning of this Act in all cases of doubt."

The following provisions are substituted for those contained in section 7 of the 1906 Act: "In every district in Canada where gas is offered for sale, one or more inspectors of gas and gas-meters may be appointed by the Governor in Council, who shall have the custody of all measuring and testing apparatus and standards, and of all stamps and stamping apparatus supplied for use in the place for which he is appointed, hereinafter referred to as his district; and the inspectors so appointed shall verify all gas-meters, and test the purity of gas used in their respective districts, and shall stamp the meters when found correct, and grant certificates as to the quality of the gas, in such manner and in such form as are prescribed by regulations made under this Act. Any such inspector may, at all reasonable hours, enter any place within his district where any meter is used for measuring gas delivered to a purchaser, for the purpose of inspecting the meter so used." In place of section 19 is one authorizing the inspector to stamp as correct every meter which does not vary from the standard measure of gas more than 2 per cent. in favour of the seller or 3 per cent. in favour of the consumer.

According to the new section 31, "every undertaker in any district for which there is an inspector of gas shall be held to have undertaken that (a) the supply of gas shall be regular and sufficient; (b) that it shall be supplied under sufficient pressure; (c) that the quality of gas as to illuminating power, when tested in such manner as may be determined by departmental regulations, shall be equal to the standard established by the Governor in Council; (d) that the gas shall exhibit no trace of sulphuretted hydrogen, or any excess of sulphur and ammonia, when tested in accordance with regulations made by the Minister."

Section 34 of the Act is repealed, and the following is substituted: "A testing place or places shall be prescribed by the Department in every district for, or in respect of, which an inspector of gas is appointed; and such testing-place shall not be less than 500 yards distant from the gas-house or premises where the gas is produced and purified, and not more than 100 yards from some point on some one of the main conducting pipes used for the distribution of the gas. Upon notice of the determination as to the location of such testing-place, every undertaker shall make the connections necessary to carry the gas from such gas-house or premises to such testing-place; and until such connections have been made to the satisfaction of the inspector, the selling of gas shall be illegal."

The following provisions relate to the purity and illuminating power of the gas: "Every undertaker, in districts in which the requisite apparatus is furnished by the Minister, shall obtain during the first weeks respectively of January, April, July, and October in each year, a certificate indicating the average quantity of ammonia, and sulphur in other forms than sulphuretted hydrogen, ascertained by official analysis

during the preceding three months to have been contained in the gas. Every undertaker furnishing gas for illuminating purposes which exhibits traces of sulphuretted hydrogen, when tested in accordance with the rules provided in that behalf in the regulations made under this Act, shall incur a penalty for the first offence, if such undertaker has more than 8000 meters, of \$60; if less than 8000 and more than 4000 meters, of \$30; if less than 4000 and more than 1000, of \$20; if less than 1000, of \$10; and for every subsequent offence, double the above-named penalties. Every undertaker furnishing gas for illuminating purposes which exhibits ammonia, or sulphur in other form than sulphuretted hydrogen, in any greater quantity than is allowed by regulations made by the Minister, or which is below the standard quality as to its illuminating properties, shall incur a penalty for each and every day during and upon which such failure to comply with this Act occurs and continues, if such undertaker has more than 8000 meters, of \$30; if less than 8000 and more than 4000, of \$15; if less than 4000 and more than 1000, of \$10; and if 1000 or under, of \$5; unless such undertaker shows, to the satisfaction of the Minister, that the occurrence was attributable solely to accident which could not, by reasonable care and foresight, have been avoided."

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Corporation Gas Consolidation Bill has been set down for consideration by a Committee of the House of Commons, which will meet on April 5. Mr. Mooney, a Nationalist Member, has been elected Chairman. On the afternoon of Tuesday last, a petition for additional provisions relating to the acquisition of the Baillieston Gas Company's undertaking was presented to the House of Commons. The matter will have to go to the Standing Orders Committee; and if they approve, the Committee on the Bill will have power, if they see fit, to add these new proposals.

A report upon the proposed introduction of stoking machinery into the Perth Gas-Works has been prepared and submitted to the Gas Committee. In the report, it is explained that it is not intended to remove any of the existing fixed plant, but that it is proposed to introduce mechanical stokers, the advantages of which are summarized thus: (1) More humane conditions of labour for the workmen; (2) retorts charged to their full capacity; (3) more gas per retort; (4) larger yields of gas coke, ammonia, and tar; (5) saving of coal; (6) less wear and tear upon plant; (7) less smoke and dust in the retort-house; and (8) reduction in working expenses. It is estimated that the total saving likely to be effected by the introduction of the machinery will amount to over £700 a year, and that the initial outlay would be about £3900. It is proposed to send a deputation from the Committee to visit Derby, Fulham, and Leicester, where different types of stoking machinery are in use, before the report is put before the Town Council.

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A SUPPLY?

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The Carluke Gas Company, Limited, are proceeding with some extensions of their gas-works, including the erection of a spiral-guided gasholder of 120,000 cubic feet capacity, prepared for telescoping, in a steel tank; also a new retort-house, with a bench of 35 retorts on the regenerative system. The plans for the work have been prepared by Mr. L. Hislop, of Uddingston.

An exhibition of gas appliances, promoted by the Montrose Gaslight Company, is being held this week in the Parish Church Hall, Montrose. It was opened on Monday by Mr. A. Muirhead, the Chairman of the Company, who said that the Directors readily concurred in the suggestion of the Gas Manager—Mr. A. Mackay—that an exhibition should be held. Mr. Mackay, it may be mentioned, was responsible for bringing together the collection of gas stoves, fires, and lighting appliances which are on view, and are of a quite up-to-date order. Lectures and cooking demonstrations have been given during the week by Miss E. M. Dods, late Principal of the Dundee School of Cookery.

An elderly lady named Mrs. Muirhead, who lives in Charterhall Road, Edinburgh, had a narrow escape from death by burning on the night of Saturday last. After she had retired for the night, a nephew who resided with her detected a smell of gas in the house. In his endeavour to locate the escape, he knocked at Mrs. Muirhead's bedroom door. The lady, when she came to open the door, unfortunately dropped the key, and then lighted a match to search for it. An explosion of gas took place inside the bedroom, by which the lady was thrown down and rendered unconscious. A fire broke out in the room. The old lady was rescued in an unconscious condition. She soon recovered, and was found to be suffering merely from shock.

As a sequel to the "Note" in last week's issue of the "JOURNAL," it may be stated that at another meeting of the Lerwick Town Council, Mr. Sinclair moved a resolution the effect of which was that when gas or other pipes are laid in the burgh, the work of relaying the roads or footways shall be done by the staff of the Burgh Surveyor, and charged for. The Council, by a majority, adopted the resolution.

**The Income-Tax Question.**—According to the "Daily Mail," the following legal opinion on the subject of the deduction of income-tax has been supplied to one of the principal London limited liability companies: "No income-tax has been imposed for the year 1909-10, no income-tax is at present recoverable for that year against the company; and therefore the company is not entitled to deduct from dividends paid income-tax thereon."

**Shrewsbury Water Supply.**—The Water Committee reported at the last meeting of the Shrewsbury Town Council that the improvements recently carried out to the Conduit and Severn water supplies had given such great satisfaction that it was generally recognized that the problem of the town's water supply, which had been before the Council for about thirty years, was at length solved. To provide for all necessary improvements in connection with the Severn supply, a further expenditure of £7084, for new mains, new engine, &c., was recommended. The report was adopted.

## CURRENT SALES OF GAS PRODUCTS.

### Sulphate of Ammonia.

LIVERPOOL, March 24.

Present requirements for export having evidently been filled, the tone has become much quieter, and some of the advance in prices has been lost. The demand for home consumption continues good, but that from consumers abroad has fallen away considerably; and the former has not been sufficient to maintain the strength of the market. At the close, quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. In the forward position, makers are still quoting £11 17s. 6d. to £12 per ton f.o.b. at the best ports, without business resulting; and it is reported that there are speculative sellers over the distant months at less money.

### Nitrate of Soda.

This article meets with rather less inquiry, but sellers are firm at 9s. 10d. per cwt. for 95 per cent., and 10s. for 96 per cent. quality, on spot.

### Tar Products.

LONDON, March 24.

The markets for tar products have remained firm during the past week. Pitch is very steady; and it is possible that we may see a further slight improvement for this season. Creosote is unchanged; and though there are not a great many orders in the market, sellers are not inclined to lower their ideas of price. Benzols and naphtha remain firm, and there are a good many inquiries in the market. As to crude carbolic acid, Continental consumers continue to report that they are purchasing at 11½d. to 11¾d. per gallon f.o.b. English ports, and, in fact, some little business has been done at this figure for prompt delivery. Crystals do not show signs of improvement.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d. ex works. Pitch, London, 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, and 30s. to 31s. others. Benzol, 90 per cent., casks included, London, 8d.; North, 7½d. to 7¾d.; 50-90 per cent., casks included, London and North, 8½d. to 8¾d. Toluol, casks included, London, 10½d.; North, 9¾d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 4d. to 4½d.; solvent naphtha, casks included, London, 1s. 3½d. to 1s. 4½d.; North, 1s. 2½d. to 1s. 3½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10¾d. to 11¾d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east and west coasts, 11½d. Naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

### Sulphate of Ammonia.

The market continues firm, though the volume of business is not so great. Actual Beckton prompt is £12 10s.; and outside makes upon Beckton terms are £12 5s. In Hull, £12 5s. is asked; and in Liverpool, £12 7s. 6d. In Leith, £12 10s. is quoted; while in Middlesbrough, £12 5s. is about the price.

## A Convincing Comparative Test !!

We have just been handed a Report from an important Gas Company that after a *prolonged test* in ordinary everyday working, of our

## "SUN" Boiler

as against a Water-Heater of one of the "Circulator" Types, they found the "SUN" uses

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used by the other Apparatus—in spite of the fact that the "SUN" was kept working constantly night and day.

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## COAL TRADE REPORTS.

### Northern Coal Trade.

The coal trade has been brisk; but the holidays have now limited the output very much. This and the doubtful prospect of the Welsh trade have stiffened prices, especially of steam coals, though the production has been heavier in the last few days. In steam coals, best Northumbrians have been quoted up to 12s. 9d. per ton f.o.b.; but there is no business of moment doing at this rate at present. Second-class steams are from 10s. 6d. to 11s.; and steam smalls are dearer—at from 7s. 6d. to 8s. In the gas coal trade, the change in price has not been so great, as the consumption of the great southern companies is now much less than it was at the turn of the year. Durham gas coals vary from about 10s. 6d. to 11s. 3d. per ton f.o.b., according to quality; but for "Wear specials," from 11s. 6d. to 11s. 9d. is quoted. A number of small contracts for gas coals are being arranged, at somewhere near the current prices. A contract has also been fixed, for between 15,000 and 20,000 tons, for the Walker Gas Company for twelve months, commencing in June; and it is said that the price is about 1s. 3d. per ton more than was paid last year. It is expected that some larger contracts will also soon be in the market. Coke is firmer; and gas coke is less plentiful. Good gas coke is about 14s. per ton f.o.b. in the Tyne.

### Scotch Coal Trade.

There is a continued demand for ell for export, as well as for local consumption. Prices are showing a disposition to improve, in anticipation of trouble in Wales. The prices now quoted are: Ell, 9s. 9d. to 10s. 6d. per ton, f.o.b. Glasgow; splint, 10s. 6d. to 10s. 9d.; and steam, 10s. to 10s. 6d. The shipments for the week amounted to 287,353 tons—a decrease of 22,635 tons upon the previous week, but an increase of 35,865 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,066,696 tons—an increase of 495,222 tons upon the corresponding period.

### Gas Coal Contracts.

The Coal Trade correspondent of the "Liverpool Post" writes: "The Liverpool Gas Company are reported to have renewed all their contracts for twelve months from July 1 next, with collieries who are now supplying them, in Yorkshire, at advances of 9d. per ton. This is the same advance at which the Hull Corporation and the British Gas-light Company, who also have works at Hull, have recently renewed. These contracts have been taken at 9d. per ton advance on account of their being renewed so early in the season last year, under which conditions they did not obtain so large a reduction in price by 3d. per ton as renewals made later in the season—they obtaining a reduction of 6d. per ton, while the later renewals obtained 9d. The Gas Coal Colliery Owners' Association have agreed that all tenders sent in for renewals this year shall be at 1s. per ton advance on the prices quoted last season. Apparently the above exceptions have been made for the reasons stated. There is no doubt that in the past gas coals have been sold at far below

prices in parity with house coal market quotations, with the result that gas has been proportionately cheaper, which, incidentally, tends to compete against house coals by the popular use of gas-stoves for heating and cooking.

### Messrs. Glover and Main, Limited.

The annual meeting of this Company was held in London last Wednesday—Mr. R. T. Glover in the chair. The Directors recommended a dividend for the past year at the rate of 5 per cent. per annum on the preference share capital, and 4½ per cent. per annum on the ordinary share capital, compared with 5 and 3½ per cent. respectively for the year 1908. In moving the adoption of the report and balance-sheet, the Chairman reminded the shareholders that the turnover of the trading companies was very largely, though not exclusively, made up of the sales of meters and stoves. With regard to Messrs. Thomas Glover and Co.'s business, the volume of trade done last year was practically the same as that for 1908; but, taking into consideration the extension at their Birmingham branch, which was now for the first time under the direct control of one of the Directors (Mr. W. R. Glover), the total volume of trade showed a considerable increase. With reference to Messrs. R. & A. Main's business, the Directors had to report that their most sanguine anticipations in regard to orders received during 1909, and more particularly in the latter part of the year, had been more than realized; and, in spite of considerable extensions, principally in London, where a complete new foundry had been built and equipped within the last two years, they had been unable to cope with the demand. As a consequence, the Directors had decided to take immediate steps to double the fittings shop at Edmonton, and to extend still further the testing-rooms and laboratories attached to both works. As the shareholders were aware, full and ample provision for reserves and depreciation had been made in the trading companies' accounts. The only depreciation to be provided for by Messrs. Glover and Main, Limited, was on the freehold land and buildings owned by them. The report was adopted, and the dividends recommended were declared.

**Trial of Improved Street Lighting in the Holborn District.**—The Works and General Purposes Committee of the Holborn Borough Council, who have had under consideration the question of improving the public lighting of the borough, reported, at the meeting of the Council last Wednesday, that they had received a report from a Subcommittee to the effect that they had had an offer from Messrs. Falk, Stadelmann, and Co., Limited, to fit some of the lamps in Hatton Garden with double incandescent inverted burners on trial, at cost price, and from Messrs. D. Anderson and Co. to make a similar trial of their "Dacolight," which was described in the "JOURNAL" for Dec. 7 last. The Committee recommended that the offers should be accepted; and this was agreed to. Messrs. Anderson's lamps will be on trial in Gower Street.



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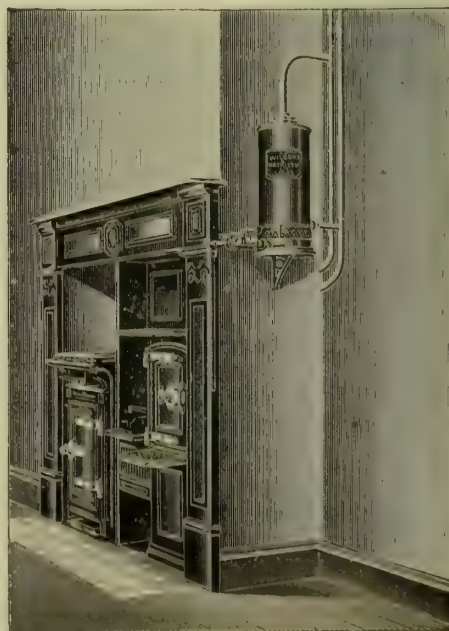
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### Torquay Gas Company.

Mr. John Kitson presided at the annual meeting of the Torquay Gas Company last Tuesday, and in moving that the report and balance-sheet be adopted, he said the year's working had yielded good results. The sale of gas had reached 177,434,000 cubic feet, an increase of 3,370,000 cubic feet over 1908, which showed that the business was steadily increasing, notwithstanding the growing competition of the electric light. The total cost of manufacture was £21,442, compared with £24,775 in 1908—a reduction of £3333. An increase in the salaries account was due to the appointment of a district inspector, whose services were appreciated by the consumers, many of whom had had their fittings examined and put in order. A bonus of £372 had been given to the staff and employees to mark the jubilee of the Company. On the sale of gas, there was an increase of £360, which was especially gratifying in view of the fact that the price had been reduced from 3s. to 2s. 11d. per 1000 cubic feet. The total receipts were £36,746, and the expenditure £28,563, leaving a balance to the profit and loss account of £7912, which compared with a balance of £6415 in 1908. After payment of the full dividends and the interest due on loans, there was a balance of £467 to be carried forward. The unaccounted-for gas had been reduced to less than 5 per cent. The report and balance-sheet were adopted, and dividends of 10 per cent. and 7 per cent. on the two classes of shares declared. In Torquay the most unsatisfactory lighting was that along the Torbay Road, which was done by electric arc lamps. Thanks were accorded the Chairman, Directors, and officials; and for the latter Mr. R. P. Kitson (the Secretary), Mr. R. Beynon (the Engineer and Manager), and Mr. J. Duckworth (the Accountant) replied.

**Devon Gas Association, Limited.**—Mr. F. Templer Depree (Chairman of Messrs. Willey and Co.) presided at the annual meeting of this Association, which was held last week in Exeter. The Association have recently acquired the gas-works at North Tawton, and they now own six works in all. The concern is making steady progress, and placing itself in a sound financial position. The Chairman reported that the work of the year had been satisfactory; and a dividend of 5 per cent. was declared.

**The New Issue of Capital by the Hornsey Gas Company.**—In accordance with the announcement which recently appeared in our advertisement columns, Messrs. A. & W. Richards offered for sale, at the Mart, Tokenhouse Yard, E.C., last Tuesday, £5000 of consolidated stock, £6500 of 5 per cent. preference stock, and £3000 of 4 per cent. perpetual debenture stock of the Hornsey Gas Company. The whole of the ordinary stock was sold at from £190 to £192 per £100, the preference stock at from £116 10s. to £118, and the debenture stock at from £100 to £100 10s.; the total amount realized by the sale being £20,182 10s.

**Maryborough (Queensland) Gas Company, Limited.**—In addition to the reports of Colonial gas undertakings noticed last week (p. 826), we have received that of the Maryborough Gas Company for the six months ended Dec. 31 last. In this period they received £3410 from the sale of gas, fittings, &c., and there was a balance of £1036 on the profit and loss account. The Directors recommended that out of it should be paid a dividend at the rate of 6 per cent. per annum, amounting to £773; leaving £263 to be carried forward. A contract has been entered into for the erection of three generator settings of retorts and a retort-house governor, at a cost of £1733. They are of the most modern type, and will, it is anticipated, greatly economize the cost of production. They are expected to be at work at the date of the next half-yearly meeting.

**Improved Public Lighting in Wandsworth.**—At the meeting of the Wandsworth Borough Council last Wednesday, the Highway Committee reported that they had had under consideration a letter from the South Metropolitan Gas Company, suggesting that the lanterns and burners for new erections should be taken from existing lamps at the corners of some of the principal streets, and that in place thereof the Company's latest inverted burner lamps which give 50 per cent. more light at the same cost, should be fixed, the extra charge for such lamps to be 3s. each, to cover the cost of labour; the expense of the lantern and burner being borne by the Company. In a further letter, the Company stated that an inverted burner had been fitted to the lamp in front of the Council House. A report from the Borough Engineer on the experimental use of the new inverted burners near the Council House was read, and it was finally decided that in future, in the part of the borough supplied with gas by the South Metropolitan Company, inverted burners shall be fitted to all new lamps, as well as to existing lamps which are altered in any way.

The accounts of Sir William Arrol and Co. for the past year show an available sum, including £9495 brought forward, of £15,394. After providing for the preference dividend, £3168 remains to be carried forward.

The Sittingbourne Urban District Council have received a letter from the Local Government Board sanctioning the Council's application to borrow £550 for the installation of a suction gas plant at the water-works.

Orders have been received by Messrs. Joseph Taylor and Co., of Bolton, for solid plate lead saturators, to be fitted with double detachable ammonia pipes, detachable acid, and detachable steam pipes, for the Yorktown and Blackwater Gas Company and the Londonderry Gas Company.

At the twentieth ordinary general meeting of Stewarts and Lloyds, held in Glasgow last Wednesday, the Chairman (Mr. J. G. Stewart), in moving the adoption of the report and statement of accounts, noticed in the "JOURNAL" for the 8th inst., stated that the conditions of trade which prevailed during 1909 were most adverse to the Company's operations. Business was restricted; and every order was the subject of extreme competition. They were only able to keep the works running by accepting contracts at prices which, in some cases, could not be regarded as profitable. They managed, however, to keep the works totally employed; and, on the whole, the results of the year's trading were better than had been anticipated.

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## THE "EXTRA"

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In the "JOURNAL" for the 15th inst., some particulars were given from the report of Messrs. C. & W. Walker, Limited, for the past year. In moving its adoption at the annual meeting last Wednesday, the Chairman (Mr. J. F. Wright) said that, in view of the depression in trade in 1909, and the keen competition they had had to meet, he thought the increased profit shown in the balance-sheet must be considered as very satisfactory. During the last few years they had spent a good deal of money in putting down new machinery, and generally in equipping the works on more modern lines. They had thus been able to secure contracts which formerly they could not have undertaken; and the result had been the increased profits made during the past few

years. They had by no means come to the end of this expenditure; and they now contemplated spending a further considerable sum with the object of facilitating production and at the same time cheapening its cost. With regard to the future, it was rather early to say anything definite as to their prospects; but the contracts already in hand seemed smaller than last year, and unless trade improved to a considerable extent, he was afraid they could hardly expect to see such good results obtained as during last year. There was, however, a considerable amount of work about at the present time, and a more hopeful feeling that trade was distinctly improving. The report was unanimously adopted.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

ENGINEER AND MANAGER. Sittingbourne Gas Company. Applications by April 7.  
CLERK OF WORKS AND MANAGER AND SECRETARY. No. 5209.  
ENGINEER AND MANAGER. Stone Gas Company. Applications by April 6.

### Plant, &c. (Second Hand), Wanted.

PURIFIER, &c. Sanderson, Edinburgh.

### Gas-Works for Disposal.

LAINDON GAS-WORKS. By Auction. April 12.

### Stocks and Shares.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. April 5.  
HORLEY GAS COMPANY. April 5.  
LOWESTOFT WATER AND GAS COMPANY. April 5.  
SEVENOAKS WATER COMPANY. April 2.  
SOUTHEND WATER COMPANY. April 19.  
WORTHING GAS COMPANY. April 5.

### TENDERS FOR

#### Coal and Cannel.

STOURBRIDGE GAS DEPARTMENT. Tenders by April 12.

#### Fire-Clay Goods.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

#### General Stores—

(Oils and Paints, Lime, Ironmongery, Brass Fittings, &c., Taps, Valves &c.)

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

### Incandescent Goods.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

### Meters.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

### Oxide (Spent).

BOURNEMOUTH GAS AND WATER COMPANY.

### Patent Licenses.

MANTLE MAKING MACHINES. Haseltine, Lake, & Co., Southampton Buildings, Chancery Lane, W.C.

### Pipes.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL. Tenders by April 9.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

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All Communications, Remittances, &c., to be addressed to  
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.  
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 862.

Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.
£	Stk.	Oct. 14	p.c.	Alliance & Dublin Ord.	86-88	..	£ s. d.	£	Stk.	Nov. 11	p.c.	Imperial Continental	178-180	+1	£ s. d.
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98-100	..	5 13 8	4,940,000	Stk.	Feb. 10	34	Do. 34 p.c. Deb. Red.	93-95	..	4 8 11
310,000	Stk.	Oct. 28	7	Bombay, Ltd.	68-68½	..	4 0 0	1,235,000	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	120-122	..	3 13 8
200,000	5	"	1	Do. New, £4 paid.	5-5½	..	5 5 8	195,242	Stk.	Feb. 25	10	Liverpool United A.	222-224	..	4 18 4
40,000	5	"	1	Bourne- 10 p.c.	29-30	..	5 6 8	501,000	"	"	7	Do. B.	163½-165½	..	4 9 3
50,000	10	Feb. 25	15	mouth Gas } B 7 p.c.	16½-16¾	..	5 0 0	718,100	"	"	4	Do. Deb. Stk.	113-105	..	4 4 7
311,810	10	"	7	and Water } Pref. 6 p.c.	15-15½	..	4 3 7	306,083	"	Dec. 29	4	Malta & Mediterranean.	4½-5	..	3 16 2
75,000	10	"	6	Brentford Consolidated	250-253	..	3 17 5	75,000	100	Nov. 26	5	Met. of 5 p.c. Deb.	59-102	..	0 0 0
380,000	Stk.	"	12½	Do. New	187-189	..	4 18 10	560,000	100	Oct. 1	5	Monte Video, Ltd.	100-102	..	4 18 0
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	5 0 6	541,920	20	Nov. 11	34	Newcastle & G'tesh'd Con	122-134	..	4 8 3
206,250	"	Dec. 29	4	Do. 4 p.c. Deb.	101-103	..	4 2 0	1,775,892	Stk.	Feb. 25	4½	North Middlesex 7 p.c.	91-93	..	5 5 8
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	213-216½	..	3 17 8	529,435	Stk.	Dec. 29	34	Oriental, Ltd.	139-141	..	5 13 6
246,320	"	Oct. 14	8	Do. A Ord. Stk.	151-154½	+1	5 3 11	55,940	10	Feb. 25	7	Ottoman, Ltd.	64-68	..	6 5 6
109,000	Stk.	Feb. 25	5	British	45-46	½	4 12 4	300,000	Stk.	Nov. 26	8	Portsea Island A.	134-136	..	5 1 0
165,700	"	"	5½	Bromley, A 5 p.c.	116-118	..	5 1 8	60,000	50	Sep. 10	13	Do. B.	126-128	..	5 1 7
82,278	"	"	5½	Do. B 34 p.c.	87-89	..	5 1 2	31,800	53	Feb. 25	13	Do. C.	119-121	..	4 19 2
5,000	"	Dec. 29	3½	Do. C 5 p.c.	103-105	..	5 4 9	60,000	50	"	12	Do. D and E.	100-102	..	4 18 0
509,000	10	Oct. 14	7	Do. 34 p.c. Deb.	87-89	..	3 18 8	100,000	50	"	10	Primitiva Ord.	72-74	..	4 8 11
250,000	Stk.	Dec. 29	4	Buenos Ayres (New) Ltd.	14½-15½	..	4 11 10	114,800	50	Oct. 28	7	Do. 5 p.c. Pref.	58-58½	..	4 8 11
100,000	10	"	—	Do. 4 p.c. Deb.	98-100	..	4 0 0	398,490	5	Jan. 27	5	Do. 4 p.c. Deb.	99-101	..	3 19 3
100,000	10	"	—	Cape Town & Dis., Ltd.	4-5	..	—	796,980	100	Dec. 1	4	River Plate Ord.	172-184	..	4 7 8
50,000	50	Nov. 2	0	Do. 4½ p.c. Pref.	6-7	..	—	488,900	Stk.	Oct. 14	8	Do. 4 p.c. Deb.	99-101	..	3 19 3
100,000	Stk.	Dec. 29	4½	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	1,000,000	10	Sep. 29	9	San Paulo, Ltd.	154-164	..	5 10 9
157,150	Stk.	Feb. 25	5	Do. 4½ p.c. Deb. Stk.	96-88	..	5 2 3	312,650	Stk.	Dec. 29	4	Do. 6 p.c. Pref.	112-122	..	4 18 0
1,513,280	Stk.	Feb. 25	5½	Chester 5 p.c. Ord.	105-108	..	4 12 7	250,000	10	"	6	Do. 5 p.c. Deb.	50-51	..	4 18 0
560,000	"	"	5	Commercial 4 p.c. Stk.	105-108	..	4 16 4	62,500	50	Jan. 3	5	Sheffield A.	233-235	..	4 5 1
475,000	"	Dec. 29	3	Do. 34 p.c. do.	103-105	..	4 15 3	125,000	Stk.	Sep. 10	10	Do. B.	233-235	..	4 5 1
800,000	Stk.	Dec. 10	7	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	209,987	"	"	10	Do. C.	233-235	..	4 5 1
209,093	"	"	5	Continental Union, Ltd.	98-100	+1	5 0 0	523,500	10	Oct. 14	10	South African.	124-127	..	7 16 11
492,270	Stk.	"	7	Do. 7 p.c. Pref.	138-140	..	4 1 4	70,000	10	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120-122	..	4 9 7
55,000	"	"	4	Derby Con. Stk.	121-123	..	4 16 4	6,429,895	Stk.	Jan. 13	3	Do. 3 p.c. Deb.	81-83	..	3 12 3
14,095	"	Oct. 2	5	Do. Deb. Stk.	103-105	..	3 16 2	1,895,445	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158½	..	1 1 3
486,997	10	Jan. 27	12	Do. 5 p.c. Ord.	98-100	..	5 0 0	209,820	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	121-123	+1	4 12 0
354,060	"	"	12	East Hull 5 p.c. Ord.	244-247	..	4 17 0	605,000	Stk.	"	5	Do. 5 p.c. Pref.	119-121	..	4 8 8
15,141,545	Stk.	Feb. 10	3½	European, Ltd.	184-19	..	4 14 9	60,000	"	"	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
2,600,000	"	"	3½	Do. £7 ros. paid.	103-104	..	4 9 8	117,058	"	Jan. 13	5	Southampton Ord.	110-112	..	4 9 3
3,799,735	"	"	4	Gas 4 p.c. Ord.	88-90	..	3 17 9	502,310	Stk.	Nov. 11	5	Tottenham A 5 p.c.	133-135	..	5 1 9
4,193,975	"	Dec. 29	3	light 34 p.c. max.	103-105	..	3 16 2	120,000	Stk.	Feb. 10	6½	and B 34 p.c.	112-114	..	4 14 4
298,740	Stk.	Mar. 16	5	and 4 p.c. Con. Pref.	80-82	-1	3 13 2	453,940	"	Dec. 29	4	Edmonton 4 p.c. Deb.	99-101	..	3 19 3
82,500	"	"	6½	Coke 3 p.c. Con. Deb.	93-95½	..	5 3 3	149,470	"	Dec. 29	8	Tuscan, Ltd.	94-97	..	8 4 2
70,000	10	Sep. 29	11	Hastings & St. L. 34 p.c.	117-119	..	6 2 3	239,476	Stk.	Jan. 3	5	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
131,070	Stk.	Mar. 16	7	Do. do. 5 p.c.	145-147	+3	4 15 3	253,636	Stk.	Feb. 25	6½	Tynemouth, 5 p.c. max.	112-114	..	4 7 9
65,782	"	"	5½	Hongkong & China, Ltd.	108-110	+2	5 0 0	79,416	"	Dec. 29	3	Wands-1 B 34 p.c.	139-141	..	4 14 0
65,500	"	Dec. 29	4	Ilford A and C	100-102	..	3 18 5					worth 5 p.c. Deb. Stk.	74-76	..	3 18 11

Prices marked \* are "Ex div."

+ Next dividend will be at this rate.



**OXIDE OF IRON.****O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

**"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old  
Broad Street, London, E.C. "Volcanism, London."**SULPHATE OF AMMONIA**  
SATURATORS and all LEAD and TIMBER  
WORK in Connection with Sulphate Plants.We guarantee promptness, with efficiency for Re-  
pairs.  
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,  
BOLTON.  
Telegrams: SATURATORS, BOLTON. Telephone 0848.**BROTHERTON & CO., LIMITED.**Offices: City Chambers, LEEDS.  
Correspondence invited.**EDGAR OF HAMMERSMITH**

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STREET LIGHTING LAMPS AND ACCESSORIES.  
BLENHEIM WORKS, LONDON, W.Telegrams: "GASOSO LONDON," Telephone:  
14 HAMMERSMITH.**LUX'S GAS PURIFYING MASS.**

See Advertisement on p. 849.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**D. ANDERSON AND COMPANY,**GAS LIGHTING ENGINEERS AND  
CONTRACTORS,

18 &amp; 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON," Telephone:  
2836 HOLBORN.**KRAMERS AND AARTS WATER-**

GAS PLANT.

K. &amp; A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

**AMMONIACAL Liquor wanted.**CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."**SULPHURIC ACID.****SPECIALLY prepared for Sulphate of**

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, and STAFFORD.

Address Correspondence and Inquiries to OLDBURY,  
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

**"NUGEPE" GAS PLANT CEMENT.****JOHN E. WILLIAMS AND CO.,**LOWER MOSS LANE,  
MANCHESTER, S.W.For all Joints in connection with Oil-Gas Plant  
and Sulphate Plant.

For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

**WARNER & VAN DER BIESEN,**

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG-ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,  
Station, or direct into Works, please apply to—  
LONDON OFFICES: 6, LEATHER LANE, E.C.**PATENTS AND TRADE MARKS**PUBLICATIONS, "MERCHANDISE MARKS  
ACT and Decisions thereunder," 1s.; "TRADE  
SECRETS v. PATENTS," 6d.; "DOCTRINE OF  
EQUIVALENTS, Mechanical and Chemical," 6d.;  
"SUBJECT-MATTER OF PATENTS," 6d.MEWBURN, ELLIS, & PRYOR, Chartered Patent  
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-  
grams: "Patent London," Telephone: No. 243 Holborn.**J. & J. BRADDOCK (Branch of Meters**Limited), Globe Meter Works, OLDHAM, and  
54 & 47, Westminster Bridge Road, LONDON, S.E.  
WET AND DRY GAS-METERS, PREPAYMENT  
METERS, STATION METERS, AND GOVERNORS.  
REPAIRS RECEIVE PROMPT ATTENTION.  
Telephones: 815 Oldham, and 2412 Hop, London.  
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."**OXIDE OF IRON (BOG ORE).**

ANY QUANTITY. ANY PORT. ANY STATION.

**DONALD M'INTOSH,**

110, CANNON STREET, LONDON.

**DUTCH OXIDE OF IRON.**

SPENT OXIDE PURCHASED IN ANY DISTRICT.

**THE First Dutch Bogore Co., Ltd.,**  
NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

**GAS OILS.****MEADE-KING, ROBINSON, & CO.**Represent the Strongest Independent Re-  
fineries in America; also Petroleum Spirit for Gas  
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and  
11, OLD HALL STREET, LIVERPOOL.**SPENCER'S PATENT HURDLE GRIDS.****THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement, Feb. 1, p. 277.

**BRISTOL RECORDING GAUGES**  
AND THERMOMETERS.J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.**AMMONIA.**Consumers in any form are invited to correspond  
with CHANCE AND HUNT, LTD., Chemical Manufac-  
turers, OLDBURY, WORCS.**J. E. C. LORD, Ship Canal Tar Works,**  
Waste, Manchester. Pitch, Creosote, Benzols,  
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,  
Carbolic Acid, Sulphate of Ammonia, &c.**OXIDE OF IRON**

(NATURAL)

FOR GAS PURIFICATION.

NEW WESTBURY IRON COMPANY, LTD.

WESTBURY, WILTS.

**"GAZINE" (Registered in England and**Abroad). A radical Solvent and Preventative  
of Naphthalene Deposits, and for the Automatic  
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West  
Moor Chemical Works, KILLINGWORTH, or through his  
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-  
TYNE.Telegrams: "DORIC," Newcastle-on-Tyne. National  
Telephone No. 2497.**"HALLITE" Asbestos High-Pressure**

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,  
LONDON, E.C.**JOHN RILEY & SONS, Chemical Manu-**facturers, Hapton, near Accrington, are MAKERS  
of Special SULPHURIC ACID, for Sulphate of Am-  
monia Making. Highest percentage of Sulphate of  
Ammonia obtained from the use of this Vitriol, which  
has now been used for upwards of 50 Years. References  
given to Gas Companies.**TAR WANTED.**

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,  
MANCHESTER.Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.**AMMONIACAL Liquor wanted.**BROTHERTON AND CO., LTD., Ammonia Distillers,  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.**OXIDE OF IRON.**

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

**BALE & CHURCH,**

5, CROOKED LANE, LONDON, E.

**SULPHURIC ACID.****SPECIALLY prepared for the Manu-**  
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN &amp; MESSEL, LTD.

with which is amalgamated WM. PEARCE &amp; SONS, LTD.

86, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON,"

Telephone: 841 AVENUE.

**METER INDICES**

WITH AND WITHOUT DIALS.

**A. ROUX & CO., Limited,**

9, SOUTHAMPTON STREET, HOLBORN, W.C.

MOVEMENTS FOR CLOCKS, PHOTOMETERS AND  
BAROGRAPHS, WHEELS, PINIONS, AND WORMS.

WORKS, HANDSWORTH, BIRMINGHAM.

**FIDDES-ALDRIDGE****SIMULTANEOUS Discharging-Charger.**The one Machine which Discharges and Charges  
at One Stroke.

See Advertisement, March 8, p. III. of Centre.

ALDRIDGE AND RANKEN,

39, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams:

Telephone:

"MOTORPATHY, LONDON,"

5118 WESTMINSTER.

**SULPHURIC ACID for Sale, specially**suitable for making Sulphate of Ammonia.  
BROTHERTON AND CO., LTD., Chemical Manufacturers,  
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-  
LAND.**HYDRATED OXIDE OF IRON.****PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**"FORTO" Incandescent Gas Mantles**Combine Brilliance and Strength. British  
Made. Send for List.

ISAAC EALES AND CO., HOWARD STREET, BIRMINGHAM.

Telephone: Central, 5623.

**GAS PLANT for Sale—We can always**offer NEW and SECOND-HAND GAS AP-  
PARATUS, including Retorts and Fittings, Condensers,  
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,  
Tanks, Valves, Connections, &c. Also a few COM-  
PLETE WORKS. Compare Prices and Particulars  
before ordering elsewhere.FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,  
Thornhill, Dewsbury.**GAS TAR wanted,**

BROTHERTON AND CO., LTD., Tar Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
WAKEFIELD, AND SUNDERLAND.**GAS-WORKS requiring Extensions**should Communicate with FIRTH BLAKELEY,  
SONS, AND CO., LIMITED, Dewsbury, who make a  
Speciality of Catering for the Smaller Gas Concerns.  
Prices Reasonable; quality and results, the best. Satis-  
faction Guaranteed.**AMMONIA Waste Liquor Disposal.**

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

**APPLICATIONS FOR APPOINTMENTS.****DO** you appreciate how much success  
depends on well-considered and lucid present-  
ment of your qualifications? I make a Speciality of the  
Preparation of Applications, and am continually re-  
ceiving complimentary letters from clients. Write now  
for Particulars.

HERBERT GREATORREX, Beechwood, MATLOCK.

**TO GAS MANAGER'S OR GAS ENGINEER'S**  
SON.**SUITABLE Man Wanted to Act as**CLERK OF WORKS during Erection of an  
8 Million Cubic Feet Works, Take Charge of Laying  
Mains and Services, and later on to Act as MANAGER  
and SECRETARY. Preference will be given to one  
investing a fair amount in Shares. Splendid Prospects.Apply, by letter, stating Age, Experience, and Wages,  
to No. 5209, care of Mr. King, 11, Bolt Court, FLEET  
STREET, E.C.



**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
and ELEVATING and CONVEYING PLANT, ROSE  
MOUNT IRON-WORKS, ELLAND.

**THE Sittingbourne District Gas Com-**  
pany require the Services of an Experienced  
ENGINEER and MANAGER for their Gas-Works.  
He must be capable of Designing and Superintending  
the carrying out of Extensions, and Competent to  
undertake the Entire Control of the Works, Mains, and  
Services, the Supervision of the Manufacture of Gas  
and Sulphate of Ammonia, and the Testing of Gas.  
Salary, £180, with Residence, Coal, and Gas free.  
The duties to commence the 1st of June next.  
Applications, stating Age, Experience, present Em-  
ployment, &c., accompanied by copies of not more than  
Three recent Testimonials, to be sent to the under-  
signed on or before the 7th of April next.

E. H. GOLDFINCH,  
Secretary.

Sittingbourne, March 24, 1910.

#### STONE, STAFFORDSHIRE.

**WANTED, a Gas Engineer and**  
MANAGER of the Works belonging to the  
Stone Gaslight and Coke Company, Limited.  
Candidates must have a Practical Knowledge of the  
Manufacture and Distribution of Gas and be able to  
prepare Plans and Specifications for any New Works.  
The person appointed must devote the whole of his  
time to the Duties and be able to keep, with assistance,  
the Books. He will be required to act as Secretary to  
the Company.  
Canvassing not allowed and will disqualify.  
Commencing Salary, £160 per Annum.  
Applications, marked "Gas Manager and Secretary,"  
stating Age and Experience with copies of Three recent  
Testimonials, to be sent not later than Wednesday,  
April 6, to JOHN KENDRICK, Esq., Chairman, Stone  
Park, Stone, STAFFORDSHIRE.

**WANTED, a Purifier, Second-Hand,**  
about 6 ft. by 4 ft. by 3 ft., with Valves, Con-  
nections, and Lifting Apparatus.  
Address K. SANDERSON, 23, Rutland Street, EDIN-  
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**CAST-IRON Pipes. Spigot and Socket**  
or Flanged. Special Quality—9 feet or 12 feet  
Lengths. When buying, Write us.  
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GRIDS, 3 ft. 6 in. high, in perfect Condition;  
mostly new. Cheap for immediate Sale.  
Apply to FIRTH BLAKELEY, SONS, AND CO., LTD.,  
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**GASHOLDERS—Splendid 45 feet dia-**  
meter and New STEEL TANK, fixed Complete to  
Plan and Specification; also 14 feet and 16 feet  
Diameter GASHOLDERS, with STEEL TANKS. Can  
be seen temporarily erected. Re-erected Cheap for  
immediate Sale.  
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

#### URBAN DISTRICT COUNCIL OF STOURBRIDGE. (GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for**  
the Supply of about 20,000 Tons of Good Screened  
GAS COAL, delivered on their Gas-Works.  
Forms of Tender may be had on Application to the  
undersigned, and only Offers on our own Form will be  
considered.  
Tenders, endorsed "Gas Coal," addressed to the  
Chairman of the Gas Committee, to be sent to me at  
the Gas-Works, Stourbridge, on or before Tuesday,  
April 12, 1910.

The Contract will contain a Fair Wages, &c., clause.  
The lowest or any Tender not necessarily accepted.  
By order of the Committee,  
CHARLES H. WEBB,  
Engineer and Manager.

Gas-Works, Stourbridge,  
March 18, 1910.

#### URBAN DISTRICT COUNCIL OF COLWYN BAY AND COLWYN.

##### GENERAL GAS STORES.

**TENDERS are invited for the Supply**  
of the following STORES and MATERIALS, in  
such Quantities as may be required in the Gas Depart-  
ment of the above Council, for the Year ending the  
31st of March, 1911—viz:

Fire-Clay Goods, Lime, &c.  
Iron Tubes and Fittings.  
Lead and Compo.  
Iron and Steel.  
Oils and Paints.  
Brass Fittings and Sundries.  
Slot Fittings.  
Dry Meters.  
Main Taps.  
Steam Valves.  
Castings.  
Incandescent Lighting Goods.  
Ironmongery.

Form of Tender and any Information may be had  
from the undersigned, to whom sealed Tenders, endorsed  
"Tenders for Gas Stores," addressed to the Council  
Officers, Colwyn Bay, must be delivered not later than  
Saturday, the 9th of April next.

The Tender of any person who, personally or through  
an Agent, canvasses any of the Officers or Members of  
the Council will be rejected.

The Committee do not bind themselves to accept the  
lowest or any Tender.

By order,  
JAMES AMPHILL,  
Clerk to the Council.

Council Officers, Colwyn Bay,  
March 17, 1910.

#### SPENT OXIDE.

**THE Bournemouth Gas and Water Com-**  
pany invite TENDERS for about 800 Tons of  
SPENT OXIDE l.o.b. Poole, Dorset.  
Samples and Particulars on Application to the  
GENERAL MANAGER, GAS-WORKS, BOURNEMOUTH.

#### SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS beg to**  
notify that their SALES BY AUCTION OF NEW  
CAPITAL ISSUED UNDER PARLIAMENTARY  
POWERS, and of STOCKS and SHARES belonging to  
EXECUTORS and other PRIVATE OWNERS in LON-  
DON, SUBURBAN, and PROVINCIAL GAS and  
WATER COMPANIES, take place PERIODICALLY  
at the Mart, TOKENHOUSE YARD, E.C.4.  
Terms for Issuing New Capital, and also for including  
other Gas and Water Stocks and Shares in these Periodi-  
cal Sales, will be forwarded on Application to MESSRS.  
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

#### By order of the Directors of the LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY  
£10 SHARES,  
AND  
£1000 FOUR PER CENT. PERPETUAL  
DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, April 5, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

#### By order of the Directors of the ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

NEW ISSUE OF £32,000 FOUR PER CENT.  
PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, April 5, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

#### By order of the Directors of the WORTHING GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £3473 CONSOLIDATED  
ORDINARY STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, April 5, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

#### HORLEY DISTRICT GAS COMPANY.

£250 "A" CAPITAL STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, April 5, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

In the High Court of Justice, Chancery Division,  
Mr. Justice Joyce. 1909, L. No. 1586.

#### THE FREEHOLD GAS-WORKS

OF THE  
**LAINDON AND DISTRICT GASLIGHT, COKE  
AND WATER COMPANY, LIMITED,**

Situate about 23 miles from London, within a short  
distance of the Laindon Station on the London, Tilbury,  
and Southend Railway. The Works comprise: Retort  
House with Eight Retorts, Vertical Condenser, Cast-  
Iron Scrubber, Tar-Tank and Pump, Two Purifiers,  
with Lifting and Traversing Apparatus, Gasholder,  
400-Light Station Meter, together with the Mains,  
Services, Meters, and Tools, the whole to be sold as a  
Going Concern and with Possession on completion of  
the purchase.

**MR. WILLIAM RICHARDS, of the**  
Firm of MESSRS. A. & W. RICHARDS (the  
person appointed by the said Judge), will SELL THE  
ABOVE BY AUCTION, at the Mart, London, E.C., on  
Tuesday, April 12th., at One o'clock, precisely in One  
Lot.  
The Works may be viewed, and Particulars with  
Conditions of Sale obtained, of J. MONTAGUE HASLIP,  
Esq., Solicitor, 6, Martin's Lane, CANNON STREET,  
E.C.4; of HARRY BARKEP, Esq., Chartered Accountant,  
6, OLD JEWRY, E.C.4, and of the AUCTIONEERS, 18,  
FINSBURY CIRCUS, E.C.

#### By order of the Directors of the SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1000 NEW ORDINARY FIVE  
PER CENT. MAXIMUM £10 SHARES.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the  
Mart, E.C., on Tuesday, April 19, at Two o'clock, in  
Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY  
CIRCUS, E.C.

#### SEVENOAKS WATER-WORKS COMPANY.

**NOTICE is Hereby Given, that the**  
Sevenoaks Water-Works Company, in pursuance  
of their Provisional Order of 1908, as confirmed by Act  
of Parliament, being desirous of increasing their Capital,  
have resolved to issue Three Hundred 4 PER CENT.  
PREFERENCE SHARES OF TEN POUNDS each.  
Tenders are hereby invited from the Public for the  
same at not less than par value.

The present issue of Capital is made to provide for  
the Extension of Mains and other works, and also for  
the Repayment of Sums over-expended on Capital  
Account.

The Company are paying the Maximum Dividend on  
their Stock and Ordinary Share Capital.

Tenders are to be addressed to the Company at their  
Offices, Oak Lane, Sevenoaks, on or before Saturday,  
the 2nd day of April, 1910, and endorsed "Tender for  
Shares."

The Shares are Payable as under—viz.:  
£2 on Application,  
£3 on Allotment,

and the Balance on the 1st day of July, 1910.

Where no Allotment is made, the Deposit will be re-  
turned in full.

Forms of Tender on Application at the Company's  
Offices.

By order of the Board,  
ALFRED GRAINGER,  
Secretary.

Offices: Oak Lane, Sevenoaks,  
March 9, 1910.

#### THE PROPRIETORS OF THE PATENTS NOS.

24,218 of 1901 and 83 of 1901, for "IMPROVE-  
MENTS relating to MACHINES FOR THE MANU-  
FACTURE OF MANTLES EMPLOYED IN INCAN-  
DESCENT LIGHTING" and "IMPROVEMENTS  
relating to MACHINES FOR THE MANUFACTURE  
OF INCANDESCENT GAS MANTLES," are desirous  
of entering into Arrangements, by way of LICENSE  
and Otherwise, on Reasonable Terms, for the purpose  
of EXPLOITING the same and ensuring its Full  
Development and Practical Working in this Country.  
All Communications should be addressed in the first  
instance to HASELTINE, LAKE, AND CO., Chartered  
Patent Agents and Consulting Engineers, 7 & 8, South-  
ampton Buildings, Chancery Lane, London, W.C.

#### THE Sir John Cass Technical Institute, JEWRY STREET, ALDGATE, E.C.

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mencing **Wednesday, April 20, 1910.**

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dustries. Monday Evenings, 7 to 10 p.m. Commencing  
**Monday, April 18, 1910.**

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Principal.

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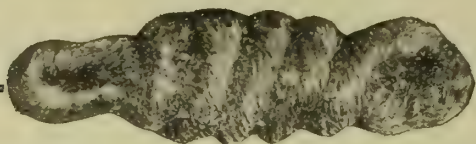
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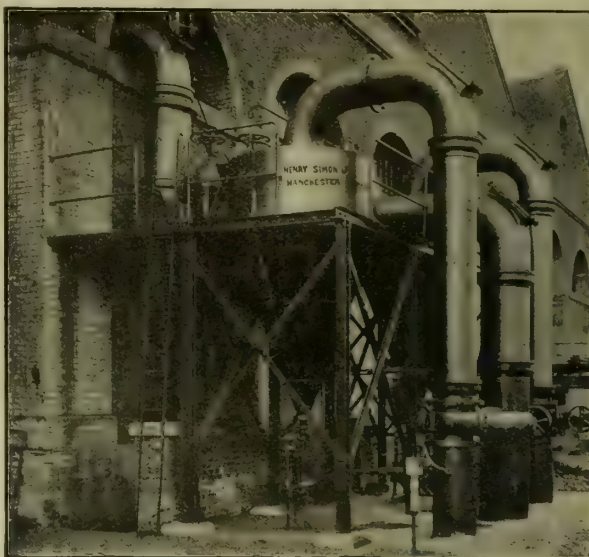
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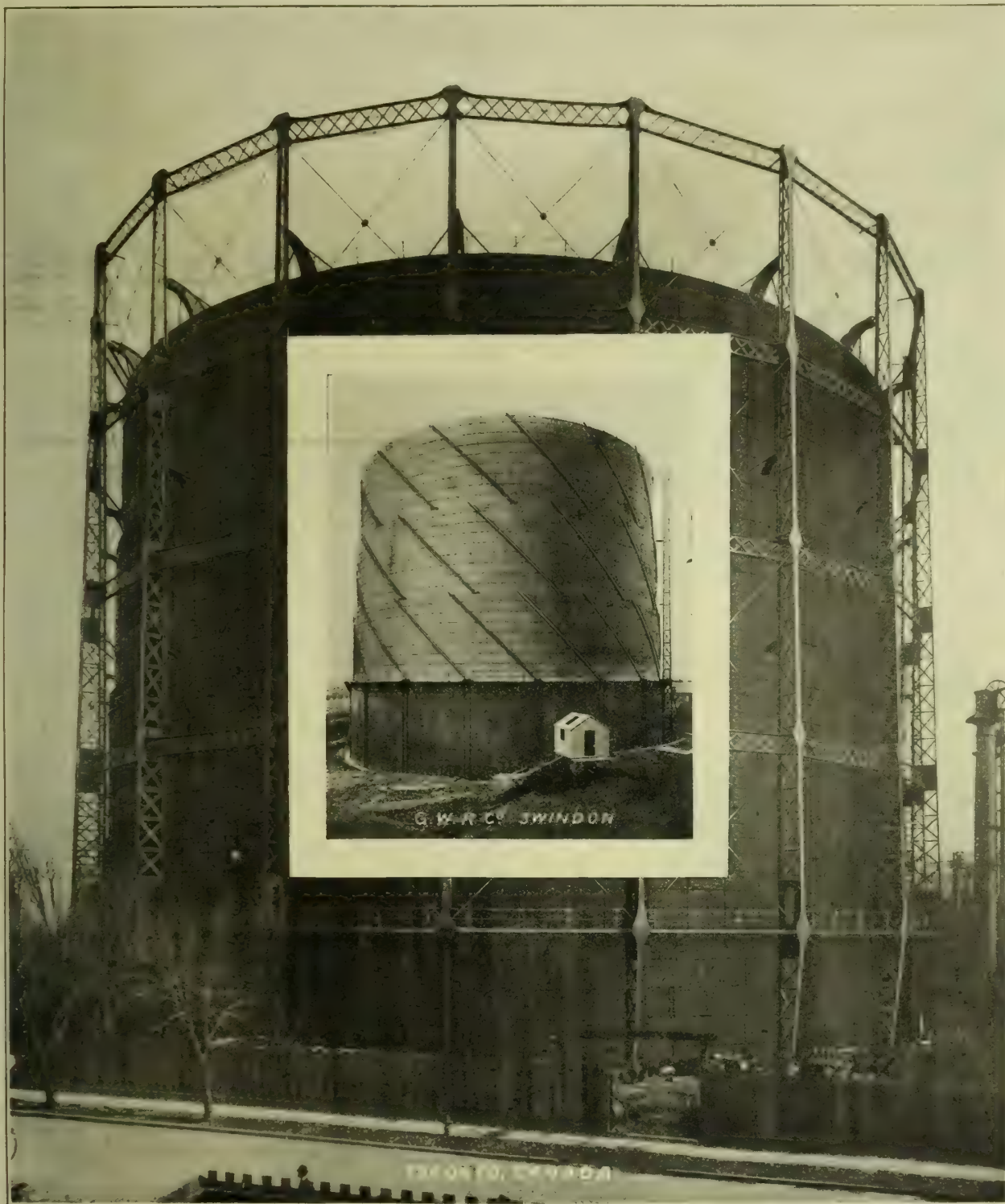
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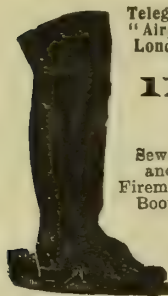
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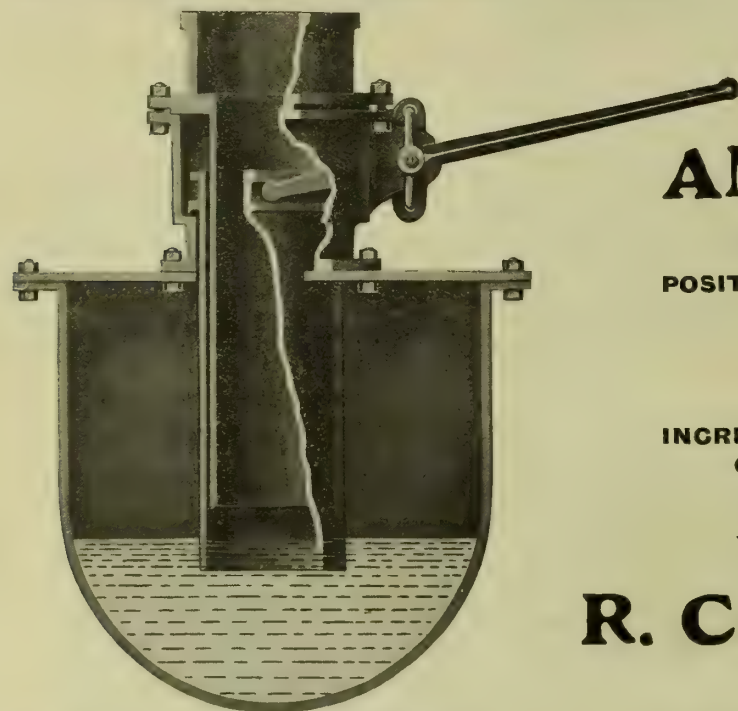
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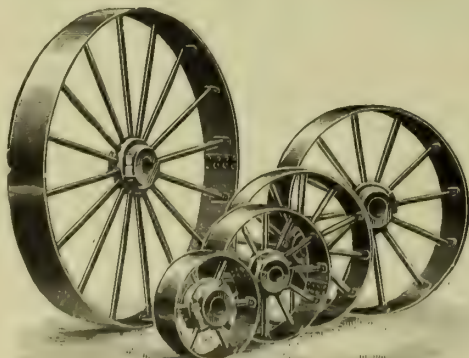
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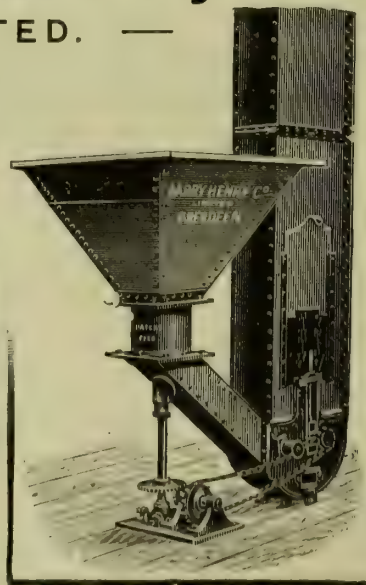
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**VOL. CVIII.**

OF THE

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Pepper Rd. Branch, Hunslet, Leeds.



Interior View of Works  
Employed in the Manufacture of  
**WELDED STEEL MAINS**  
for WATERWORKS Etc.

**JOHN BROWN & CO., LTD., SHEFFIELD,**

Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

# **ALDWARKE MAIN GAS COAL**

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

**VERY FREE FROM IMPURITIES.**

TELEGRAMS: "ATLAS SHEFFIELD."



# Welsbach

## LIGHT

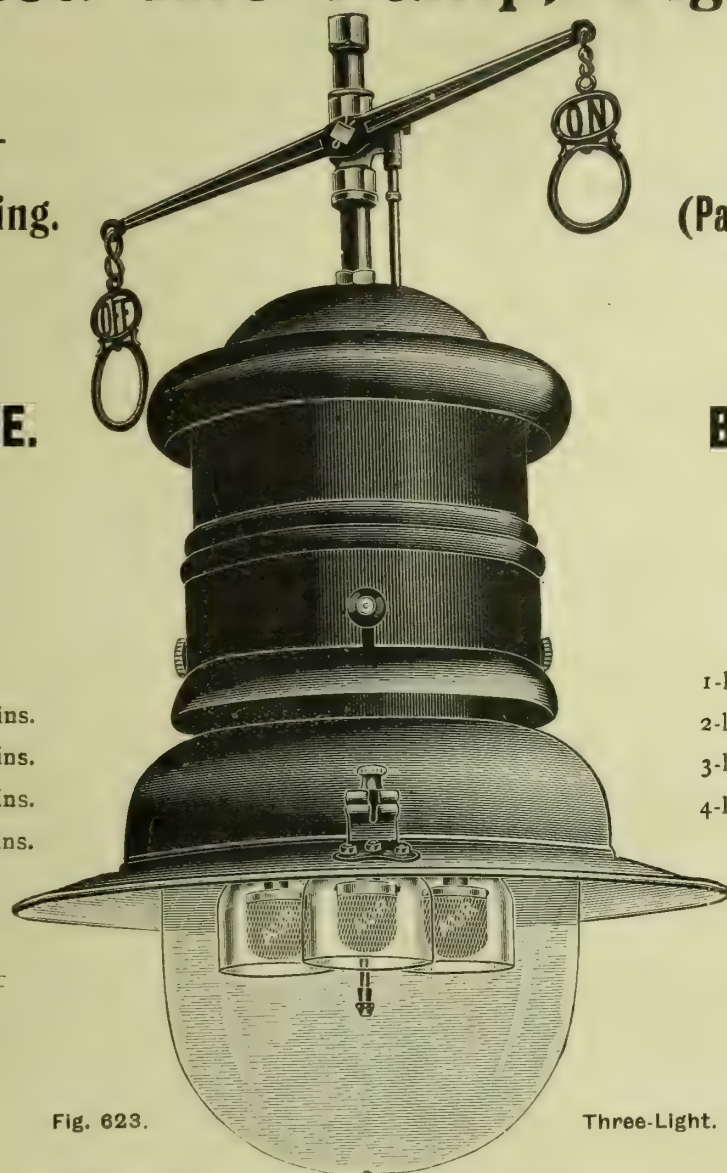
### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

#### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 36
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

**THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,**  
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.



# SILICA MACHINE MADE RETORTS.

TRADE "C.O." MARK.  
REGISTERED.

## THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.

**GREATER CONDUCTIVITY THAN ANY FIRE-CLAY RETORT.**

For Particulars and prices apply—

**JOSEPH MORTON, LTD.,**

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## ARROL-FOULIS

Stoking Machinery

## HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

**WILL DISCHARGE A RETORT IN ONE OPERATION**  
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

**SIR WILLIAM ARROL & CO., Limited,**  
**GLASGOW.**

[See Illustrated Advertisement, March 15, p. 706.]

# GAS WORKS APPLIANCES, TOOLS, &c.

## HULETT'S

Coke Barrows.

Forks and Shovels.

Service Cleansers.

Pressure Gauges.

Gas and Liquor Valves.

Cotton Waste, Yarn.

Syphon Pumps.

Street Lanterns.

Main Laying Tools.

&c., &c.

See Special Catalogue No. 153.

## D. HULETT & CO., LTD.

Gas Engineers.

55 & 56, High Holborn, LONDON, W.C.

Established 1818.







# THE "DARWEN" ARCH PIPE

Prevents Stopped Ascension Pipes.

"The Cost is moderate and can be saved in a Single Season."

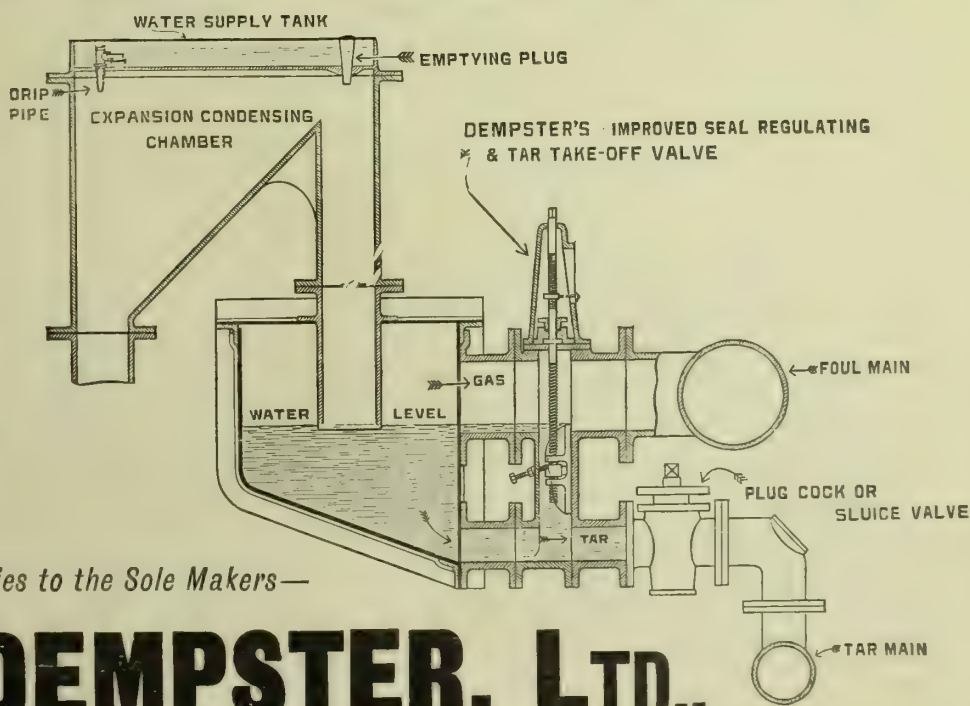
"The Arch Pipes can be seen in operation upon application."

"It will pay you to try them upon troublesome Pipes."

Upwards of 400 are already at Work or on Order.

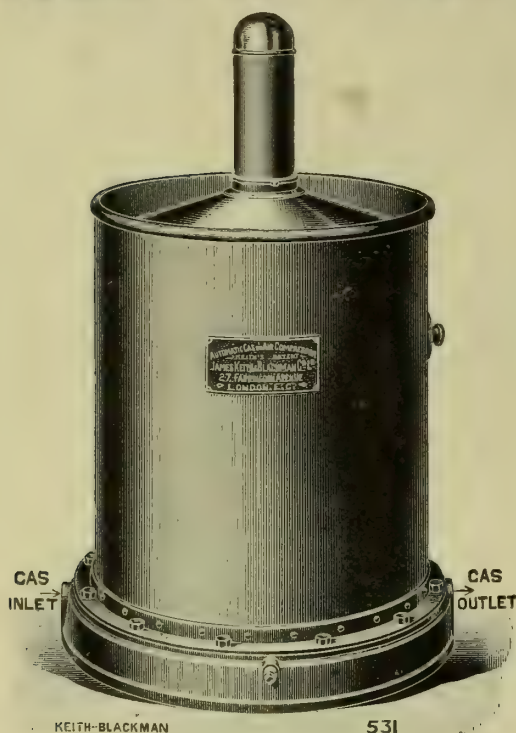
Please address all Enquiries to the Sole Makers—

**R. & J. DEMPSTER, LTD.,**  
GAS PLANT WORKS, **MANCHESTER.**





# KEITH PATENT GAS ENGINE ANTIFLUCTUATOR.



Its use cures all troubles of pulsation in Gas Mains, and maintains a steady pressure.

Permits the Engine to work at its highest efficiency.

Saves its cost in a very short time.

Made in various sizes.

Full Particulars on application to

**JAMES KEITH AND BLACKMAN CO., LTD.,**  
27, FARRINGTON AVENUE, LONDON, E.C.

**CLAPHAM BROS., LTD., KEIGHLEY,**  
SOLE MAKERS OF THE  
“**ECLIPSE**” SPECIALITIES

In WASHER-SCRUBBERS, WATER-TUBE CONDENSERS, LIVESY WASHERS,  
P. & A. EXTRACTORS, RETORT MOUTHPIECES, and DRY-LUTE PURIFIERS.



The above is a view of a Purifying Plant entirely undertaken by us for the Manchester Corporation, to the Designs of their Engineer, J. G. NEWING, Esq., it covers 1144 square yards and contains Twelve Purifiers with space for an additional Four, each 35 feet square, with a total area of 14,700 square feet. Upwards of 2400 Tons of Steel and Iron were used.

Representatives— { THOS. B. YOUNGER, A.M.I.C.E., LONDON.  
JOHN D. GIBSON, PAISLEY.  
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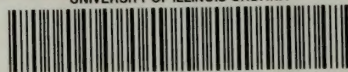








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